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DERECH HATEVA



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**A Journal of Torah and Science
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The publication of this journal would not have been possible without the help of our generous donors. Jewish tradition teaches that the Torah is a “tree of life to those who support it” (Proverbs 3:18). The Midrash interprets this verse to mean that the Torah gives life to those who participate in Torah study, as well as those who support its study. Derech HaTeva provides the unique opportunity for students to synthesize their passion for science with their love of Torah, and we thank you for making this opportunity possible.

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Dedication

We dedicate the eighteenth volume of Derech HaTeva: A Journal of Torah and Science to the memory of Esther Ohayon, who was struck by a car and killed instantly while walking to the Etz Chaim Synagogue in Florida on the night of Yom Kippur, Sept. 13, 2013. She was 57 years old.

Her 16-year-old daughter, Orly Ohayon, was also struck and, although critically injured, she survived. Esther's fate was not as fortunate, and her sudden death serves as a reminder of both the fragility of the human body and the ultimate power of G-d as its maker. Through this dedication, we hope to emphasize the importance of utilizing our opportunities to engage in the study of Torah and science with the recognition that they may be limited, because each precious moment may be the last.

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Devorah Farber Amy Nathan Chaya Spigelman

"וְקַשְׁתָּם מִשֵּׁם אֶת יְהוָה
אֱלֹקֵיךְ וְמִצְאָתָּה בַּי תְּדַרְשֵׁנוּ
בְּכָל לְבָבֶךָ וּבְכָל נְפָשָׁךְ"

“From there you will seek Hashem,
your G-d, and you will find Him,
if you search for him with all your
heart and all your soul.”

Devarim 4:29

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North African Jewry: The Possibility of Introducing Genetic Screening

Jacqueline Benayoun

Many of the Jewish communities in North Africa are among the oldest in the world, dating over 2,700 years. Jewish communities in North Africa, including Morocco, Algeria, Libya, Tunisia, Sudan, and Egypt, were established early in the Diaspora; other Jewish communities arrived after their expulsion from Spain in 1492 [1]. Over the twentieth century, the vast majority of these Jews have emigrated, mainly to Israel and France, with substantial numbers moving to South America, Canada and the US, and establishing communities there.

Due to the largely homogenous Jewish communities that were present in North Africa for centuries, similar genetic markers, as well as unique genetic diseases, can be traced to these insular communities. The similar genetic make-up among the North African Jewish communities is indicative of their seclusion and minimal intermarriage, strengthening the claim of a Jewish presence in North Africa since the destruction of the first Beit Hamikdash. Dr. Harry Ostrer, a medical geneticist at the Albert Einstein College of Medicine and author of papers on North African Jewish genetics, stated, “Jews tend to be more related to one another than they are to non-Jews, including non-Jews living nearby - it’s true in every region” [2].

In a recent study published in Proceedings of the National Academy of Sciences, Dr. Ostrer and colleagues analyzed DNA samples from 509 people of North African Jewish origin [3]. Upon comparing the single nucleotide polymorphism (SNP) data with data from a variety of other Jewish and non-Jewish groups, they found that the North African populations had genetic patterns more similar to European and Middle Eastern Jews than to non-Jewish people from that region. The data indicated that the Jews in this region seldom intermarried with non-Jews. In addition, the North African Jews formed two major subgroups: (a) Moroccan and Algerian Jews and (b) Tunisian, Djerban, and Libyan Jews. These two subgroups exhibited a high degree of marriage within their own community (or, endogamy) and showed significant relatedness to European and Middle Eastern Jews, with both subgroups being part of the larger Ashkenazi and Sephardic Jewish groups. The researchers attributed these later findings to the North Africans Jews marrying with Sephardic Jews who arrived after their expulsion from the Iberian Peninsula in the 15th century.

“This work demonstrates a shared genetic history among the Jews of North Africa and strengthens the case for a biological basis for Jewishness,” said Ostrer [3]. Moreover, with this knowledge in hand, the discrete genetic patterns of North African Jewry have led to the presence of distinct hereditary disorders that characterize these communities. Just as Ashkenazi Jews have unique genetic disorders, such as Tay Sachs disease, in their community, the North African Jewish community also has its own unique genetic disorders that range from common to rare and that vary in their modes of inheritance [4].

A common genetic disorder in the North African Jewish community is familial Mediterranean fever (FMF) (OMIM #249100), an autosomal recessive disorder resulting from mutation in the pyrin gene. This disease is manifested by recurrent attacks of fever and inflammation of liquids around the abdominal cavity, the joints, and the lungs [5]. Amyloidosis and renal failure are clinical complications that may develop. FMF was notably observed in Jews from Libya, Morocco, and Tunisia. FMF is commonly found in men, more so than in women, and is believed to affect one in seven Jews from these regions. The most common clinical treatment for this disorder is colchicines, which can ameliorate some of the painful symptoms. A late-onset form of the disease was characterized by Tamir et al. [6]. These patients experienced their first FMF attack at age 40 or later.

Similarly, glycogen storage disease type III (GSD III) (OMIM #232400) is an autosomal recessive disorder that heavily affects North African Jews. GSD III, caused by deficiency of a glycogen enzyme, is characterized by an accumulation of abnormal glycogen with short outer chains. Many patients are enzyme-deficient in liver and muscle and experience hepatomegaly, hypoglycemia, and growth retardation. Muscle weakness can become more severe in adults, and some affected people will develop cardiomyopathy [7]. When examining the population genetics of this disorder, the overall incidence of GSD III is about 1 in 100,000 live births in the U.S.; however, it possesses a frequency of 1 in 5,400 with a carrier frequency of 1 in 35 among North African Jewish individuals in Israel [8].

Another disorder common in North African Jews is ataxiatelangiectasia. Mutation of the ATM gene is responsible for this autosomal recessive disorder characterized by cerebellar degeneration, immunodeficiency and cancer predisposition. Carriers of the gene were reported to be moderately cancer-prone. A single mutation was observed in 32/33 defective ATM alleles in Jewish A-T families of North African origin, coming from various regions of Morocco and Tunisia. This mutation occurs as a stop codon, or a nucleotide triplet that signals a termination of DNA replication, at position 35 of the ATM protein. This founder effect presented an opportunity for population-based screening for carriers of ataxiatelangiectasia carriers in the Jewish community [9]. In population genetics, the founder effect originates when a few individuals establish a larger population, causing a loss in genetic variation among a group.

Clearly, unique hereditary genetic disorders are identified within different North African Jewish communities. This resulted from their isolation, endogamous marriages, and restricted gene pool in these Jewish communities over hundreds of years. Little emphasis has been directed to developing a panel of genetic screens for North African Jewry. However, such a screening panel is the

obvious solution to minimize the incidence of disorders associated with this community. Genetic screening has proved successful for other Jewish subgroups, in particular the Ashkenazi Jewish community, and programs, such as Dor Yeshorim, have lessened the incidence of Tay Sachs disease tremendously [10]. Creating a genetic screening system specific to North African Jewry could

potentially lower the incidence of their specific genetic disorders, a valuable concept since North African Jewry comprises the third largest group of World Jewry. Although introducing genetic screening into a large Jewish sub-group will be challenging, primarily because of the various modes of inheritance in this Jewish group, the benefits for future generations in reducing incidences of these diseases are tremendous.

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The Sounds that Reach the Soul

Rebecca Benhaghnazan

Jerusalem of gold, and of bronze, and of light, Behold I am a violin for all your songs. We have returned to the cisterns, to the market and to the market place A ram's horn calls out on the Temple Mount in the Old City. And in the caves in the mountain thousands of suns shine - We will once again descend to the Dead Sea by way of Jericho!"

In her famed piece, "Yerushalayim shel Zahav" ("Jerusalem of Gold"), Israeli songwriter and musician Naomi Shemer depicts the Jewish nation's desire to return to the holy city of Jerusalem. In 1967, when Jerusalem was freed by the Israeli Defense Forces (IDF) during the Six Day war, Shemer added the final stanza to her song. At the time Jerusalem was liberated, the Israeli soldiers sang the original version of the song at the Western Wall. The line, "A ram's horn calls out on the Temple mount in the Old city," alludes to Rabbi Shlomo Goren, the Chief Rabbi of the IDF during the Six Day war, blowing the shofar, a ram's horn, upon the capture of the city [1]. The shofar is a symbolic item in Judaism and has served a variety of functions for the Jewish people, dating back to biblical times.

The shofar is mentioned seventy-two times throughout the Bible in many different contexts [2]. When the Jewish people stood at Mount Sinai, ready to receive the Torah, the shofar was sounded loudly, as it says, "And it came to pass on the third day, when it was morning, that there were thunders and lightning and a thick cloud upon the mount, and the voice of a shofar exceeding loud..." (Exodus 19:16). The thunder, the lightning, and the loud noise of the shofar caused the Jewish nation to tremble in awe of G-d upon becoming His nation.

The shofar was not only used to instill the awe and the fear of G-d into the Jewish people at Mount Sinai, but it also served military purposes. When the Jewish nation entered the land of Israel during the war against Jericho, G-d instructed Joshua to encircle the city once for a duration of six days. On the seventh day, Joshua was instructed by G-d to encircle the city seven times, and the priests were instructed to blow shofars. When the shofars were sounded and the people cried out, the walls of the city collapsed, and the Jews captured Jericho, ultimately leading to their triumph (Joshua 6:1-5). The shofar was also used to frighten the enemy when Gideon the Prophet led the Jewish people in war against Midian, as it is written:

Now Gideon came with the hundred men that were with him to the edge of the camp, in the beginning of the middle watch, when they had but recently awakened the guards; and they blew the trumpets, and they smashed the pitchers that were in their hands...And every man stood in his place around the camp; and the entire camp ran, and they trumpeted, and fled. And they blew the three hundred

trumpets, and the Lord set every man's sword against his fellow, and throughout the whole camp... (Judges 7:19, 21-22)

The shofar was also used to announce victory in war. When King Saul reigned over Israel, and Jonathan killed the Philistine officer, Saul sounded the shofar to spread the word of the victory over all of the land of Israel (I Samuel 13:3-4). Due to its distinct sound, the shofar was used prior to entering battle to summon the soldiers to gather in prayer and repentance [3]. The shofar was also used during war to warn the people that the enemy was approaching and to signal a ceasefire. Furthermore, the shofar was used to alert the people about a rebellion [2].

Upon the coronation of a king, the shofar was sounded. When Abshalom became King of Hebron, he sent spies throughout the land and instructed them to inform all people that when they hear the shofar, they should respond with "Abshalom is King in Hebron" (II Samuel 15: 9-10). After the downfall of Queen Jezebel, Elisha the Prophet instructed one of his disciples to anoint Jehu as the King of Israel. To announce Jehu's anointment as King, the shofars were sounded (II Kings 9:1-2,13). As seen in Psalms (47:6), the shofar was also used as a symbol of coronation of G-d over the entire universe [10]. During the times of the Temple, the shofar was used as a musical instrument in conjunction with trumpets. The shofar was also used to announce a new moon and the Jubilee year, the latter of which happened every fifty years.

Today the shofar serves as an integral part of Rosh Hashanah and Yom Kippur services. As mentioned by Maimonides, the sounds of the shofar impel one to introspect and engage in repentance for his misdeeds. He states:

Even though the sounding of the shofar on Rosh HaShanah is a decree, it contains an allusion. It is as if [the shofar's call] is saying: Wake up you sleepy ones from your sleep and you who slumber, arise. Inspect your deeds, repent, remember your Creator. Those who forgot the truth in the vanities of time and throughout the entire year, devote their energies to vanity and emptiness which will not benefit or save: Look to your souls. Improve your ways and your deeds and let every one of you abandon his evil path and thoughts (Mishneh Torah Hilchos Teshuva 3:4)

A specific sequence of blasts are blown with the shofar to fulfill the commandment of listening to the shofar on the high holidays; these blasts of the shofar have both neurological and endocrinological effects on listeners. In her article "The Science of Shofar," Yvette Alt Miller described one's reaction to the shofar's blasts [4]. Upon listening to alarming sounds like the blasts of the shofar, one's fight or flight response may lead to a cascade of events that bring about a physical change in the body. The body becomes transformed,

allowing the listener to become much more alert. During a state of alertness, the hypothalamus, which has an abundance of functions including serving as the control center of the autonomic functions of the peripheral nervous system, secretes hormones. One such hormone is neuropeptide-S, which suppresses anxiety and appetite and reduces the need for sleep. Moreover, this small effector proteinneuropeptide-S induces wakefulness and increases feelings of energy. Adrenaline and norepinephrine are also released from the adrenal glands, which are responsible for mental alertness and increase heart and breathing rates. The aforementioned physiological changes sharpen attentiveness.

Along with a heightened cognitive alertness, one's sense of emotions and long term memory are enhanced upon listening to the loud blasts of the shofar. Once startled, our amygdalae are stimulated by neurotransmitters known as catecholamines, which include adrenaline and norepinephrine. The amygdalae, located in the temporal lobes of the brain, process emotional reactions. The sudden startling sound of the shofar not only stimulates the amygdalae, but it also stimulates the hippocampus, which is in close proximity to the amygdalae in the brain. In the "fight or flight" situation, the hippocampus is stimulated to ensure that one remembers the course of events that transpired during the situation, as a way to learn from the stressful episode. All experiences during this new state of alertness are engrained into the memory for a much longer time than they would be for non-fight or flight experiences.

Overall, the brain is much more active in times of stress than it is at rest. It is during these more intense moments that one endures, such as on Rosh Hashanah and on Yom Kippur when listening to the shofar, that neurons in the brain receive more signals and a person is able to process a greater amount of information. During the brief moments when one listens to the blasts of the shofar, he or she is mentally transformed, allowing for heightened cognitive activity. This increase in energy and sharpened attentiveness provides an altered state of consciousness to focus one's thoughts, causing a person to perceive the surrounding world differently. Heightened functioning of the amygdalae allows one to make decisions without detailing nuances. One can also introspect and focus on his/her own undesired past conduct with hopes of future improvement, all with a sense of clarity. Furthermore, with a stimulated hippocampus, all feelings, reflections, and New Year's resolutions are etched in one's long-term memory, ultimately to be carried into the future. The sensitivities that are brought about in this transformed state empower one to make positive changes [4].

To announce a New Year and a jubilee year, to serve as a spiritual wake-up call, to coronate a king, or to instill awe within the Jewish nation, the shofar has served a plethora of roles for the Jewish people. However, an underlying purpose of the shofar is to serve as a way to communicate to the Jewish people. It has served to alert individuals and the nation as a whole. As mentioned in Isaiah (27:13), the shofar will be used to announce entry into the Messianic Era.

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Does Performing Mitzvot Make Us Happy?

Emily Chase

Judaism stresses that the ultimate goal of man is serving and cleaving to G-d. As King David said, “One thing I ask of Hashem, that shall I seek: Would that I dwell in the presence of Hashem all the days of my life” (Tehillim 27:4). Shlomo, his son, noted that man’s whole duty is to fear G-d and keep His commandments (Kohelet 12:13). As opposed to other philosophies, Judaism does not view happiness as the goal in life; rather, the goal should be to do what is right in G-d’s eyes. Although this is the case, Judaism recognizes happiness as an obvious result of fulfilling the ultimate goal of serving and cleaving to G-d.

The happiness derived from coming close to G-d is discussed throughout Jewish liturgy. Zechariah (2:14) declared, “Sing and be glad, O daughter of Zion! For behold, I am coming and I will dwell in your midst - the word of Hashem.” From this verse, it appears that the presence of Hashem rouses happiness amongst the Jewish people. Devrei HaYamim (16:10) confirms this connection with the words, “The heart of those who seek Hashem will be happy.”

From the Jewish perspective, following G-d’s word also creates happiness in the heart. Tehillim (19: 8-9) states, “The Torah of Hashem is perfect, restoring the soul, the testimony of Hashem is trustworthy, making the simple wise; the orders of Hashem are upright, gladdening the heart...” Furthermore, later in Tehillim (97:11) it is written, “Light is sown for the righteous, for the upright of heart, gladness.” This verse again emphasizes the relationship between piety and happiness.

Ramchal connects the concepts of following the Torah and G-d’s presence in his work Mesillat Yesharim. As he writes in Chapter 1, “True perfection is only cleaving to G-d...but for man to merit this good, it is fitting he should first work...with the strength of his actions that produce this result and these [actions] are the mitzvot.” In other words, doing mitzvot creates a spiritual proximity to G-d. Therefore, these actions lead to happiness, while they are aimed at a greater goal. Hence, according to the Jewish perspective, serving G-d is the source of true happiness.

There is empirical data that seems to point toward the positive effect of Torah observance. Professor Jeremy D. Kark, M.D. Ph.D., et al. noted that “mortality in 11 secular kibbutzim between 1970 and 1985 was nearly twice that of 11 matched religious kibbutzim” [1]. They conducted a cross sectional study on 10 of these kibbutzim and concluded that “the findings are consistent with an interpretation that Jewish religious observance may enhance the formation of certain protective personality characteristics.” This study suggests an association between Jewish religiosity and a lower kibbutz mortality rate.

Professor Jeff Levin reported on findings of the 2009 Israel Social Survey, which involved 6,056 Jewish participants [2]. Religious indicators were found by asking the participants questions about their Jewish religious knowledge, their preservation of Jewish tradition, their synagogue attendance, and how important they viewed Jewish observance. The amount of knowledge regarding Jewish religion and tradition was positively correlated with greater well-being. Well-being was measured with the help of self-assessment questions regarding health, functional health, and life satisfaction. Synagogue attendance showed a large positive relationship with overall life satisfaction, as did the preservation of Jewish religious tradition. The importance of Jewish observance seemed to have no effect. Datim and Haredim self-reported to have the greatest levels of well-being. Overall, Professor Levin found that “greater Jewish religious observance is significantly associated with higher scores on indicators of self-rated health, functional health, and life satisfaction.”

Two studies were conducted by Professor Leslie J. Francis et al. on religiosity, personality, and happiness, one study among 203 Israeli male and one study among 298 female undergraduates [3, 4]. Religiosity was measured using the Katz-Francis Scale of Attitude toward Judaism, a questionnaire analyzing their responses to G-d, Bible, prayer, synagogue, and the Jewish religion. By taking personality into account, a significant positive correlation between religiosity and happiness was noted.

These studies suggest that feelings of connection to G-d and observance of Jewish customs are associated with increased levels of happiness and other positive qualities. However, Judaism understands the element of personal choice as well. For example, in Tehillim (100:2), we are told to take initiative to “serve Hashem with happiness, come before Him with joyous song.” In fact, the Jewish people were warned regarding what would happen if they did not add the personal dimension of happiness to their service, with the words “Because you did not serve Hashem, your G-d, amid happiness and goodness of heart...so you will serve your enemies whom Hashem will send against you, in hunger and in thirst, in nakedness and without anything..” (Devarim 28: 47-48). In the Jewish view, though there is a necessary element of personal connection to the mitzvot, happiness is still ultimately derived from service and relationship with G-d, and empirical evidence seems to support this belief. Through their connection and service of G-d, people can attain an inward happiness, based on something beyond themselves.

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Genetic modification of foods is a relatively new science that began in the 1970s. Scientists alter the genetic makeup of plants to maximize their harvest potential and to make them harder. When a plant is genetically modified (GM), scientists add one or more genes to the plant's genome and allow it to grow in a laboratory. When the plant is transformed, its seeds are gathered and planted in a field. If the plants grow properly and satisfy the needs for which they were modified, the seeds are mass-produced and sold to farms. One example of a successfully modified food is the anti-freeze strawberry. In cold weather, strawberries may freeze on their vines, thereby damaging the fruit. Scientists isolated the gene from salmon that prevented the fish from freezing in the icy-cold water and incorporated this gene into strawberries. The gene was effective in the strawberries, and they no longer froze in cold weather [1].

While many scientists agree that genetically modified foods pose no more danger than conventionally grown crops, others beg to differ. Among those of the latter position is Rabbi Reuven Flamer of the Apple K hechscher, who will not certify genetically-modified foods as kosher. According to the strict letter of kosher food law, a genetically modified organism (GMO) used as a food ingredient is not prohibited; however, Rabbi Flamer regards such GMOs as not natural. Additionally, there is a Torah-based law to "guard your health." GMOs are the number one concern for health conscious consumers and for businesses in the natural, organic food market and in the conventional food industry, according to Rabbi Flamer [2]. The Rabbi's concerns regarding the GMOs are best explained by Thierry Vrain, a former pro-GMO scientist. Vrain was a research scientist for Agriculture and Agri-Food Canada (AAFC), charged with the job to assure the public that genetically engineered crops were safe. Vrain, doubting the veracity of his own claims, closely examined the data from various laboratories that showed that mice and rats fed genetically modified crops developed serious health problems. In a letter posted on foodrevolution.org, he wrote, "In 2009 the American Academy of Environmental Medicine called for a moratorium of GM foods, safety testing and labeling. Their review...noted that animals show serious health risks associated with GM food consumption including infertility, immune dysregulation, accelerated aging, dysregulation of genes associated with cholesterol synthesis, insulin regulation, cell signaling, and protein formation, and changes in the liver, kidney, spleen and gastrointestinal system" [3]. His alarming findings highlight the potential problems of genetically modified foods.

The kashrus status of GM foods is a rather new issue on the halachic frontier. Health issues are not the only caveats that raise halachic concerns. The kashrus status of a recombinant gene and its encoded protein needs to be considered. For example, may one isolate a gene from a pig, transfer it into cells of a cow, and use the encoded protein to produce a better cow or cow product, such as its

milk? Biotechnological techniques were used to isolate spider web genes and splice them into bovine mammary gland epithelial cells maintained in vitro in Petri dishes. Such genes encode for spider web proteins which are harvested from the medium. Spider web proteins were then spun into strong, lightweight fibers that potentially could replace steel. The ultimate goal of these preliminary studies was to produce a herd of transgenic goats, containing the spider web genes inserted in their cells, so that upon milking, spider web proteins will be easily obtained. Assuming that such transgenic goats were farmed, what is the kashrus status of their milk? Rabbi Dr. M.D. Tendler, Rosh HaYeshiva of Rabbi Isaac Elchanan Theological Seminary (RIETS), Yeshiva University, and Professor of Biology, Yeshiva College, holds that (a) a spider web is not an ochel (food item), even for animals and, hence, "issur v'heter" laws are not applicable and (b) a gene does not carry the halachic signature of its origin" [4].

A related issue is the potential problem in significantly altering animals, specifically concerning the kashrus simanim of the animal. Kosher animals are identified with specific signs, or simanim. A kosher animal must have split hooves and chew its cud, and a kosher fish must have fins and scales. If a cow was modified to the extent that it no longer had split hooves or a fish was altered so that it no longer produced scales, would they be kosher? It is necessary to expound on the two schools of thought concerning this matter. The first opinion is that the simanim do not make an animal kosher, they are merely indicators of what Hashem decided people could eat. The second opinion is that the simanim are the determinants of an animal's kashrus status. According to the first opinion, a cow genetically engineered to lack split hooves would still be kosher, while according to the second opinion, such a cow would be forbidden. The Chasam Sofer explains that a kosher bird without its kashrus simanim was forbidden to be eaten, but if the simanim were regained, the bird would reassume its kosher status. Conversely, Rabbi Wosner is of the opinion that a kosher bird would not become forbidden with a loss of its kashrus simanim [5].

Lastly, there is concern that combining genes from two distinct species classifies the transgenic animal as kelaim, a mixture forbidden by the Torah. Apparently, the actual prohibition of kelaim in Vayikra is specific to the mating of two different species or to the sowing of two types of seeds. In the construction of recombinant DNA, the spliced genes are completely integrated within the genome of the "host," without mating. According to Rabbi Shabtai Rappaport, Rosh Yeshiva of Shevet Yisroel, Efrat, Israel, genetic modification does not involve sexual conduct, a necessary aspect of kelaim, and thus would be halachically permitted [6].

Jews believe that Hashem put us into this world to perfect it. Whether or not genetic modification is a part of that perfection is disputed. Rabbi Rappaport adds that since Hashem gave humans

the power of biotechnology, it should be properly harnessed and the byproducts of this technology are permissible [6]. Rabbi Flamer [2], however, is of the opinion that the way Hashem created food

is perfect and should not be altered. With genetic modification, a relatively new science has developed, with its own unique halachic issues.

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Leah's Eyes: A Contribution to her Children

Bracha Einzig

Lavan had two daughters. The older one's name was Leah and the younger one's name was Rachel. Leah's eyes were רכבות, while Rachel had beautiful features and a beautiful complexion" (Bereshit 29:16-17). The word רכבות has various translations according to different commentaries; some are positive aspects about her eyes, while others are negative. In his commentary on the Torah, Rav Chaim Ibn Attar notes that the juxtaposition of Leah's eyes with a description of Rachel's beauty shows that the word רכבות is not of a positive nature; rather, it shows that Leah was not beautiful because of her eyes. Rashi has a different interpretation: He translates רכבות as "tender" because Leah was crying all the time. Rashi notes that Leah was always weepy because she thought she was destined to marry the evil Esav. She saw the parallel between Rivkah's twin sons and Rachel and herself, in which the older son (i.e., Esav) would marry the older daughter (i.e., Leah), while the younger son (i.e., Yaakov) would marry the younger daughter (i.e., Rachel). Leah could not bear to witness this fate that seemed to be bestowed upon her and therefore cried constantly to G-d in order to change it. Rashi's commentary is seen as more positive in nature; although her eyes were tender, it was because of her constant connection to G-d through prayer.

The largely controversial Ben Efraim on this passage presents an entirely different approach, suggesting that the letter נ should be added to the word רכבות to make the word רכבות נא, meaning lengthened. The word רכבות נא implies that Leah's eyes were long or large. Seelenfreund and Schneirder proposed that the description of long and large eyes could be medically interpreted as myopia (nearsightedness) [1]. Nearsightedness occurs when the eyeball is too long or the cornea, the clear front cover of the eye, has a larger curvature than normal [2].

The difference in the sisters' eyes not only had to do with beauty but also may have contributed to their different roles. From the text, it is apparent that Leah and Rachel had different responsibilities: Leah was found in the tents, while Rachel was a shepherdess. It can be inferred that the difference in the tasks that each daughter was given paralleled the difference in their eyes. Leah stayed around the house due to her sight "disability," while Rachel, being able to see far distances, was able to tend to her father's flocks [1]. Whether or not the word רכבות נא implies myopia, the Talmud (Bava Basra 123a), quoting Rabbi Eliezer, states that the verse from the Ben Efraim means that Leah's ultimate legacy for her descendants were רכבות נא, large rewards. It is possible that not only did the descendants of Leah merit larger rewards, but they also inherited her larger eyes.

Myopia is an eye condition in which light enters the eye and focuses in front of the retina, as opposed to on it. This occurs when the eyeball is too long or the cornea has excessive curvature. This causes distant images to be out of focus, while close objects are clearly seen. Myopia is a very common eye abnormality, and it is

estimated that nearly 30% of all United States residents are affected by it [2]. Based on several studies, Ashkenazi Jews seem to have a higher rate of myopia than other ethnic groups, yet the frequency of myopia for the group has not yet been defined. The data indicating that Ashkenazi Jews have a higher predisposition towards myopia is substantial enough for researchers to use Ashkenazi Jews to trace the chromosomal location of myopia in genome-wide analyses [3-5].

In a 2011 study of 44 large Ashkenazi families, linkage of myopia to chromosome 11 and 22 was noted. Identification of myopia to a specific region on chromosome 11 (11p14-q14) is significant because it overlaps with MYP7, a locus, previously reported in a population of United Kingdom twins, that contains the known eye gene, paired box gene 6 (PAX6). This evidence contributes to the theory that Ashkenazi Jews are substantially more predisposed to myopia than other ethnic groups [5].

Not only do Ashkenazi Jews inherit the gene for myopia, they also have an environmental aspect that lends to an increased rate of occurrence. Zylbermann et al. researched the study habits of Jewish teenagers enrolled in secular and in religious school. Their study focused solely on the Jewish population so that the influence of the genetics involved would be minimized. In Israel, the secular schooling system and the religious schooling system have very different curricula and therefore were compared. The secular system is a 6-hour coeducational program with equal time given to near-vision work as well as listening, with daily homework not exceeding three hours. The religious system is drastically different; boys and girls attend different schools with different curricula. The religious teenage girls have a curriculum very similar to the secular schools, 6 hours of learning as well as 2-3 hours of activities that require near vision, such as sewing or drawing. The religious teenage boys have a significantly different schedule; they learn in school for 16 hours a day. Their learning is focused on the Talmud, which largely consists of the close study of text with print of various sizes positioned side by side. For these boys, learning is also accompanied by back-and-forth rocking of the torso to aid in concentration [6].

The study showed that male and female Jews in secular schools in Jerusalem had a similar rate of myopia, which, in turn, was very similar to that reported for the United States. Their findings were not statistically significant in determining whether a genetic component for myopia occurred with Ashkenazi Jews, since the sampling was taken from Jews of various backgrounds. For the religious teenage boys, the prevalence of myopia was 81%, which contrasted sharply with the 27% in secular school teenagers in Jerusalem. This also presented a considerable variance from the religious teenage girls who have a 36% rate of myopia. The higher rate of myopia for religious teenage boys was correlated to their study habits and school curricula, consisting of sustained near

vision, frequent changes in accommodation due to the swaying study habit, the need for accurate accommodation when reading small print, and the variety of print size, all tending to heavy accommodative eye usage. This study concluded that sustained near vision leads to myopia.

Although no frequency is officially documented, it seems that

Ashkenazi Jews have a genetic predisposition for myopia with defects located on chromosome 11 and 22. In addition, the environmental aspect of studying Talmud for prolonged periods of time contributes to the frequency of this disease. Whether myopia is brought on by genetic and/or environmental factors, it seems that many Jews have inherited their matriarch Leah's nearsightedness as well as her ability to make sure she lived up to her potential.

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Smoking in Jewish Law

Yael Farzan

Although limited research exists on the prevalence of smoking in Orthodox and ultra-Orthodox Jewish populations (one 2012 study [1] showed that prevalence among ultra-Orthodox Israeli men is 12.8%), the halachic permissibility of smoking has been subject to discussion and controversy since the 1980s.

Smoking: A Possible Danger?

Decades ago, before rabbinic authorities knew of the extreme dangers entailed in smoking, it was believed that smoking was not prohibited according to Jewish law. These early rabbinic authorities base their ruling on two Talmudic principles: that one should not enforce a restrictive decree on a population unless the majority of people can follow it (*Baba Kamma* 79b), and that it is better for people to commit an inadvertent sin than an intentional one if they will not keep the decree anyway (*Shabbath* 148b). However, both arguments are not applicable when a person's life is at stake (*pikuach nefesh*), which is the case with smoking.

The late Rabbi Moshe Feinstein was one of these authorities who thought that Jewish law does not forbid smoking. Although he strongly discouraged people from smoking (and did ban smoking in a public area), he resisted issuing a general ban on smoking. He based his ruling on the principle that "Shomer peta'im Hashem": G-d protects the simple (*Tehillim* 116:6). In an event where an activity presents a possible danger, and most people are willing to take that risk of danger in order to engage in the act, "G-d protects the simple," and Rabbanim should not ban that activity. Smoking, Rabbi Feinstein concluded, is such an act that fulfills both conditions.

In 1977, Rabbi J. David Bleich agreed with Rabbi Feinstein that smoking involved a certain degree of danger, but could not be banned because many people were willing to accept the risks. Rabbi Bleich thus compared smoking to driving in a car or crossing the street. Quoting Rabbi Yaakov Etlinger, Rabbi Bleich also differentiated between an act that must be banned if it will incur immediate danger and one that does not need to be banned if it only might incur future danger (*Binyan Zion* #137, as cited in [2]). Cigarette smoking, he said, fell into the latter category. Later, Rabbis Shlomo Zalman Auerbach and Ovadia Yosef agreed with the reasoning provided by Rabbis Feinstein and Bleich, and they believed smoking to be permissible.

But over the past 30-odd years since Rabbi Feinstein wrote his ruling, the two conditions, that the activity presents a probable danger and that most people are willing to accept the risks inherent in smoking, did not seem to apply anymore. Smoking has since been proven to present a definite danger, and efforts undertaken by numerous anti-smoking associations and campaigns have resulted

in a decline of smokers and/or a wariness to smoke because of the risks involved.

Smoking: A Definite Danger

Later studies brought to light the fact that smoking has been shown to be the direct and inevitable cause of many health problems. Time and time again, it has been proven that tobacco smoke causes heart disease, chronic bronchitis, shortened life expectancy, stroke, lung cancer, age-related macular degeneration, diabetes, tuberculosis, colorectal cancer, liver cancer, cleft palate, rheumatoid arthritis, impaired immune function, and other types of cancers and fatal illnesses [3]. This month, the U.S. Surgeon General just issued the 32nd edition of the "Surgeon General's Report on Smoking and Health," in which he bemoaned that "smoking remains the leading preventable cause of premature disease and death in the United States" [2]. According to the Centers for Disease Control and Prevention, smoking causes one in five deaths in America [3]. Additionally, an overwhelming amount of research has demonstrated that even being exposed to second-hand smoke is directly linked to the same diseases. These "passive" smokers are at significant risk of contracting the same diseases as these "active" smokers themselves, and approximately 53,000 nonsmokers die annually simply from being around smokers, making "passive smoking" the top third leading preventable cause of death in the United States [4].

Assistant Dean of Albert Einstein College of Medicine and prolific medical ethics author Dr. Fred Rosner stated that tobacco was first suggested to cause cancer in the early 1970s, but today "there is no longer any doubt that cigarette smoking is a hazard to health" [5]. The director of the CDC, Dr. Thomas R. Frieden, stated that "tobacco is in a league of its own in terms of the sheer numbers and varieties of ways it kills and maims people" [3].

The upsurge of strong research revealing the harmful effects of smoking has led contemporary rabbinic leaders to prohibit smoking in Jewish law and hence overwrite the lenient smoking declarations of earlier authorities, which were based on the fact that there was insufficient evidence linking smoking to definite health dangers.

For example, Rabbi Moshe Tendler declared that, based on the overwhelming array of scientific evidence, smoking is a definite cause of danger, so "Shomer peta'im Hashem" does not apply. In the 2005 Proposal on Smoking delivered by the Rabbinical Council of America, Rabbis Saul J. Berman, Reuven Bulka, Daniel Landes, and Jeffrey R. Woolf concluded that: "...based upon present research and the stated argument of Rabbi Moshe Feinstein, the smoking of cigarettes constitutes a blatant violation of the Torah's commandment against inflicting harm on oneself and hence is absolutely prohibited according to Jewish law" [6].

Smoking in the Presence of Others:

According to a foundational Jewish law, as seen in Baba Kamma 91a, individuals are not allowed to harm others. The Shulchan Aruch in Choshen Mishpat 420:1 states that Judaism forbids a man to injure his friend. In this case, contemporary rabbanim have declared that smoking around other people falls into this category of “harming others.” The RCA rabbinic authorities, for example, wrote that “it is clear that that the infliction of injury on another party, by means of tobacco smoke, constitutes assault” [6]. The deleterious nature of tobacco smoke violates the commandment not to cause injury to a fellow Jew; thus, smoking around others is prohibited.

According to Rabbi Menachem Slae, other additional commandments are violated when one smokes cigarettes in the presence of others, including the prohibition against murder and against placing a stumbling block in front of a person [7, as cited in 6]. In fact, Rabbi Slae lists a total of thirty-four other commandments, both positive and negative, that are desecrated by smoking in the presence of others.

Indeed, it is interesting to note that although Rabbi Moshe Feinstein z”tl does not prohibit the act of private smoking in the 1980s, he does prohibit smoking in close proximity to non-smokers because he admitted that “...smokers actually commit assault” to the people inhaling their smoke. Rabbi Feinstein even permits someone to sue a smoker for damages if he or she is harmed by second-hand smoke. Even temporary exposure to secondhand smoke (SHS), otherwise known as environmental tobacco smoke (ETS), he reasoned, has immediate negative effects on one’s health [11].

Smoking in private:

Although it has thus been concluded that smoking in the presence of others is considered to be a violation of causing injury to another, what about smoking in private, when no one other than the smoker is being harmed?

R’ Moses Maimonides, the Rambam, places great importance in not transgressing the positive commandment of taking care of one’s life (Devarim 4:9, 4:15). In Devarim 4:9, the Torah commands us to “Rak hishamer lecha u’shmor nafshotecha me’od”—just watch yourself and guard your life very well. Six pasukim later, it repeats “Ve’nishmartem me’od le’ nafshoteichem,”—just guard your lives very well (Devarim 4:15). Both statements instruct a person to safeguard his or her life very well and thus forbid intentionally placing oneself in danger. In fact, the Rambam writes that the sin of injuring one’s fellow is equal in weight to the aveira of injuring oneself (Hovel u’Mazik, V:1). He bases this on the discussion in Baba Kamma (90b) and its elaboration in Choshen Mishpat 420:2 and Aruch Hashulchan. Additionally, in his famous work Mishneh Torah, he lists an array of sins that all fall under the category of harming one’s life or body. Many authors cite his famous words: “Many things are forbidden by the Sages because they are dangerous to life. If one disregards any of these and says, ‘If I want to put myself in danger, what concern is it to others?...disciplinary flogging is inflicted upon him.’ Based on his statements, one may deduce that smoking—which consists of a definite danger—is clearly prohibited under this commandment. Even private smoking,

which is hinted to by Rambam’s specific scenario of “If I want to put myself in danger, what concern is it to others?” is forbidden.

The Rashba (Responsa I:616) and the Rosh (VIII:13) also agree with the Rambam. The Ramo, too, states in Yoreh Deah 116:5 that “one should avoid all things that might lead to danger because a danger to life is stricter than a prohibition” and that one should be more concerned about a danger to his or her life than transgressing a certain prohibition. The Ramo adds that it is forbidden to rely on miracles when one engages in a dangerous or life-threatening activity, including smoking.

Thus, even smoking in private is banned in Jewish law. Rabbi Hayyim David HaLevi (the Sephardic Chief Rabbi of Tel Aviv in 1976) and Rabbi Eliezer Waldenberg have both published declarations based on this Rambam, the former of which was publicized widely and was included in the 12/11/1976 edition of the New York Times.

Conclusions:

In his 1973 article, Rabbi Nathan Drazin asks the question, “Why... have the great halachic authorities of our generation been silent concerning the prohibitions of Jewish law in regard to cigarette smoking?” Rabbi Drazin calls the use of drugs and cigarette smoking “evil practices” that are “certainly forbidden by Jewish law” [8, as seen in 5].

“The fact that so many Jewish people smoke,” wrote Dr. Rosner in 1981, “is no justification for this dangerous and life-threatening practice. If many Jews commit a transgression, others should certainly not follow; rather they should try to teach the sinners to repent from their evil ways.” Dr. Rosner urged “physicians and Rabbis... themselves” to quit or avoid smoking “in order to practice what they preach and teach by example” [5].

Going forward, leaders both in the medical and rabbinic world have urged Orthodox and ultra-Orthodox authorities to publicize the prohibition of smoking to their community members. According to certain Rabbinic rulings, preventing the spread of SHS “is not simply the responsibility of the smoker and the non-smoker, but rather that of the community generally, and especially that of the court (Bet din).” The Rambam (in his Hilchot Rotzeah U’Shmirat Nefesh) writes that anyone who engages in a self-harming act should be inflicted with lashes (specifically, stripes of rebelliousness) [6].

Already, many efforts are being made to reduce the incidence of smoking. The Rabbis who authored the 2005 Proposal on Smoking recommended that smoking should be banned from all community facilities and functions, including at the synagogue, day schools, mikvaot, and community events. Also, they encourage Rabbis who themselves smoke to immediately quit smoking and educate their congregations on the dangers of smoking, as well as its halachic prohibition. The authors noted that famous rabbanim who themselves smoked centuries earlier “would not have sanctioned this conduct” if they had known about the contemporary research correlating smoking with all these negative health effects[6].

Physicians counseling Orthodox and ultra-Orthodox patients to

quit smoking have also been urged to keep in mind the halachic discussion of smoking in Jewish law and the earlier (now obsolete) declarations permitting it in the 1980s [9]. I suggest that publicizing these recent halachic rulings will gradually stem the prevalence of smoking in Orthodox and ultra-Orthodox circles, even though it has been both scientifically and rabbinically stated that the “craving to smoke” remains one of the most difficult obstacles to smoking abstinence.

In a 2005 study on smoking abstinence, several researchers found that Orthodox Jewish smokers had less of a craving to smoke on the Sabbath as opposed to a regular weekday[10]. This was because they knew that the smoking element of “lighting a fire” was definitely forbidden on the Sabbath. Based on this study, I propose that once the halachic rulings of our Sages become mainstream in the Jewish world, it will be easier to abstain from habitual daily smoking as well.

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An Unexpected Leader: A Psychiatric Analysis of King Saul

Talia Felman

King Saul is arguably the most perplexing personality in the book of Samuel. The first king of Israel and the only king who preceded the Davidic dynasty, Saul faced challenges in his public leadership and in his personal life. In both these forums, Saul drastically fluctuates between bold, assertive, and courageous and meek, timid, and afflicted. These conflicting descriptions of Saul suggest that perhaps he was not simply a human with changing moods but that he had a genuine metabolic disorder. It is important to keep in mind that Saul, like many other personalities in Tanach, was an agent of G-d en route to completing a mission. Still, being part of a divinely ordained plan does not dictate that every person in that plan is perfect. In fact, a person's flaws are often an integral part of the role that he is best fit to play. Therefore, Saul's deficiencies do not deem him corrupt, even if they led him to act unfavorably. It is possible, then, to entertain the idea that Saul, a righteous man, was afflicted with some sort of psychiatric illness.

Scholars in the fields of both Judaic studies and medicine have proposed that Saul's behavior matched that of a patient with clinical epilepsy. Epilepsy, a neurological disorder characterized by excessive cortical nerve cell activity and episodes of seizures, has been called the "holy disease," because it stems from malfunctioning in the holy site called the head and was thought to be caused by supernatural forces [1]. This description points to the possibility of Saul having epilepsy, as his negative states were attributed to a "ruach ra'ah," a seemingly supernatural cause (1 Samuel 16:14). However, epilepsy is a physiologic disease with a genetic basis. Thus, in the absence of a family history of mental disorders, the cause for the "evil spirit" may not be hereditary, which implies Saul was not epileptic [2].

Paranoia has also been proposed as a possible explanation for Saul's peculiar behavior. Saul's acute fear of David's usurping of his kingship led him to pursue David frantically. Professor Joshua O. Leibowitz, a renowned doctor with expertise in the history of medicine, pointed out that "the anomalies in the behavior of King Saul belong to the domain of psychiatry." He cited specifically the "vigorous reactions and changes" in Saul's nature [3]. The pathology that afflicted Saul is characterized by intense responses and drastic fluctuations in behavior and character. While paranoia may fall into the domain of psychiatry, it does not primarily feature the changes that Leibowitz referenced.

The same criteria, namely Saul's extreme variation in behavior, rule out any possibility of his negative thinking being a result of major depressive disorder. Depression could explain Saul's frequent melancholy but cannot explain Saul's moments of heightened mood and hyperactive and aggressive interpersonal reactions. Therefore, there is likely a psychiatric disorder better suited to describe Saul's behavior.

A less accepted but potentially more accurate explanation is bipolar 1 disorder. According to Maimonides, the biblical phrase ruach

ra'ah refers to all sorts of melancholia. In describing a woman afflicted with melancholia of this sort, Maimonides notes that one cannot rely on periods of calmness in these people because, although they have periods of sanity, one can never be sure whether the periods of insanity are over [3]. Similarly, Saul's attacks of melancholia are introduced in the text with the words "whenever" or "on the morrow" (1 Samuel 16: 16, 23). Saul was not constantly afflicted; rather, he faced sadness from time to time [2]. This periodic melancholy is an essential part of the cycle that bipolar patients experience.

Bipolar disorder is not defined solely by episodes of depression, similar to the ones Saul faced, but also includes the patient experiencing unforeseen and extreme manic or mixed episodes. During a manic episode, the patient can exhibit symptoms such as inappropriate behavior, bizarre speech, and an irritable mood [4]. The best example of one of Saul's manic episodes is when he was once again afflicted with a ruach ra'ah. Saul raved incoherently (vayitnabeh) in the house and repeatedly attempted to kill David by hurling a spear at him (1 Samuel 18). Shortly after attempting to kill him, Saul appointed David as a military officer and proceeded to give him his daughter in marriage. Just a little while later, the ruach ra'ah came upon Saul, and he returned to his attempt to murder David (1 Samuel 19:9). Within just a few verses, Saul's treatment of David oscillated between life threatening and emphatically encouraging.

These incidents, which occur consecutively, are symptomatic of a manic episode. King Saul exhibited a heightened irritable mood and a decreased need for sleep as he was tormented by a ruach ra'ah. He also showed aggression, disturbed thought patterns, and possibly even delusions due to the intense jealousy he felt toward David, all of which are signs of a manic episode [2]. Such an episode lasts for weeks and can include alternating periods of normal functioning and successful interpersonal relationships [4]. For instance, Saul's appointing David as officer and handing him his daughter is a conciliatory action that he made amidst other contradictory gestures. The juxtaposition of a wide range of behaviors portrays Saul as cycling through both the sadness and mania that defines bipolar disorder.

In retrospect, it is possible to see the duality in Saul's persona appear earlier in his life. The text introduced Saul as a timid young boy, searching for lost donkeys, when Samuel arrived to inform Saul of his destiny to be king of Israel. In this incident, Saul was portrayed as sensitive in his search for his donkeys [5]. Saul also appeared slightly self-conscious, as evidenced by his reluctance to share with his uncle what transpired - that he had been anointed king - while searching for his donkeys (1 Samuel 10:12). Finally,

when Samuel was ready to anoint him, Saul hid among the kelim, or vessels (1 Samuel 10:22). In his youth, Saul was shy and somewhat vulnerable.

Once Saul assumed kingship, the personality he displayed was almost completely unrecognizable. He took bold actions in mobilizing the nation against the Ammonites. Threatening his nation to unite, Saul distributed a cut up oxen to the tribes (1 Samuel 11). Later, stubborn in his own plans, Saul refused to submit to Samuel's instructions to wait for him before responding to the threat of the Plishtim (1 Samuel 13). These bold and assertive gestures were contrary to the actions of Saul in his younger years.

Perhaps it is these disparate personas that lived at odds inside Saul and that converged in an inner conflict later in his life. Were an emotionally disturbed person to assume leadership today, physicians would immediately recognize this behavior as abnormal. Bipolar disease is often said to rob a person of his true self. Does the same axiom apply, however, in a case like Saul's, where one is unaware that an entirely different "self" has taken charge of him? Without the sophisticated knowledge and wide array of pharmacological treatments that modern medicine has to offer, Saul and his family were left to cope with the mood disorder, even if it meant complicating the narrative of the Jewish people as a result. Nevertheless, Saul's mental challenges did not add only to the complexity of the development of the Jewish nation but enhanced its depth and multidimensionality as well.

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The Admoni Gene: What Made the Red Man Red?

Zahava (Sheryl) Finkelstein

A typical preschool project on Parshas Toldos will depict the two brothers born in this sedra in the following way: Yaakov will usually have a kipa and tzitzis, perhaps with a sefer in hand, and Eisav will usually have a bow and arrow and will always be colored red. In fact, the first description that the psukim give us about Eisav is that he is an אָדָמָׁנִי (Bereishis 25:25), loosely translated as ‘red.’ This ‘redness’ seems to be a defining characteristic, but requires further explanation in order to grasp a more thorough understanding of its significance.

Rashi, based on Bereishis Rabbah 63:4, notes that אָדָמָׁנִי is a “סִימָן שֶׁהָיָה שׁוֹפֵךְ דִּמְםִי” (Bereishis 25:25). Meforshei Rashi, such as the Mizrachi, Sifsei Chayim, and Gur Aryeh, elaborate that the information that Eisav is destined to be a murderer is apparently sufficient reason for the Torah to write the word אָדָמָׁנִי at all. In fact, Eisav did actualize this “destiny” and become a killer (as Rashi notes on Bereishis 25:29).

Fascinatingly, modern science can hypothesize that the siman within Eisav’s redness has genetic basis. There are two aspects of Eisav’s phenotype to keep in mind while speculating the genetic basis for his אָדָמָׁנִי. Firstly, he was projected to become a murderer, and, secondly, the basis of this siman was due to his redness.

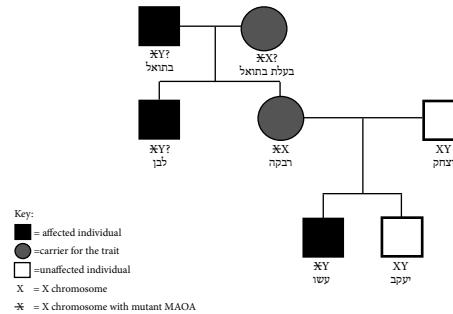
Typically, the genetic basis of murder tendencies is linked to a mutation in the MAOA (Monoamine oxidase Isoenzyme A) gene, a condition “associated with violent, criminal, or impulsive behavior” [1]. Eisav seems to fit these phenotypic expressions of the colloquially-termed ‘antisocial’ gene. Bereishis Rabbah 63:10 and 63:12 relate that Eisav lived a life of lawlessness: He murdered on multiple occasions, and the gemara in Baba Basra 16b makes it clear that he earned the title “criminal.”

Research on the MAOA gene has established that this is an X-linked gene [2]. Eisav, as a male, has only one X chromosome, which he inherited from his mother, Rivka. While Rivka herself was a kindhearted woman (Bereishis Rabbah 60:6, Bereishis 24:18-20, see also Bereishis Rabbah 63), she was the daughter of B’suel, the immoral ruler of the depraved Aram Neharayim (Yalkut Shim’oni, Bereishis 109). Perhaps B’suel’s X chromosome had an MAOA mutation as well, and he passed on the defective gene to his daughter Rivka.

Females, however, have an advantage in the inheritance of X-linked traits. They inherit two X chromosomes, one from each parent, and on the tenth of embryonic development, each cell in the developing female fetus decides which X chromosome should remain active and which should hyper-condense into an unproductive Barr body. Because each cell independently and apparently randomly chooses which X chromosome to inactivate, inevitably some cells will choose one X, some will choose the other, and all future daughter cells from mitotic divisions will phenotypically manifest the choice that was made in-utero. Thus, a female, who is heterozygous for

X-linked traits, meaning she has different forms of a gene for a given trait, will display a mosaic of the various traits, and is known as a manifesting heterozygote. However, it is possible that haplosufficiency occurred, just as it is possible in autosomal traits, and only one allele would act as the functional copy of the gene, and thus the mosaic could be masked. That is to say, Rivka Imeinu is not being suspected here of expressing the same abhorrent traits that Eisav possessed. A person can carry many deleterious genes that are not expressed because of haplosufficiency, and thus those genes will have no effect on the person’s life whatsoever.

Based on this scientific background and evidence from the psukim and meforshim, we can speculate that a supposed-inheritance of an MAOA mutation in Eisav’s family is as follows:



In this speculated pedigree, B’suel and his wife are presumed to have mutant copies of the MAOA gene, which the son Lavan inherited as well. Their daughter Rivka might have inherited one mutant copy of the gene from her father, and one normal copy of the gene from her mother. She then might have passed on the mutant copy to her son Eisav and the normal copy to her son Yaakov.

Assuming that Eisav phenotypically expressed this gene, his mother Rivka had to be at least a carrier of the trait. However, we can speculate that Rivka inherited a normal copy of the gene, and, as a female with two X chromosomes, she displayed haplosufficiency and did not exhibit the phenotypic effects of her MAOA mutation. Her father, as mentioned above, was an immoral person and the ruler of an immoral people, so perhaps he manifested this trait and passed it on to his daughter. Alternatively, perhaps his wife was a carrier for the trait, and she gave Rivka her mutant X chromosome, and the normal X chromosome came from B’suel. However, given the information we know about B’suel, it is not unlikely that he had a mutant X, and, therefore, Rivka’s normal X had to come from her mother. It is safe to assume that B’suel’s wife was a carrier for the trait, and she gave a mutant X to her son Lavan, who also exhibited criminal behaviors (Rashi, Bereishis 31:29; Rashi, Dvarim 26:5; R’ Chaim Soloveitchik; R’ Velvel Solovetchik on “מְלֹא אַזְעָקָה” in The Hagadah of the Roshei Yeshiva, pg 118). The speculated pedigree above explains how B’suel, Lavan, and Eisav can manifest the trait,

while Rivka and Yaakov do not. In this model, Yaakov and Eisav are assumed to be dizygotic twins, also known as fraternal twins. This model also elucidates an enigmatic passuk near the birth of Eisav. Bereishis 25:20 emphasizes that Rivka is the daughter of B'suel and the sister of Lavan Ha'Arami. Five psukim later, Eisav, the אָדָמָנוּן, is born. R' Hirsch on this passuk references Baba Basra 110a: "רֹב בְּנֵי הַלְּכִינָן אֲחֵרִי אַתָּה האם" in order to explain the relevance of Rivka's family background to the birth of her sons. While the text of the Gemara does not specify whether the son takes after this maternal uncle in an autosomal, sex-linked, environmental, or any other way, scientifically, a son typically takes after the mother's brothers in X-linked inheritance. Therefore, it makes sense that Eisav would manifest a MAOA mutation that his uncle Lavan expresses as well. In this case, Yaakov presumably would have inherited Rivka's X chromosome that did not carry the mutation.

However, all of this speculation leaves out a crucial point. It assumes that Eisav is simply manifesting an anti-social gene, while Bereishis Rabbah clearly states that Eisav's anti-social tendencies were symbolized by his redness. Therefore, a deeper understanding of the meaning of this redness might provide a connection between Eisav's appearance and his criminal tendencies.

R' Hirsch and Metzudos Tziyon explain that אָדָמָנוּן means "ruddy," implying a red complexion (R' Hirsch on Bereishis 25:25 ח"ד "אָדָמָנוּן"; Metzudos Tziyon on Shmuel 1 16:12). Not surprisingly, the expression of this trait is also controlled by a gene, the Arginine Vasopressin Receptor 1A (AVPR1A). The protein produced by this gene is "involved in the control of body fluid osmolality, blood volume, blood pressure, and vascular tone," which presumably would give the person a redder appearance [2]. In fact, the Be'er Hatorah in his peirush on Rashi in Bereishis 25:25, notes that Eisav, as a "בעל תאות", loosely translated as a person who indiscriminately indulges in his desires, would experience ",הַרְבָּה מִתְּהֻבָּה" an increase in his blood flow. Tangentially, Dr. H. Babich explains in the name of Dr. A. Reisenberger that this could have taken place even while Eisav was in-utero, so that he would already have this red complexion at birth. He suggests that perhaps Yaakov and Eisav experienced "Twin-Twin Transfusion Syndrome," in which one twin (Eisav) is connected to the placenta, receiving all the food and nutrients from the mother. The second twin (Yaakov) is connected to the first twin and is nourished by the first twin's leftovers, rather than both twins being connected to the placenta independently and receiving equal nourishment [3]. Therefore, it is possible that Eisav was already eating and drinking more than his share, even while in the womb, and therefore had a ruddy appearance at birth. This is consistent with the בָּאָר הַתּוֹרָה's approach that a red appearance comes from such indulgence.

The AVPR1A gene is also associated with "Anti-social Behavior traits" [4]. For example, researchers have found that injecting AVP into the hypothalamus of male mice increases aggression and that AVPR1A engenders aggressive tendencies related to sibling rivalry, a concept which readily applies to Eisav and Yaakov [5, 6].

However, assuming Eisav possessed the AVPR1A gene means that he had to have inherited it from at least one of his righteous parents. This gene is autosomal and is located on chromosome 12, so we cannot utilize the same X-linked genetics loophole that applied to the MAOA gene [2]. That is to say, while a discussion of MAOA inheritance is plausible given that Rivka could have

passed on the X-linked trait to her son, without experiencing any of its phenotypic effects itself, an autosomal trait phenotypically expressed in a child typically has expression within a parent. Perhaps we can look to mice again, in which AVP injection in female mice inhibited aggression in females, unlike in their male counterparts [6, 5]. Although one cannot automatically interpolate from mice to humans, it is possible to speculate that Eisav's gene came from Rivka, yet as a female, Rivka did not manifest the trait in the same way that her male son did.

In fact, considering the one other person described in TaNaCH as an אָדָמָנוּן HaMelech, increases the likelihood that AVPR1A plays a role in the אָדָמָנוּן phenotype. The first description the psukim give us of Dovid, before we even know his name, is that he is an אָדָמָנוּן (Shmuel 1 16:12). When Shmuel comes to anoint Dovid as the next king of Israel, the first thing he notices is that Dovid is an אָדָמָנוּן, and his mind immediately jumps to Eisav, the other אָדָמָנוּן. He becomes worried that this man will be a murderer, just as the other אָדָמָנוּן was (Bereishis Rabbah 63).

Indeed, Dovid killed as well, and he manifested other traits associated with the AVPR1A gene, such as musical genius [7, 8]. Dovid was described as "נָגֵן יָדָיו", the arranger of Sefer Tehilim, a harp player, and was employed as the royal music player in his pre-kingship days (Shmuel 1 16:22). An obvious question seems to emerge, and one might wonder why Dovid was appointed as a king, given that he was an אָדָמָנוּן.

Hashem reassures Shmuel that, while Dovid is indeed an אָדָמָנוּן, he is an אָדָמָנוּן עַמְּפַת עַיִנִים, which indicates that he will kill only when directed to do so by Sanhedrin (who are referred to as "עַיִנִים") (Shmuel 1 16:12; Bereishis Rabbah 63; Malbim on Shmuel 1 16:22 ח"ה "הַזֶּה אָדָמָנוּן"). Dovid, therefore, is likely to be manifesting the same trait that Eisav possessed, although he is choosing to utilize his copy of the gene to do good and kill Klal Yisrael's enemies according to the dictums of Sanhedrin, rather than to lead a life of lawlessness as Eisav did.

This leads to a fascinating insight. The Council for Responsible Genetics notes that while people may inherit a predisposition for a trait, such as aggression, it is impossible to solely blame genetics for that person's choices [9]. In fact, R' Dessler notes in his Michtav MeEliyahu that "כָּל אָדָם בְּכָל מִצְבַּת שִׁיחָה הוּא בַּעַל בְּחִירָה אָדָמָנוּן". Every single person, at every point in his life, has the capacity to choose. This point is demonstrated phenomenally through the juxtaposition of Dovid and Eisav. Both had the same trait of אָדָמָנוּן. Both even manifested it through murder. However, as R' Hirsch emphasizes in his commentary to Bereishis 25:27, both had the power of choice. Dovid chose to channel his talents to serve Hashem, and Eisav chose to utilize his for evil.

All the science and genetics mentioned in this article were based on speculation. The Torah was not given to be a springboard for genetic analysis; it was given to direct our lives. However, the Michtav MeEliyahu's point still holds true, and one can learn that there is always a choice to be made, and there is always a way to utilize one's circumstances L'shem Shamayim as Dovid HaMelech did.

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Chicken Soup Remedy: Seeking Truth in an “Old Jewish Wives’ Tale”

Michelle Golfeiz

Seeking cures for illnesses today requires tremendous patience and persistence as patients navigate through the medical maze. Confronted with numerous visits to doctors, diagnostic tests, and treatments, patients’ dreams and hopes of instant cures may rapidly fade. Yet, this was not always the reality. In the past, our ancestors turned to the Sefer Harefuot, or “The Book of Remedies,” to seek instant cures. According to Rashi, “The Book of Remedies” contained numerous natural remedies, which the Jewish people used as a source of immediate recovery from illness. Due to their abbreviated bouts with disease, they were not humbled by their experiences with illness and failed to recognize Hashem’s role as the ultimate Healer. In response, King Hezekiah hid “The Book of Remedies,” an act approved by our Sages, to prevent this lack of acknowledgement of Hashem [1].

With “The Book of Remedies” lost, today we seek medical guidance from physicians, hoping that, as Hashem’s messengers, they can provide the necessary cure. Of course, there is one age-old remedy that any Jewish mother or housewife will attest to and that apparently was not lost with “The Book of Remedies”: homemade chicken soup. Dr. Nancy Caroline and Dr. Harold Schwartz noted that some believe that the recipe for chicken soup was part of the oral tradition relayed to Moses on Mount Sinai [2]. As they serve it to their ill family members, Jewish mothers and housewives rely on the healing powers of chicken soup. It is no wonder that chicken soup is often referred to as the “Jewish penicillin,” “bohbymycetin” or “bobamycin,” as mentioned by Dr. Stephen Rennard [3]. However, does chicken soup truly possess remedial properties, or is it simply a myth perpetuated by Jewish mothers and housewives?

The healing phenomenon of chicken soup has been known since as early as the twelfth century. Maimonides, a Jewish physician and philosopher in Egypt, reports chicken soup as a remedy for upper respiratory tract symptoms [4]. Although until today, chicken soup is commonly prepared and consumed for remedial purposes, its medicinal powers have not yet been corroborated with scientific evidence, as noted by Dr. Linda Vorvick [5]. Only an accumulation of anecdotal testimonies supports the usefulness of chicken soup in relieving cold symptoms, according to Dr. Rennard. He added that much about the mechanisms of chicken soup in helping minimize symptoms of upper respiratory tract infections are not yet understood [3]. Nonetheless, three important research studies were conducted in the latter half of the twentieth century, each uncovering different aspects related to chicken soup’s role in treating upper respiratory tract infections.

The most recent of these studies was led by Dr. Rennard in 1993 at the University of Nebraska Medical Center. He suggested that cold symptoms from upper respiratory tract infections could be attributed to inflammation. He hypothesized that if chicken soup lessened inflammation, then it may alleviate cold symptoms. In his study, he sought to determine if chicken soup would slow or decrease the migration of neutrophils, a class of white blood cells

involved in protecting against infection. Through his research, Dr. Rennard revealed that chicken soup presents anti-inflammatory properties that could minimize symptoms of upper respiratory tract infections [4].

To determine if chicken soup played a role in reducing inflammation, he performed a standard Boyden blindwell chemotaxis chamber assay, which tested chicken soup’s effects on reducing neutrophil chemotaxis, or movement of the white blood cells. Results demonstrated overall that chicken soup decreased neutrophil movement. During preparation of the chicken soup, prior to the addition of vegetables, the chicken broth alone did not have any effect on neutrophil movement; however, after the addition of vegetables, the soup decreased neutrophil movement. The chicken as well as each vegetable in the chicken soup when tested separately reduced neutrophil movement. In addition, tests of different store-bought soups, used as a comparison, presented similar reductions in neutrophil movement to that of the homemade chicken soup, albeit at varying levels.

Dr. Rennard concluded, based on this study, that numerous ingredients found in chicken soup contribute to its remedial properties. Furthermore, he proposed that chicken soup could alleviate symptoms of upper respiratory tract infections by producing a moderate anti-inflammatory response through reducing neutrophil movement [3]. Nonetheless, he was unable to pinpoint an individual ingredient in the soup responsible for the reduction of neutrophil migration; rather, he suggested that the effect on neutrophil migration might be due to the mixture of the ingredients. The recipe used in the experiment consisted of the following ingredients: chicken, onions, sweet potatoes, parsnips, turnips, celery, carrots, parsley, salt and pepper. As Dr. Rennard noted, “All vegetables and the soup had activity. I think it’s the concoction.” Dr. Rennard mentioned that in addition to its anti-inflammatory properties, other benefits of chicken soup include its ability to rehydrate and nourish, as well as the placebo effect of the consolation of being served chicken soup when ill [4]. The results of Dr. Rennard’s study clearly reinforced the common belief that chicken soup displays medicinal properties.

In an earlier study, Dr. Kiumars Saketkhoo investigated how the steam from chicken soup may provide remedial benefits for upper respiratory tract symptoms. To test this, he compared the effects of drinking hot water, cold water, or hot chicken soup on nasal mucus velocity in human subjects, as the release of mucus from the nose helps protect against pathogenic bacteria and viruses. Healthy subjects were directed to drink hot water and hot chicken soup, both with and without a straw, and cold water without a straw. The subjects were then tested for any change from their normal nasal mucus velocity. Results showed that subjects who drank hot water without a straw or hot chicken soup with or without a straw experienced significantly greater increases in nasal mucus velocity than those who drank hot water with a straw or cold water without

a straw. Chicken soup without a straw showed the largest increase, followed by hot water without a straw, followed by chicken soup with a straw.

Based on this study, Dr. Saketkhoo determined that drinking hot liquids temporarily speeds up nasal mucus velocity due to the inhalation of steam through the nose. Additionally, he suggested that hot chicken soup might contain an extra element relating to either taste or smell that may increase nasal mucus velocity, even more than hot water alone. He therefore proposed that hot fluids, especially hot chicken soup, are more effective than cold fluids in treating upper respiratory tract infections [6].

Clinical evidence for the remedial benefits of chicken soup was reported by Drs. Caroline and Schwartz in a case study of an otherwise healthy middle-aged male patient suffering from mild pneumococcal pneumonia. They reported that he began to recover when treated with a chicken soup regimen of 500 ml of chicken soup by mouth every 4 hours. Then, because of his improvement, the patient refused more chicken soup. Soon after the termination of the patient's chicken soup regimen, his condition began to quickly deteriorate. This time, chicken soup was not presented to him due to lack of accessibility, and he did not respond to treatment with penicillin. Thus, due to the progression of his illness and ineffectiveness of treatments, he was forced to undergo a thoracotomy.

Following these clinical observations, Drs. Caroline and Schwartz concluded that prematurely discontinuing a patient's chicken soup regimen might have severe consequences for the patient. They

suggested that, although further research was needed to find the ideal length of treatment, it is best for the patient to continue with the entire suggested ten-day chicken soup regimen and to slowly decrease chicken soup consumption thereafter. If the patient subsequently relapses, he should promptly be treated with a second chicken soup regimen [2].

Based on these three research studies, chicken soup may provide cold symptom relief for two primary reasons. Chicken soup may cause an anti-inflammatory effect by reducing neutrophil movement, thereby mitigating cold symptoms. In addition, steam released by chicken soup may minimize nasal congestion by increasing the flow rate of mucus and minimizing the extent of the pathogen's contact with the lining of the nose [7]. Moreover, it seems advisable to continue eating chicken soup throughout the duration of an upper respiratory tract illness. Further studies are required to understand the mechanisms associated with chicken soup's remedial properties for upper respiratory tract infections.

Indeed, these three studies together demonstrate the veracity of the "old Jewish wives' tale." As Dr. Rennard [8] noted, "Just because it is an old wives' tale doesn't mean it's wrong." Jewish mothers and housewives have demonstrated wisdom over the centuries by insisting on the power of chicken soup to ease symptoms of the common cold virus and other similar upper respiratory tract infections. Yet, in the end, chicken soup is simply chicken soup. We must always remember that Hashem is our ultimate Healer. Otherwise, we too will be guilty of the same sin as the people in the time of King Hezekiah who relied on "The Book of Remedies" for cures without acknowledging Hashem as the ultimate Healer.

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Clarifying the Question of Cosmetic Surgery

Sima Grossman

Although there have been cases of plastic surgery that date back to 2600 years ago, there has been a relatively recent upsurge in plastic surgery operations due to improved sterilization techniques and the advent of anesthesia [1]. Since plastic surgery operations were so rare until recently, teshuvos did not appear on the subject until about 60 years ago [1]. The topic of plastic surgery raises many halachic issues. While some of these issues seem clear-cut, upon delving into them it becomes evident that the prohibitions potentially encountered with plastic surgery are not well defined. This has led to a disagreement among poskim as to the permissibility of cosmetic surgery.

In any discussion of plastic surgery and halacha, a distinction must be made between cosmetic surgery and reconstructive surgery. Reconstructive surgery is the term used for plastic surgery performed to repair damage caused by a disease, birth defect, or an accident. The halachic issues surrounding reconstructive surgery are different and pose fewer problems than those surrounding cosmetic surgery. Therefore, this article will focus on cosmetic, rather than on reconstructive, surgery.

Cosmetic surgery is performed solely to enhance the patient's body image. The earliest halachic authority to address the question of whether cosmetic surgery is permitted is Rabbi Lord Immanuel Jakobovits. Rabbi Jakobovits outlines four main concerns with plastic surgery. Two of these issues are halachic, while the other two are philosophic. The first is chavalah, the prohibition against wounding oneself or others. The second is the prohibition against placing oneself in a situation of danger, or sakana. The third, more philosophic issue, is the concern that people should not become too vain. This concern pertains more to males than females and ties into the prohibition of begged isha (the prohibition against men wearing women's garments). The fourth, purely philosophic issue that Rabbi Jakobovits discusses is the question of whether man may improve on G-d's creation, which is thought to contain no blemishes [1].

Ultimately, Rabbi Jakobovits concludes that cosmetic surgery is forbidden due to the fact that it causes vanity. However, he makes allowances when cosmetic surgery was performed to improve someone's shalom bayis (domestic harmony) or to enable a person to earn a decent living [1].

Rabbi Yehuda Waldenberg, the late rabbi of Shaare Zedek Hospital, addresses the question of whether cosmetic surgery was permitted in his work *Tzitz Eliezer* (Volume XI, no. 41 subsections 8 and 9). Similar to Rabbi Jakobovits, Rabbi Waldenberg rules that cosmetic surgery is forbidden, stating that cosmetic surgery falls under the prohibition of chavalah on the part of the patient and on the part of the surgeon. The patient may not allow the surgeon to perform the surgery, since doing so would constitute wounding oneself, and the surgeon is forbidden from performing the surgery since the surgery would cause the patient to sustain a wound.

Furthermore, Rabbi Waldenberg states that cosmetic surgery is prohibited since one may not put his or herself "into a situation of the usual kinds of danger that are associated with operation" [2]. Rabbi Waldenberg also has grave concerns regarding the issue of improving on G-d's work. He expounds his opinion at length, that mere mortals cannot take the task of creation into their own hands. The form that G-d gave us, he states, is the form that fits us best.

Interestingly, Rabbi Waldenburg does not address the issue of vanity. Instead, he raises a different concern that Rabbi Jakobovits did not mention at all. Rabbi Waldenberg believes that cosmetic surgery is out of the realm of the acts of healing that the Torah allows a doctor to perform [2]. The Torah states (*Shemos* 21:19) "v'rapoh yirape" (he shall be thoroughly healed). The Talmud (*Baba Kama* 85a) explains that this verse grants permission for a doctor to heal. Both Rashi and the Tosefos ask why the Torah needs to dedicate a pasuk to this issue. They explain that we might think that since illness was decreed from G-d, we are not allowed to interfere and heal an ill person. The verse informs us that this is not the case.

Others state that the Torah is concerned that we would think that healing falls under the prohibition of chavalah. Therefore, the Torah notes that when someone wounds someone else with the motivation to heal, there is no issue of chavalah involved [3]. Rabbi Waldenberg, supra, limits this leniency. He holds that the Torah does not mean to grant permission for a doctor to cause wounds for the sole purpose of beautification.

Rabbi Moshe Feinstein, widely regarded as the posek hador (chief law decisor of the generation) and Rabbi Waldenberg's contemporary, rules that cosmetic surgery is permitted (*Igeros Moshe, Choshen Mishpat*, Vol. II, Chapter 66, page 289). Unlike Rabbis Jakobovits and Waldenberg, Rabbi Feinstein addresses only the issue of chavalah. Rabbi Feinstein cites the Rambam (*Hilchos Chovel and Mazik*, Chapter 5, Halacha 1), who maintains that the Torah only forbids wounds given in a contentious manner. Since wounds caused by cosmetic surgery arise from the opposite intent, Rabbi Feinstein concludes that cosmetic surgery does not come under the category of chavalah. Rabbi Feinstein further maintains that even if the Rambam's definition of chavalah is invalid, cosmetic surgery is still permitted. He states that since the cosmetic surgery was for the patient's benefit and the patient is choosing to do surgery from his or her own free will, there is no issue of chavalah involved.

As seen above, Rabbi Feinstein only discusses chavalah. Although others have seen chavalah as only one of the many issues associated with cosmetic surgery, Rav Feinstein considers chavalah to be the only issue. In order to see how there can be room in the prohibition of chavalah to allow for cosmetic surgery, we must examine this prohibition further.

The Mishnah (Babylonian Talmud, Baba Kamma, p. 90) quotes Rabbi Akiva as saying, “One who injures himself, even though he is not allowed, is not liable, while another who injures him is.” According to this Mishna, Rabbi Akiva prohibits self-injury. The Talmud (Baba Kamma p. 90-91), however, cites a contrary report, where Rabbi Akiva states, “A person is permitted to injure himself?” The Talmud attempts to reconcile the two seemingly contradictory attributions. However, there is ultimately no reconciliation. Instead, the Talmud concludes that there is simply a disagreement among the Tannaim as to what Rabbi Akiva actually ruled.

The Talmud states that the Tanna who prohibits self-injury follows the view of Rabbi Eleazar Hakkapar, who holds that that a nazirite sins by inflicting upon himself the pain of not drinking wine. Rabbi Hakkapar extends this prohibition, a fortiori, to a person who fasts. The Talmud states that the same reasoning applies to self-injury. The Meiri, however, notes that the prohibition of Rabbi Hakkapar is Rabbinic in origin (Meiri, Beit Habichira, Baba Kamma p. 91, b). This is important because Rabbinic prohibitions allow for more exceptions than biblically based prohibitions. Thus, it may be that according to the Meiri, even Rabbi Hakkapar would allow self-injury when the benefit outweighs the injury.

The Talmud adds the opinion of Rabbi Chisda, an Amorra, to the mix. Rabbi Chisda was once walking among thorns when he picked up his garments, causing his legs to be injured. Rabbi Chisda justified the self-injury, asserting that while the injury to his body would eventually heal, the injury to his garments would not. It is evident from Rabbi Chisda that the prohibition against self-injury is not absolute.

The Ramah (Shita Mekubetzes, Baba Kamma p. 91, b) states that because he is the latter authority on this topic in the Talmud, the law follows Rabbi Chisda. The Ramah therefore concludes that self-injury is not prohibited, which follows the view of Rabbi Akiva in the Gemora over the citation of Rabbi Akiva in the Mishna. The

plain meaning of the Ramah cited in the Shita Mekubetzes does not distinguish between self-injury for a purpose and self-injury for no purpose. Thus, the Ramah would seemingly never prohibit self-injury. Rabbi Feinstein notes this but disagrees with the Ramah. According to Rabbi Feinstein, Rabbi Chisda allows self-injury only when there is an overriding benefit. Rabbi Feinstein cites Rabbi Chisda as the source for the Rambam’s view that chavalah is prohibited only in a contentious manner.

Most, if not all, cosmetic surgery would seem to be allowed under the view that self-injury is permitted. According to Rabbi Chisda, if there is overriding benefit to performing the surgery, cosmetic surgery seems to be permissible. Therefore, a plain reading of the Talmud in Babba Kamma shows it is possible that all of the Tannaim (Rabbi Akiva in the Mishna and Gemora, and Rabbi Hakkapar) would allow beneficial cosmetic surgery. This accords with the Rambam and Rabbi Feinstein, but not with the Ramah. However, even the Ramah concludes that the law accords with Rabbi Chisda. Thus, the Rambam, the Ramah, and Rabbi Feinstein all conclude that the Talmud allows self-injury when there is an overriding benefit. Therefore, cosmetic surgery should be permissible under Jewish law in specific cases where there is an overriding benefit.

The authorities analyze the innovation of cosmetic surgery under the rubric of halacha. Similar to many other medical questions, the halachic issues involved in cosmetic surgeries are not clear-cut. Rabbi Jakobovits, Rabbi Waldenberg, and Rabbi Feinstein each found different concerns for cosmetic surgery. Rabbi Feinstein comes to a very different conclusion than Rabbi Jakobovits and Rabbi Waldenberg. Although most poskim nowadays follow the opinion of Rabbi Feinstein, it is worthwhile to understand Rabbis Jakobovits’ and Waldenberg’s concerns. As new cosmetic surgery procedures are invented, new halachic concerns may be raised. It seems that cosmetic surgery will continue to remain a relevant topic in halachic discourse.

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Kidney Donation: It's Complicated

Sara Kaszovitz

Judaism places great value on human life. The Torah has many guidelines for how a Jew should live his life, yet the Torah believes that preservation of life is more important than are most Torah commandments. This is evident from the commandment that states: "You shall keep My statutes and My judgments: which if a man do, he shall live by them" [1]. The Talmud derives from this pasuk that "one should live by these laws, but not die from them," implying that one should not sacrifice his life in order to keep the Torah's commandments [2]. The only three laws for which one must sacrifice his life in order to avoid these transgressions are idolatry, forbidden sexual relations, and murder [3]. Thus, it is clear that Judaism places great emphasis on the value of human life, and one should do the most he can to preserve his life while still living a Torah lifestyle.

One is also required to do whatever he can in order to save a fellow Jew's life. The Torah says that "you should not stand idly by the blood of your neighbor" demonstrating the Torah obligation to save the life of any Jew who is in danger [4]. Similarly, the Talmud states: "He who saves a single life is as if he saved an entire world" [5]. Thus, it is clear that Judaism also places great emphasis on doing whatever one can in order to save another Jew.

It is clear that the Torah charges a Jew to both do his best to preserve one's own life and do whatever he can to save a fellow Jew's life. What would the Torah say, however, about risking one's own life in order to save a fellow Jew? For example, would the Torah allow someone to undergo surgery to remove a kidney and give it to someone who is need of a kidney transplant? On the one hand, by performing the surgery, the donor can save someone else's life. Yet, surgery in and of itself poses risk to the donor.

Rabbi Reuven Fink's article, "Organ Transplants," noted that the Talmud Yerushalmi states that one is obligated to save another's life from certain death, even if he may pose a danger to his own life by doing so. He explained that commentaries elaborate that this is because, without intervention, the victim will surely die, and the one intervening only has the possibility of dying. Yet, the Talmud Bavli, the more widely accepted Talmud in determining the practice of Jewish law, states that one is not obligated to risk his life to save another life [6]. This position is accepted lehalacha, as noted in the commentary of the Radbaz, who writes that one is not obligated to lose a limb to save someone else's life, but if he does so, it is considered a pious act. He continues to say, though, that if someone puts his life in jeopardy (i.e. a clearly greater risk than losing a limb) to save another Jew, he is a chassid sotah, or a foolish pious individual [6]. The Radbaz is clearly of the opinion that if one can lose his life while attempting to save another's life, this would be a foolish act to perform, as Jewish law encourages one to value his own life. Yet, the Radbaz also demonstrates that one is considered pious for saving another Jew's life, even at the risk of losing a limb,

reflecting the Jewish value of doing whatever one can in order to save another Jew's life. Thus, when one is deciding whether or not to try to save another individual, he should weigh the potential risks to himself and the potential benefits of the recipient to determine whether or not the act would be considered recommended by Jewish law.

Donating a kidney poses two threats to the donor. First, removing a kidney requires surgery, and there are substantial risks that come with any surgery, certainly one of this magnitude [7]. Additionally, although an individual can live with one kidney, physicians debate the long-term effects removing one kidney can have, and some suggest donating a kidney can result in a potential shortened lifespan for the donor [8].

For a kidney transplant to be successful, a few conditions must be met. The most important condition is that the recipient has a similar genetic makeup to that of the donor, particularly in terms of the human leukocyte antigen (HLA) complex. The HLA system is composed of multiple genes that make up a major histocompatibility complex, a complex involved in monitoring one's immune system. If the HLA system recognizes foreign antigens (such as those of a virus) that do not match the cellular antigens of the body, it will destroy the invading antigen. Antigens are substances that stimulate production of antibodies. Thus, if one receives an organ from a donor, they must have almost identical HLA complexes to ensure that the recipient's HLA system does not fight off the donor's cells of the donated organ. An HLA complex is made up of multiple genes, and individuals vary in terms of the makeup of this complex. Therefore, it is extremely rare to find two individuals who have the same genes comprising the HLA system. Consequently, if one is a "match" for an organ donation, it means that the donor has a genetic makeup that is close enough to the patient in need of the transplant. A match is a rare occurrence. Therefore, if one has the ability to save another individual's life by donating a kidney, it is a unique opportunity, and if that individual passes up the opportunity to donate the organ, it is unlikely that another individual will have a close enough genetic makeup to donate the organ.

Even if someone receives a kidney from a donor with a similar HLA complex, it is not definitive that the transplant will be successful. Sometimes, the body still recognizes the new organ as foreign, and the immune system fights off these new cells, preventing a successful transplant. Therefore, even after donating a kidney, one can never be sure at the outset if the transplant will be successful or not.

The Minchat Yitzchak was asked a question as to whether a healthy individual can donate a kidney to save someone who is ill. The Minchat Yitzchak responded that one needs to weigh the danger

he poses to himself and how effective the transplant will be when making this decision. If the donor will be able to continue a healthy life, then Jewish law would encourage him to donate the organ, as Jewish law places tremendous value on saving another individual's life. Yet, if the individual could pose threats to his own life, and the surgery may not be successful, Jewish law may prohibit the donation, as one is prohibited from putting his own life in danger [9].

From the above discussion, it is clear that kidney donation is very complex. The results for both the donor and the recipient are not usually known prior to the surgery. Furthermore, Jewish law is also complicated in that it values saving someone else's life but prohibits risking one's own life. Thus, if someone is a match for a kidney donation he should ask a posek what to do, as kidney donation is complicated both from a medical standpoint and from a Jewish law standpoint.

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Jacob's Injury: Differential Diagnosis of Hip Pathology

Deena Miller

One of the earliest hip injuries, recorded to have occurred over 3,500 years ago, was the biblical story of Jacob wrestling with the angel (Genesis 32:25-33). Jacob crossed the ford of Jabbok with his family as he was returning to Canaan to reconcile with his brother Esau. Upon the realization that he left something behind, Jacob returned to retrieve it and encountered a man, who according to Jewish tradition was a supernatural being: the guardian angel of his estranged brother Esau [1]. The story was recorded as follows:

And Jacob was left alone; and there wrestled a man with him until the breaking of the day. And when he saw he prevailed not against him, he touched the hollow of his thigh; and the hollow of Jacob's thigh was strained, as he wrestled with him...And the sun rose upon him as he passed over Peniel, and he limped upon his thigh. Therefore the children of Israel eat not the sinew of the thigh-vein, which is upon the hollow of the thigh, unto this day; because he touched the hollow of Jacob's thigh, even in the sinew of the thigh-vein [2].

The battle between the angel and Jacob is described by Rabbi Shlomo ben Yitzchak as two individuals struggling together, each attempting to overthrow the other with interlocked arms (Rashi Breishit 32:25). The anatomic site of the trauma is defined through the words of the text. The verse indicates that the man touched the kaph of his thigh, and the kaph of Jacob's thigh loosened. The kaph describes a curved surface such as the palm of a hand, the sole of a foot, or a socket and a shell; here the kaph indicates the hip socket and acetabulum, the curved surface closest to the thigh [3]. Talmudic scholars teach that the kaph is specifically the convex shape formed by hip musculature and its attached gluteal muscles (Hullin 89b).

Hip injuries can be classified into two general categories: those in which there is a dislocation and those with muscular and neurological damage. If this had been an injury with a hip-joint dislocation, Jacob would not have been able to move without treatment, a contradiction based on the continuation of the passage where Jacob limps away. Furthermore, Jacob remained alone, which indicates that there was no medicine man or healer from the Bedouin people around to reduce the dislocation [3]. Thus the injury was more likely a loosening of the socket instead of a complete dislocation. This is a pathological condition, similar to another biblical reference, when Balshazzar was frightened by Mene Tekel. It is written that "the joints of his hips were loosened, and his knees smote one against another," thus the hip joint loosened without displacement (Daniel 5:6). However, there remains an opinion that a dislocation actually occurred even though Jacob was capable of limping away, because there was a form of solar healing orchestrated by G-d after the sun rose (Breishit Rabbah 32:25-33).

In contrast to a complete dislocation, a non-dislocated hip injury can occur through resistance to motion or physical contact. Rabbi Samson Raphael Hirsch explains that when Jacob was gripped

by the angel, Jacob showed resistance and therefore the muscle tore away from the ligaments and he was unable to control his leg movement (Breishit 32:25). This was sufficient to cause the limp described at the end of the episode, but it did not render Jacob unable to move. Maimonides suggests that Jacob envisioned this battle through a prophecy [4]. This does not preclude Jacob from suffering the injury mentioned in the text. Jacob could have endured a resistive injury even through a prophetic battle if, perhaps, his body subconsciously reacted to the terrifying battle he envisioned [5]. Alternatively, the angel could have induced multiple blows directly to Jacob's buttock (Rashi Hullin 91a). Similarly, the injury could have been caused if the angel struck Jacob close to his genitalia. This interpretation stems from the angel seeking a moral weakness within Jacob. Jacob's only sin was marrying two sisters, a marriage that would be prohibited only in the future. The angel injured Jacob near his reproductive organs to punish his sexual offense (Midrash Rabbeinu Bahya Genesis 32:25).

Additionally, commentators describe an injury to the sciatic nerve. The word nasheh does not occur elsewhere in Hebrew and is defined as "the nerve of the hip" in Arabic [3]. The Talmud derived the interpretation of the sciatic nerve from nasheh because it means "slipped away," and the nerve was moved during the injury (Hullin 91a). Commentaries quote the opinion of the Midrash that there was an anatomical distortion caused by flattening of the hip (Breishit Rabbah 32:25-33). Pressure applied to the sciatic nerve caused by hip abnormalities, as well as its effect on surrounding muscle groups, including the piriformis muscle, can cause damage and sufficient pain for an individual to limp [6, 7].

Moreover, there is an opinion that Jacob's hip was "split" open "like a fish," suggesting an open wound. As was previously mentioned, there would have been some reduction of dislocation or miraculous healing if Jacob suffered a complete dislocation and was able to leave on his own. Therefore, a more probable injury would have been a hip fracture in which the individual is ambulatory with an altered gait [8]. According to this assumption, the "split" pathology was more likely describing a laceration than a compound fracture, which would require extensive medical attention.

Dr. Leonard Hoenig studied the differential diagnosis of Jacob's hip and incorporated dislocation, fracture, and damaged soft tissue [9]. It is crucial to note that without radiologic images, the exact diagnosis of Jacob and the extent of his injury will remain unknown. However, the multitude of ideas brought down through biblical commentaries, in comparison to present day journal articles, indicates that damaged hip pathologies were discovered over 3,500 years ago. The breakdown of what was available for medical treatment at the time and the success at which Jacob was capable of limping away dictate a less severe injury, unless there was Divine intervention and miraculous healing. This discussion allows the reader to have a better appreciation for the medical facts behind the story of Jacob and to see the evolving nature of a differential diagnosis, dating back to understanding Jacob's injury.

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Sacred Hunger

Rachel Mirsky

Eating disorders, characterized by severe disturbances in eating behavior, span the gamut from anorexia nervosa to obesity, with binge eating and bulimia located within this spectrum. Anorexia nervosa, as a category of mental illness, was initially included in the 1952 version of the Diagnostic and Statistical Manual of Mental Disorders (DSM) published by the American Psychiatric Association. Later, in the 1987 version of the DSM, binge eating and bulimia were also included as mental illnesses. However, the history of eating disorders began many centuries ago. Literature of ancient Egypt refers to aberrations in eating patterns and examples of these disorders are also noted in the Tanach and Talmud.

The first appearance in the Tanach of eating disorders involves obesity, and, as interpreted by the Midrash, is possibly part of polycystic ovarian syndrome (PCOS). It was theorized that the cause of Sarah's inability to conceive was due to PCOS, which is characterized by a hormonal imbalance with subsequent failure of ovulation. Without an egg to fertilize, conception cannot occur, thus resulting in infertility. PCOS is often associated with the clinical presentation of obesity, and, in those affected by PCOS, the beneficial effect of weight loss on fertility is well established [1].

The Talmud (Yevamot 64b) notes that Sarah, although a beautiful woman, had not reached complete pubertal development. These are clinical manifestations of PCOS, along with insulin resistance and obesity. Around 800 years ago, Rabbi Levi ben Gershom, also known as the Ralbag, observed a link between female infertility and obesity, theorizing Sarah as the prime example. He states that "it is recognized that excess fat and obesity are reasons for infertility," and this may explain why Sarah could not conceive. However, if Sarah was obese and had PCOS, then how did she eventually become pregnant and have a child? The answer is that Sarah allowed her maid servant, Hagar, to have children with her husband [2]. This selfless act was actually beneficial to Sarah. Bitterness arose between these two women over their mutual relationship vis à vis Abraham, ultimately leading to detrimental psychological effects, such as jealousy and depression, as well as fighting. With Sarah, these "detrimental" psychological effects had a positive impact on her fertility by causing her to lose weight, consequently permitting her to conceive.

In contrast to Sarah, Hannah manifested her eating disorder possibly as anorexia nervosa. Also barren, Hannah was desperate to have a child with her husband but was unable to conceive. Hannah's husband, Elkanah, had a child with his second, less-loved wife. This wife, Peninah, made Hannah's mental state worse, as she "would torment her (Hannah) constantly because the Eternal had shut her womb" (1 Samuel 1:6). Additionally, we are informed in verse 7 that because of Peninah's torments, Hannah stopped eating. This point is emphasized in the following verse when Elkanah asks

Hannah why she does not eat. This may be the first historically documented case of anorexia nervosa, probably brought on by clinical depression induced by the pain of being unable to have a child. This depression and Peninah's added torment possibly led to the anorexia nervosa, which had a negative impact on her fertility. Once Hannah prayed to G-d and was told that her prayers will be answered, "she ate and was downcast no longer," (1 Samuel 1:18) and soon thereafter she conceived and bore a son [3].

The third eating disorder discussed in Jewish literature is bulimia nervosa, which is characterized by binge-eating followed by induced-vomiting. Binge eating is first mentioned in the Torah in Bamidbar (11:31). The Jews, wandering in the desert and receiving sustenance from G-d in the form of Manna, grew tired of this daily diet and complained to Moshe. In response, G-d sent fowl, which descended from the sky, and the people over-indulged. This behavior, clearly identified as inappropriate and hazardous, resulted in the people being punished. The biblical commentator and physician, Maimonides, addresses this issue by stating that "excessive eating is like a deadly poison to the body of any man, and it is a principal cause of all illnesses" [4]. Boolmot, "ravenous hunger," is referred to in the Talmud (Yoma 83a, b) and in Tosefta Shabbat (8:30). This condition is considered life-threatening, and it overcomes the victim and impairs his judgment concerning food [5]. Induced vomiting after binge eating, characteristic of bulimia, is discussed and discouraged in the Talmud. It states that "one should not induce vomiting after a meal so as to be able to eat more..." (Shabbat 147b). The unhealthy nature of this behavior was recognized, and consumption of honey was thought to be a suitable antidote (1 Samuel 14:29) [6].

Eating disorders, similar to other mental illnesses, show no boundaries between populations. There is clear evidence in Judaic literature that the Jewish community is not immune to these problems. While these disorders are widespread, there have been increasing numbers of Jewish boys and girls affected by anorexia nervosa, bulimia nervosa and obesity in recent years. No single reason has been identified to explain this recent increase; however, several societal and cultural theories have been proposed. Food plays a central role in Jewish culture and is a focus during Shabbat and holidays. Centuries ago, the sages recognized the dangers posed by eating disorders on physical and mental health, and it behooves our present day leaders to join with mental health professionals to address these issues [6].

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Girl, Boy, or Somewhere in Between?

Sarah Nagar

For centuries, the development of the embryo remained a mystery. Ancient civilizations conceived of innumerable theories to explain the phenomenon, including the worshipping of females as the source of life, or, as the Greek Pythagoras of Samos believed, the sperm contained a fully-formed person that grew when it encountered the egg [1]. Though modern hindsight proves such theories false, a quick glance at an ancient Judaic text dating back to Tanaic times, called a b'raita, provides an incredibly accurate insight into human embryologic development.

This particular b'raita, as understood by Rashi (B'rachot 60a), enumerates a chronological list of prayers for the husband to recite immediately following sexual intercourse. For the first three days, the husband prays for a sperm to be received by the egg. From day three until forty after conception, the husband prays for the fetus to be male. From the fortieth day until the conclusion of three months, the husband prays for healthy fetal development, while from the conclusion of the third to the conclusion of the sixth month, he prays for no miscarriage. Finally, during the final three months, the husband prays that the fetus's exit from the womb should be in peace (i.e., an uncomplicated birth).

According to this b'raita, gender is established by the fortieth day, yet, in a different tractate (Niddah 30b), Rabbi Yishmael notes that it takes eighty days from conception for the fetal sex to fully develop, which seems to contradict the b'raita [1]. Thankfully, the Torah U'madda approach can resolve this supposed contradiction by incorporating modern science's understanding of human embryologic development. All somatic cells of a female fetus have two X chromosomes, while those of a male fetus have one X chromosome and one Y chromosome. Internally, in early embryologic development, the developing fetus has bipotential gonads, which have the potential to develop either into testes or ovaries. It is the presence of a Y chromosome that determines the sex of the fetus.

The Y chromosome contains the gene, sex-determining region of the Y (SRY), which, when activated, encodes a protein (testes determining factor, or TDF) that programs the undifferentiated fetal gonads to develop as testes. TDF, a transcription factor, thereby stimulates the development of testes, which in turn secrete testosterone, leading to the development of internal and external male reproductive structures. In the absence of a Y chromosome, or more specifically in the absence of the SRY gene, by default, the undifferentiated gonads develop as ovaries and the fetus is female. Stated simply, the gender of a fetus is determined by the presence or absence of the SRY gene [2, 3].

Returning to the supposed contradiction, the b'raita implies that it took forty days from conception until the fetus was directed to maleness. What is so special about 40 days after conception? Apparently, activation of the SRY gene occurs at about the 6th week of gestation. Once activated, the biochemical processes are ignited towards maleness, and praying for a male child after this time is useless. However, as Rabbi Yishmael claims in the tractate of Niddah, 80 days after conception is the critical time. It is now known that the fetus is female (i.e., XX, without a Y chromosome), therefore, by default, at about day 80 after conception, when the undifferentiated gonads are programmed to develop as ovaries. Between these forty and eighty days, as the fetus, through the SRY gene, has had the potential to form as a male but did not, flaws could still occur on the chromosomes. Consequently, when Rabbi Yishmael states that one can determine the sex of a female gender only by the 80th day, it does not imply that the fetus is gender-less for those forty days, but rather by the 80th day the fetus is officially established to have developed as a female, without any errors on the chromosomes. As modern science's understandings of embryonic development advance, a Torah U'madda approach makes it apparent that there was no contradiction between the b'raita and the statements of Rabbi Yishmael.

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Animal Experimentation: Necessary Evil or Just Evil?

Amy Nathan

G-d created every life form on Earth, including man and animal. On the one hand, every creature must be treated with kindness and compassion. On the other hand, lower creatures were created for man to use to his advantage. The controversy surrounding animal experimentation is heated and prevalent in the modern world. Multiple organizations have formed to protect animal rights, such as the Society for the Prevention of Cruelty to Animals and People for the Ethical Treatment of Animals, while those opposing such groups assert the importance of animals in research to benefit mankind. In addition to the ethical and scientific implications of this debate, Jewish law propounds its own tenets regarding animal experimentation.

One of G-d's attributes is abundant mercy, and He extends His mercy to man and animal, as stated in Psalms, "And His tender mercies are over all His works" (Psalms 145: 9). Imitatio Dei, emulating G-d's ways, is an ethical principle in Judaism; therefore, people are also expected to act compassionately towards animals [1]. In fact, we see from the book of Proverbs that when a person cares for the welfare of animals, he is considered righteous, "A righteous man regards the life of his beast..." (Proverbs 12:10). Thus, showing concern for animals' welfare is considered a moral trait [2].

Despite its importance, compassion for animals is not necessarily codified in Jewish law; rather, it is a midda tova. Nonetheless, there are laws related to the promotion of animal well-being. For example, one is forbidden to muzzle his ox while it threshes in order to enable the ox to eat from the produce while working (Deuteronomy 25:4). Also, the laws of rest on Shabbos apply to animals as well as to people: "On the seventh day you shall rest; that your ox and your donkey may have rest" (Exodus 23:12) [3]. In addition to laws protecting animal welfare, there are prohibitions against treating animals in a cruel manner and causing them pain, known as tza'ar ba'alei hayyim. The Talmud, in Baba Mezi'a 32b, explicates the law that "you shall surely release it with him" (Exodus 23:5), meaning that one must provide assistance in unloading the burden that an animal carries. The Talmud adds that one must provide more care than that delineated by the general law due to the principle that precludes cruelty to animals and promotes alleviation of tza'ar ba'alei hayyim [1]. There is no consensus as to whether the nature of the prohibition of tza'ar ba'alei hayyim is dioraytah or dirabanan. Nevertheless, the predominant position is that it is dioraytah [4].

While causing distress to animals seems to be prohibited by the Torah, there are other times when the Torah explains that animals may be used to benefit mankind. For example, the Talmud teaches that "Whatever G-d made in His world was not made for naught: He made a snail, which is [helpful for curing] a scab, [He made a] fly as an antidote for a hornet's sting" (Shabbat 77b). This verse indicates that it is acceptable to utilize animals for human benefit

[4]. The Shulchan Aruch states that there is no prohibition of tza'ar ba'alei hayyim when the animal is necessary for "healing or for some other purpose." For this reason, a person is allowed to pluck feathers from a live bird, a practice that was done in order to attain quills for writing. However, the Rama adds that people do hold back from plucking the feathers, because it is an unkind practice (Even Ha'ezer 5:14).

The Rama's qualification leads to several interpretations regarding animal experimentation. The motive behind the Rama's appendage is to benefit people, not animals [2]. Since it is a cruel act to pluck the feathers from a live bird, the Rama cautions against it in order to preclude people from developing this negative, violent character trait. Therefore, the law regarding tza'ar ba'alei hayyim is not absolute. At times, it is permissible to inflict pain on animals when doing so benefits people, as the Talmud states: "The slaughter and causing of pain to animals is permissible for the need of man" (Avodah Zarah 13b). Nevertheless, the pain should be reduced to the fullest extent possible [5].

The non-absolute nature of tza'ar ba'alei hayyim provides the latitude for animal experimentation. For instance, Tosafot permits tza'ar ba'alei hayyim for medical purposes. Rabbi Jacob Ettlinger makes a distinction between "great" pain and "minor" pain, where the infliction of minor pain on animals is more lenient and permitted for a larger array of benefits [2]. The Shvut Yaakov asserts that the Rama was opposed only to directly engendering pain. Thus, animal medical testing is allowed when the pain experienced by the animal is not immediate. Nonetheless, the Shvut Yaakov restricts his consent for animal experimentation, arguing that it is allowed only when no alternative method of obtaining information is available and the benefit to science is not negligible [4]. Rabbi Eliezer Waldenberg permits animal experimentation as long as the animal's suffering is reduced to the greatest extent possible [2]. The Ma'arkhei Lev explains that animal medical experimentation is permitted when it is essential and there are no alternative methods. The Rama's case of plucking feathers from live birds is avoidable because people would benefit the same amount from doing so to dead birds. The general opinion among the poskim is that animal testing is permitted [1].

The permissibility of animal experimentation, albeit with some limitations, is important in furthering scientific knowledge. For years, animal models have been used to help mankind learn about human diseases and devise methods to treat or cure them. Even during the time of the Talmud, there was an understanding that animals can provide insight on human pathology: "The medical knowledge of the Talmudist was based upon tradition, the dissection of human bodies, observation of disease, and experiments upon animals" (Hullin 57b). For example, Claude Bernard, a researcher in the 1800s, greatly contributed to the field

of physiology through his studies of animals, which elucidated the functions of various organs, such as the pancreas and liver [6]. Thus, without animal experimentation, the scientific field may not have advanced to be what it is today.

Animal testing is a vital aspect of scientific research that has contributed to the development of the medical field. The topic is a

controversial debate, with animal activists on one side admonishing cruelty to animals, and researchers on the other side citing the importance of animal models. The Talmud also recognizes the significance of using animals to study the human body. The Torah safeguards against cruelty towards animals, and poskim generally allow animal medical experimentation as long as the pain to the animal is not immediate, direct, or unnecessary.

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On Magic and Medicine

Michelle Neiman

In the second volume of his *Guide for the Perplexed*, Maimonides discusses reasons for the commandments, and he sorts them into categories based on various criteria. Chapter Thirty-Seven of this volume is the introduction to the section that discusses the commandments pertaining to the prohibition of and “deliverance from the errors of idolatry” and any related practices that would lead Israel along the path to idol worship. Included among the commandments enumerated in this section are the prohibitions regarding the practice of magical acts. Maimonides defines magic as anything that is “said to be useful, but is not required by speculation concerning nature” – namely, any practice whose performance could not be demanded based on logic and scientific reasoning, or anything “in accordance with occult properties.” In other words, any act in which “reasoning cannot judge nor can the intellect cognize as true” is considered to be an act of magic and is therefore expressly forbidden by Jewish law. Any magical practice requires at least one of the following three elements: beings, time, and human action. The element of human action would encompass any variety of strange behaviors including “clapping hands...burning something...or muttering a speech understandable or not” [1]. All of this falls under the category of what Maimonides classifies as Amorite usages.

Maimonides explains his reasoning: The prohibition of those acts that are “things not required by reasoning concerning nature” is because they “lead to magical practices” and eventually to idolatry [1]. Any activity that had no logical basis for its performance was forbidden by law, as engagement in such an activity would lead to involvement in magical acts and, consequently, to the worship of false gods. However, Maimonides states explicitly, quoting the Babylonian Talmud, that, “[all] that pertains to medicine does not pertain to the Amorite usages” and further clarifies that the Rabbis permitted any actions “required by speculation concerning nature,” with regard to medical procedures while “other practices are forbidden” [2,1]. He allows the implementation of any activities deemed necessary by logic or science, especially then the practice was related to medicine and healing.

Maimonides’ position is uncompromisingly clear as he “[insists] that repudiation of all magical practices be motivated by the rational conviction that such practices are worthless.” David Horwitz, in his article regarding Rashba’s positions concerning various *halachic* and scientific scenarios, highlights Maimonides’ “disavowal of sham magical cures” in his interest of preserving and protecting human health [3]. Horwitz quotes Isadore Twersky, who emphasizes Maimonides’ prohibition of occult rituals and contrasts it with his endorsement of magical practice for medicinal purposes, thereby presenting the competing principles within Maimonides’ philosophy [4]. Maimonides’ unfavorable opinion of “magical practices” was limited, however; he disallowed only what was not proven to be effective. Horwitz writes:

Three categories of cures existed according to [Maimonides]: effective ones based upon the laws of natural science, sham cures of occult virtue, and the nebulous category of “empirical medicine”...Any cure that is part of the third category which truly “works” would be permitted, and ultimately, with advancement of scientific thought, will also be classified with cures of natural science [3].

This incredible loophole within the laws of healing allows for great flexibility in terms of what would and would not be permissible in the name of medicine. In light of this, it can be inferred that Maimonides clearly “[concedes] the validity of empirical medicine” as well as its permissibility “even though [its] causes [remain] unknown” [3].

Permitting the practice of medical treatments that have been proven effective is a principle that has been accepted since the time of the Talmud. Giuseppe Veltri, a scholar and professor of ancient Judaism and medieval philosophy, notes that both the Babylonian and Palestinian Talmuds list the popular medicinal amulets of the times and repeatedly underscore the accepted “magic-medicinal principle according to which ‘like cures like’” [5]. The Rabbis clearly believed in their power but only allowed the practice once the charms had been proven effective, thereby limiting their use in a fashion similar to the way that Maimonides eventually would.

The Rabbis implemented a further restriction on contemporary methods of healing, particularly in the area of “conjurations” or “whispering.” They believed in the inherent power of “whispering as a remedy,” and they permitted the practice; however, they specifically forbade the recitation of Biblical verses. This was done not because the muttering of the words was itself a forbidden act, but rather to prevent the use of Biblical texts as incantations. Veltri suggests that this may have been forbidden “due to the fear of abuse by bibliomancy,” and he reaffirms that the decree was certainly not intended to absolutely abolish the practice of muttering or whispering [5].

Maimonides states, “it is allowed to use all remedies...that experience has shown to be valid even if reasoning does not require them...[for] they pertain to medicine” [1]. The significance of this statement cannot be understated - Maimonides explicitly allows any and all forms of treatment to be implemented so long as they have been proven effective. Veltri expands on this idea and asserts that so long as a practice was proven to be an effective cure, it was acceptable. He maintains that, “the usefulness of a cure is the criterion for its ‘scientific’ value” and adds that “[foreign] and barbarian procedures, too, can be of proven medical value.” Broadly speaking, any healing practice would be considered acceptable so long as it was proven effective. However, “[the] inventions of the magic, on the other hand, are only ‘deceits’”

because these cannot be proved empirically” and are nothing more than shams, Maimonides’ second category of cures. Such ineffective practices were outlawed on the basis of their uselessness. It is unanimously agreed that if there is no evidence to support the validity of an occult practice, meaning it “cannot be verified,” then it should not be given any credence, nor should it be allowed, as it is nothing more than “magic and superstition” [5].

Rashba has an intriguing approach for assessing various questionable medical practices. Horwitz explains Rashba’s rationale as hinging on his definition and usage of the word “science.” If one takes science to refer to any subjects dealing with the natural world, medicine would by necessity follow the laws of natural science. Any medical practices would, therefore, be classified as legitimate if they conformed to the laws of nature and as fraudulent rituals if they did not. The other use of “science” is in reference to contradictions between *halacha* and contemporary science. Medicine would then be defined as anything that is effective; there is no need to conform to the laws of nature and as such, no deviation from legitimacy [3]. The validity and permissibility of various practices would then depend on the precise definition of “science” according to Rashba, and on an understanding of contemporary science. Horwitz acknowledges that “[the] tension between these two views of medicine continued into the medieval period” and that it “continues today in areas such as acupuncture” [3].

In keeping with the second interpretation of “science,” Rashba signed a ban on philosophical studies in 1305 but pointedly and unequivocally permitted the study of medicine. If one were to infer Rashba’s intentions from this document, one would find that Rashba wholeheartedly encouraged the study of medicine, “presumably with all its concomitant astrological studies and occult cures,” and the practice of anything that was presumed to be an effective treatment. [3] His remarkably liberal ruling regarding the

permissibility of such practices can be applied back to Talmudic discussions regarding the use of amulets and charms. Schwartz writes, “Rashba acknowledged the reality of spirituality brought down upon amulets” and “points out that both Talmuds contain an abundance of magical material that violates no religious precept.” Schwartz references the aforementioned ban, signed during a period of immense controversy during which Rashba “refused to issue an absolute ban on the medicinal use of astral magic”, as additional proof of Rashba’s position. [6]

Not surprisingly, there were those who disagreed with Rashba’s approach. Abba Mari, an early fourteenth-century religious and philosophical figure, maintains that “all scholars are unanimously inclined towards prohibition” of any magical-astral acts, even those related to medicine. [7] Rashba refutes this position and responds that Abba Mari did not “properly understand the sources and especially not Maimonides.” Rashba argues, based on the principles of Maimonides, that so long as a practice is proven to be effective, it is permitted. He “entertained no doubts as to the reality of astral magic and accordingly permitted its use for medicinal purposes” [6]. Nothing, not even practices with absolutely no logical foundation according to the laws of nature, posed a problem to Rashba in the face of the possibility of saving a human life.

Veltri emphasizes this same underlying theme surrounding the responses to this issue, that “the Rabbinic practice stresses the principle of healing as being much higher than the danger of idolatry,” that human healthiness in its strongest condition is of utmost value [5]. The importance of healing trumps any perceived risks and any possible associations with idol-worship in the eyes of the Rabbis of the Talmudic era, Maimonides, Rashba, and countless others. The magnitude of the responsibility for the maintenance of human well-being cannot be overemphasized, and it is our duty to do everything within our power to ensure that our actions distinctly emphasize this code.

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The Halachic Status of an Alzheimer's Patient

Dahlia Pasik

Alzheimer's disease is the most common form of progressive dementia in the elderly population. It is a neurodegenerative disorder characterized by the neuropathologic findings of intracellular neurofibrillary tangles and extracellular amyloid plaques that accumulate in vulnerable brain regions. There are several genetic loci on different chromosomes that are relevant to Alzheimer's disease. Specifically, a gene for late-onset Alzheimer's disease is located on the short arm of chromosome #4 [4p14-p13] [1].

Both men and women are susceptible to Alzheimer's disease. As the age of the individual increases, the likelihood to develop the debilitating disorder proportionally increases. The disease affects approximately 5% of people older than 65 and more than 20% of those who reach the age of 80. The onset of Alzheimer's disease is a steady process. The earliest marked symptom is the loss of memory for recent activities. Emotional behavior is typically categorized by depression, anxiety, and failure to keep track of daily happenings. Difficulty in handling spatial relationships and initiation of motor skills may also be present. In the late progression of the disease, a patient may sink into a pure vegetative level losing the ability to perceive, think, speak, and even move. It is usually at this point that the family of the patient must seek solutions to complex issues such as the implementation of advanced life-support systems, the employment of resuscitative measures, and the continuation of necessary nutrition and hydration for the living although fully vegetative patient [2].

A term that is relevant to many aspects of *halachah* is the category of a "shoteh." A person who is classified as a *shoteh* is disqualified from performing specific *halachic* roles. It should be noted, however, that the use of the word "shoteh" does not actually appear anywhere in *Tanach*. The term appears in the Talmud, as discussed below. Most commonly, the term is used in association with a clinical manifestation of psychosis, in which the individual lacks the ability to distinguish reality from fantasy. This inability in perception results in the lack of capability to perform expected roles. In *Chagigah* 3b, three features of the *shoteh* are described: he who goes alone at night, he who spends his night in a cemetery, and he who tears his clothes. Rav Huna holds that all three of the aforementioned criteria are required. He maintains that each act in and of itself may be irrational but is not necessarily characteristic of overall insanity. However, Rabbi Yochanan holds otherwise and states that even one of the three principal criteria is sufficient for a diagnosis of *shoteh*. The Talmud expands the explanation of the *shoteh* diagnosis. The Talmud states that to be classified as a *shoteh*, the aforementioned actions must be performed in a *derekh shetut*, a deranged manner. This requirement of the Talmud excludes the possibility of the actions of the alleged *shoteh*. There may be, in reality, a logical reason backing the unusual actions of the alleged *shoteh* going out alone at night, spending the night in a cemetery,

or tearing his clothes. Thus, according to the Talmud, the correct diagnosis of a *shoteh* is not based only upon specified conduct, but also upon a symptom-oriented description of the conduct [3].

Rambam, along with Rabbi Yochanan, maintains that only one criterion was necessary to be classified as a *shoteh*. However, Rambam provides different examples of what constitutes a *shoteh* from those stated in *Chagigah* 3b. Rambam uses the following criteria to label a *shoteh*: one who walks naked, breaks vessels and throws stones, and one who remains constantly confused in a particular sphere. The person with these characteristics would be considered a *shoteh* even if he may speak coherently with regard to other matters. Rambam also states that one who is excessively anxious and hasty in judgment is also deemed as a *shoteh*. It should also be noted that there are two additional subtypes in the description of the *shoteh* that are stated in *Chagigah* 3b. They are the *ittim halim*, *ittim shoteh* ("periodically well, periodically psychotic"), and the *shoteh le-davar ehad* ("insane with respect to one domain") [3].

The *shoteh* symptoms can be divided into four current-day DSM-IV psychotic illnesses. The first disorder is schizophrenia, the most common and arguably the most severe of the psychotic disorders. Symptoms include delusions, hallucinations, incoherent speech, and disorganized behavior. The second category of a modern day *shoteh* is an individual with mood disorders. Both major depressive (unipolar) and manic-depressive (bipolar) disorders can manifest as psychosis and, thus, fall under the category of *shoteh*. In this depressed state, the individual will cycle between a normative and psychotic role. This, therefore, describes the *shoteh* as one who is "periodically well, periodically psychotic." The third category that falls under the Talmudic description of a *shoteh* is delusional disorders. Individuals suffering from a delusional disorder lack the thought disorder, abnormal behavior, and prominent hallucinations of schizophrenia. Delusional patients typically only possess the symptom of "being out of touch with reality." This parallels with the type of *shoteh* of one who is "*le-davar ehad*," insane with respect to one domain. The last contemporary disorder classified as a *shoteh* is a brief psychotic disorder. This type of disorder is a temporary psychosis; meaning, the psychotic episode is singular in nature and will not last longer than one month. However, in order to be considered a *shoteh*, the episode must be repeated on at least 2-3 occasions and may be longer than one month [3].

When diagnosed with Alzheimer's disease, the person is essentially classified as a *shoteh*. One may argue that Alzheimer's disease is considered a delusional disorder because Alzheimer's patients are oftentimes completely out of touch with reality. They also experience a range of mood disorders that are related to a *shoteh*. Thus, a patient with Alzheimer's disease is *halachically* considered to be a *shoteh* [3].

A *shoteh* has a unique status in *halachah*. The *shoteh* is commonly mentioned alongside the *heresh* (deaf mute) and the *katan* (minor); all share the commonality of “*lav benei da’at*,” the lack of understanding. Because a *shoteh* lacks understanding, he is restricted in *shelihut*, i.e., the ability to take upon oneself the responsibility of others’ well being. Therefore, a *shoteh* cannot be *motzi* another in the blowing of *shofar*. A *shoteh* is also not allowed to bake *matzah*, to set up an *eruv* for *Shabbos*, or deliver a *get*. Additionally, a *shoteh* is not permitted to get married or divorced (*Yeramot* 112b). Aside from lacking understanding, a *shoteh* also lacks responsibility. Therefore, a *shoteh* is exempt from certain damages. If the animal of a *shoteh* wounded the animal of a sane person, the *shoteh* does not bear any responsibility. Also, a *shoteh* is not aware of what is in his domain, and is therefore exempt from contributing *terumah* from his property (*Shabbat* 153b). A *shoteh* is also unqualified to engage in any business negotiation. *Halachah* is also wary of the need to safeguard the *shoteh*. There are *halachos* forbidding divorces in the case of one spouse becoming insane later in life as well as various obligations that are incumbent upon the community to assist the *shoteh* in certain areas of life [3].

There are certain figures in *Tanach* who have been recorded as having Alzheimer’s disease. One notable figure is Nebuchadnezzar. In the book of Daniel, Nebuchadnezzar dreams that a heavenly messenger suddenly cuts down a huge tree. Daniel interprets the dream and states that Nebuchadnezzar will suffer from seven years of madness before his sanity and his kingdom will be restored.

Nebuchadnezzar’s insanity is described as follows: “He was driven from mankind, he ate grass like oxen, and his body was washed by the dew of heaven, until his hair grew like feathers and his nails like talons” (Daniel 4:30). This animalistic-like behavior is a likely indication that Nebuchadnezzar was stricken with Alzheimer’s disease.

Both Doeg and Ben Zoma have also been known to have suffered from Alzheimer’s disease/dementia. In *Sanhedrin* 106b, Rav Amni states: “Doeg did not die until he forgot all his learning.” This forgetfulness may be a reference to Alzheimer’s disease. Additionally, Ben Zoma, as noted in *Chagigah* 14b, was also found to have suffered from dementia. It states that, “Four men entered the Garden, namely, Ben Azzai, Ben Zoma, Aher, and R. Akiba... Ben Azzai cast a look and died. Ben Zoma looked and became demented. Aher mutilated the shoots. Rav Akiba departed unhurt.” From here, it can be deduced that Ben Zoma experienced dementia.

The Chasam Sofer states that the community at large has a *halachic* obligation to care for the mentally disabled. Similar to a mentally incompetent *shoteh*, a patient with Alzheimer’s disease deserves to be treated equivalently to a patient suffering from any other mentally debilitating illness. Unfortunately, there is no specific and effective treatment for Alzheimer’s disease that currently exists today. Therefore, all other options that are available, such as supportive and symptomatic care, are *halachically* required to be instituted for the Alzheimer’s patient.

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DNA Evidence for the Bene Israel of India

Chana Ratner

David Rahabi, a Jewish merchant, identified an Indian community known as the Bene Israel. Throughout the generations, this community kept traditional Jewish customs such as Shabbat, Kashrut, Brit Milah, and recitation of Shema. They were unable to explain the reason why they observed these customs, and instead, only responded that these Jewish rites had been kept since time immemorial [1]. There are many speculations regarding the origin of the Bene Israel. Some speculate that they descend from Jews who settled in India many centuries ago, and others posit their origin as being one of the ten lost tribes. Questions arise regarding their halachic status as Jews, as well as the weight held by these long-kept mitzvot.

According to their widespread tradition, the ancestors of this community originally fled Palestine due to the persecution of Antiochus Epiphanes. Shipwrecked near the village of Navgon on the Konkan coast of western India around 175 BCE, only seven men, who were Kohanim, and seven women survived. These survivors are thought to be the founders of this Jewish community in India. Aside from this legend, there is no further evidence to substantiate this story [2]. The Bene Israel are known by the Indian locals as the “Shanwar Telis,” which is translated as “Saturday oil men,” because their businesses were closed on Saturday [1].

The Indian Jewish community is the fourth largest Asian Jewish community after Israel, Asian Russia, and Iran. When the State of Israel was established, 20,000 of India’s total Jewish population of 30,000 emigrated to Israel, as well as a few other destinations [3]. DNA analyses of the Bene Israel community began in 1999, and researchers discovered that the Bene Israel were genetically distinct from other Indian communities. Haplogroup 28, a specific grouping of DNA polymorphisms common in Indian populations, was barely found among the community of Bene Israel. Further studies showed that the Bene Israel share DNA similarities with Ethiopian Jewry and with the Yemenite Jewish community. Much like the Ethiopian and Yemenite communities, males in the Bene Israel community have a high incidence of the Cohen Modal Haplotype (CMH; haplogroup 9). Haplotype 9 occurred at a lower frequency among other Indian groups. The CMH is common in kohanim, supporting the legend of the Bene Israel that their founding fathers were seven shipwrecked kohanim [2].

Within the past 15 years, there has been much scientific interest in the genetics of the Jewish people. More specifically, research has focused on the genetic similarities among the Jewish communities scattered throughout the Diaspora and in Israel. These studies analyzed DNA sequences on the Y chromosome (for paternal lineage), on mitochondrial DNA (for maternal lineage), and on the entire set of nuclear chromosomes (for the entire genome). The techniques included analyses of subtle variations in DNA sequences, termed single nucleotide polymorphisms (SNPs), as

well as analyses of more prominent polymorphic variations in chromosomal structure, termed copy number variations (CNVs). Additionally, haplotypes, which are molecular markers linked on the same chromosome were analyzed in these studies. The usage of DNA microarrays allowed for thousands of known DNA sequences to be evaluated. In general, such studies have shown that Jews are genetically closer to each other than they are to gentiles within the same geographic region. It has been found that isolated Jewish communities share a common set of genetic markers with the larger Jewish population, indicative of both a common Middle Eastern ancestry, as well as admixture (intermarriage) between Jews and gentiles [4]. Genome-wide variation analyses of SNPs and CNVs showed that different Jewish communities within the Diaspora show varying degrees of genetic similarity to the larger Jewish populations. Communities with weak linkages to the larger Jewish population include the Indian Bene Israel [5]. Yet, studies of Y chromosome data point to a paternal genetic link between the Bene Israel and Middle Eastern Jewish origins [6]. Studies of mitochondrial DNA elucidate matriarchal founder effects. In the Indian Bene Israel community, a sole founding mother (i.e. a family) accounted for the majority of contemporary mitochondrial genomes [5].

In India, the second most common malignancy among women is breast cancer [7]. BRCA1 and BRCA2 mutant genes, important in familial breast and ovarian cancers, lead to an increased risk in developing malignancy among women. A study was conducted to determine the occurrence of the BRCA1 and BRCA2 mutations and their role in familial breast cancer among Indian women. The BRCA1 mutation, which occurs at a high rate amongst Ashkenazi Jews, was found in Indian women at a rate of 16.4%. In this study, 17 out of 61 patients had mutations either of their BRCA1 or BRCA2 gene. Although the Indian women had an elevated incidence of the BRCA1 mutation, similar to the high rate among Ashkenazi Jews, the specific genetic haplotype for this mutation in the Indian population may have had an independent origin, as it is different from that in Ashkenazi Jews [8].

Due to their questionable background, the Bene Israel have encountered many difficulties integrating into the Jewish communities outside of India. In 1914, the rabbinical authorities in Jerusalem ruled that intermarriage between traditional Jews and Bene Israel was forbidden. Again in 1964, the Sephardic Chief Rabbi of Israel, Yitzchak Nissim, forbade the marriage between traditional Jews and Bene Israel, unless the Bene Israel community could prove that no intermarriage had taken place with the local Hindu population. The rabbinate held the position that in the past, the Bene Israel community was unaware of the Jewish laws relating to divorce and levirate marriage. Past failure of adherence to such laws would have led to mamzerut (a person born of certain forbidden relationships). The Bene Israel countered the argument

posed by the rabbinate by stating that intermarriage with Hindus was not possible in past generations due to the Indian laws of the caste system. Their ancestors never would have intermarried, as they could have only married within their own caste [2].

Genomic analysis of populations is a tool used to study relationships among different communities and to trace their migrations. As a whole, diverse Jewish populations share common DNA markers indicating Middle Eastern ancestry. Despite this commonality, each population has unique DNA markers based on its geographic region in the Diaspora [4]. By identifying SNPs, CNVs, and haplotypes, genomic DNA microarrays noted genetic similarities among these scattered Jewish populations. These studies showed that the vast majority of Jewish communities in the

Diaspora share DNA molecular markers, thus indicating a strong association with the overall Jewish people. With regards to the Bene Israel community, however, their genomic DNA signatures, only weakly identified with those of the larger Jewish population. This would support the rabbinical ban on Jews marrying members of the Bene Israel community. Conversely, analyses of their mitochondrial and of their Y chromosomal DNAs were supportive of their ancestry's descent from a small group of kohanim that were shipwrecked off the Indian coast. The Bene Israel community had mitochondrial DNA markers indicating only one founding female (i.e., family) and Y chromosomal markers indicative of their descent from kohanim. This data, coupled with the caste system existent in India and with their Jewish customs and rites, support the notion that the Bene Israel are an isolated community of Jewish descent.

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The Power of Mindful Meditation

Hila Refael

The human stress response was once an ancient tool necessary for survival. Over the years, our world has undergone an industrial and technological transformation. We are constantly bombarded with emails, texts, and information twenty-four hours a day, nonstop. The modern world has put our biological stress response in high gear. Our work and personal lives have become rushed, and we are under constant pressure. Consequently, our health suffers, and our thinking becomes hurried and confused. We become far less likely to make healthy lifestyle choices, like getting enough sleep, exercising regularly, and eating well. We forget to take care of ourselves, both physically and mentally. For this reason, over the past century, stress-induced diseases have become common. It is crucial for us to learn techniques for stress reduction and to recognize that these practices are relevant to our lives. Small changes in outlook and perception have the ability to dramatically augment the quality of our lives.

How can we find center and focus in our lives when we feel constant pressure? To make the most of our ability to live the life we have dreamed of, we need to change our perspective of the mundane and stray from habitual responses. Meditation, or more specifically mindfulness, is a practice that can help us develop a sense of tranquility.

Meditation in the general sense comprises of a wide variety of practices. Some involve intentional and controlled thinking, while others allow your mind to wander. All practices involve influencing the individual's consciousness through the regulation of attention [1]. Meditation usually entails a certain quietude of the mind and a sense of surrender to a deeper aspect of the mind [2]. Mindfulness, a specific form of meditation, involves the practice of living in and accepting the present moments [3]. Danny Penman, Ph.D., coauthor of *Mindfulness: An Eight-Week Plan for Finding Peace in a Frantic World*, explains that the practice has become widespread: "Mindfulness has gone from a niche practice to something embraced by tens—if not hundreds—of millions of people." The practice is more than just a new age trend; it produces results and is being implemented in more dynamic environments. Google offers its staff a program, some school districts have added it to teacher training, and it has even presented itself in Congress (see Rep. Tim Ryan's new book, *A Mindful Nation*).

If you are unfamiliar with meditation, the practice may seem like a mystery. "Meditation" might suggest an image of a monk sitting cross-legged, deep in concentration. You might associate meditation exclusively with Eastern religions such as Buddhism or Hinduism, but not associate it with Judaism. In actuality, there is evidence that Jews have implemented meditative practices throughout their history [4]. A Midrash showed that Abraham valued meditation and explained exactly how this began his career. Abraham discovered G-d through contemplation of existence and the meaning of life.

Through meditation, he ultimately formed a conversation and relationship with G-d. Abraham's experience can be seen as the paradigm of human connection to G-d. Commentaries on the life of Abraham suggest that when he sent his children off to the East bearing gifts, he included gifts with aspects of meditative practices. These practices eventually surfaced in Far Asian spiritual teachings, and some speculate that the Hindu caste of holy men called the "Brahman" was actually named after the Abrahamic tradition that initiated them [2]. Many Biblical accounts of the early holy men in Judaism involve meditative practice. Abraham's son Isaac was a meditator. His bride Rebecca first saw him when he was meditating in the fields (Genesis 24:63). Early shepherds generally chose the pastoral lifestyle in order to be able to meditate in the fields. Meditation is clearly an ancient practice in Judaism. Since the ideology of Judaism and its religious practices eventually migrated westward, it is appropriate for its meditative practices to migrate along with its more accepted religious practices.

With the rising mainstream popularity of meditation in recent years, it is interesting to explore its historical roots in Judaism. Although it is often overseen in discussion of the relevant Eastern religions that value meditation in their traditions, Judaism actually participated in dialogue with schools and mystical masters, producing one of the most important systems of practice [4]. As we look later in Jewish history, there is a longstanding tradition of meditation; Talmudic sages and mystical Kabbalists from the time of the Baal Shem Tov were known to meditate before and during prayer. Until the Jewish Enlightenment, meditation and mysticism were held as equally important to intellectualism. As Judaism shifted toward a more intellectual perspective, other Jewish values fell by the wayside. Anything semi-mystical was regarded as superstition and occultism and was presumed unworthy of serious study. The deeper meaning of the phenomenology of Jewish meditation was lost in the process.

Although meditation is an ancient practice that has been widely recognized throughout history as a true benefit to the human psyche, in recent years it has been categorized as "new science" in medical literature. The practice has been refreshed in a sense and is gaining popularity as a legitimate treatment for a plethora of illnesses. Moreover, when it comes to new science, it actually works—with no negative side effects.

The scientific community is conducting experiments to discover the extent of benefits of a meditative method of treatment. One experimental study ran two training sessions, each focusing on a different level and length of sustained meditation. Both interventions were effective at improving mood; however, only brief meditation training was found to reduce fatigue and anxiety and to increase mindfulness. Brief mindfulness training significantly improved visual-spatial processing, working memory, and executive

functioning [5]. Thus, the findings suggest that benefits are not only found in long-term meditators; even four days of meditation training is enough to enhance the ability to maintain attention. These benefits of mindfulness and meditation can be applied as treatment for patients with a variety of illnesses. When people are faced with chronic stress and an overactive limbic system, their sympathetic nervous system puts them into “fight-or-flight” mode. That continuous high-gear physiological response is taxing on the body and mind, and people eventually begin to exhibit physical symptoms [3]. The initial symptoms can be mild, such as headaches or increased susceptibility to flu and colds. As people have persistent stress and constant pressure, more serious health issues can develop. Stress-induced conditions include depression, obesity, diabetes, obsessive-compulsive disorder, attention deficit hyperactivity disorder (ADHD), anxiety disorder, ulcers, heart disease, and even cancer [2].

The scientific community is developing a mindfulness-based stress reduction (MBSR) program as a legitimate treatment option. Although no one can be relaxed at all times, with mindfulness, one can learn to counteract the fight-or-flight response by flexing his or her relaxation response through the parasympathetic nervous system [3]. A person who practices mindfulness every day gains major brain bonuses. Human brains have a plasticity quality. The brain has the ability to change physically, functionally, and chemically throughout life [6]. The human body undergoes long-lasting functional changes as a result of a person developing and learning new things [7]. Thus, practicing mindfulness can actually change the structure of a person’s brain, strengthening the areas that control emotions and stress responses [3]. This means a person would have fewer stress hormones coursing through his or her body at any given time.

One study found the MBSR program is helpful in patients with coronary heart disease. Risk factors for the disease include anxiety and depression. Further risk is associated with stress, which leads to high blood pressure and heart rate, physical inactivity, and being overweight. The MBSR treatment was found to reduce psychological risk factors of anxiety and depression and symptoms of stress, blood pressure, and body mass index in the patients. The MBSR program shows improvements in people with stress-related illnesses [8].

Aside from its growing use in the health field, mindfulness has major payback for individual people who welcome it into their lives. An individual can attune the mind to discover a better understanding of his or herself [4]. Generally, we see ourselves through a thick veil of ego, and it is difficult to see ourselves as others see us. Through meditation, we can learn to see ourselves with a degree of objectivity. In this way, we can recognize our own shortcomings, and we can learn to overcome them. The Musar movement, one of the most important meditative movements in Judaism, taught that a person should strive to grow spiritually, ethically, and morally throughout his lifetime [4]. A combination of awareness techniques can be used to work on our character traits throughout our lifetime and to continuously grow toward self-perfection.

We cannot be mindful all the time, but moments of practice have a long-lasting cumulative effect. Obtaining a peaceful balanced soul

is an objective in Judaism, and the tools for attaining it are subtly integrated into the Torah laws [2]. The essence of this objective exists in the basic Hebrew greeting “shalom.” The word shalom is used as a salutation, but it also means “peace” and implies completion, wholeness and perfection. This word has significance in Judaism; we use it to bless each other, and we request peace in our prayers. Living a Torah lifestyle encompasses this idea and enriches both our inner experience on subtle levels, as well as our outer behaviors, habits, and relationships. Chassidic Jews believe that inner turmoil is reduced when we have a clear understanding of our goals and that the freedom of doubt that comes from faith and awareness enriches our lives with joy. The core values that we learn from the Torah laws nurture the whole meaning of shalom. They promote the experience of wholeness and a peaceful spirit. When we are aware of the meditative perspective, biblical laws take on a new significance, and we can recognize where mindfulness is reinforced in the Jewish tradition. In Judaism, we are meant to experience closeness to G-d in everything we do [4]. The Talmud developed this from the verse “In all your ways know Him” (Prov. 3:6). Working, praying, eating, and the simplest tasks can be turned into a more spiritual experience. As Jews, we can elevate even the most mundane activities to see G-d in every facet of life and to move toward an inner peace.

One of the primary techniques for attaining a peaceful soul is establishing regular times for meditation [2]. Rabbinic tradition guides us to pray three set times a day. Established times for making gratitude were introduced for the well-being of the individual. For prayer to reinforce our trust and yield a peaceful soul, we must recognize its meditative qualities. Mindful prayer is conscious of our connection to G-d and enhances our awareness of G-d's presence in our daily lives. This practice of awareness augments our trust in a higher power. The Shema prayer is a specific blessing that portrays this mindful quality. Shema is a Jew's basic declaration of faith in one individual G-d, and it should be said twice a day, throughout life. The Talmud explains that it is meant to be said only once at a time because of the prayer's concept of unity. If a person prepares himself mentally and says the six words of the prayer very slowly, Shema could be an extremely powerful short daily meditation. It reinforces our relationship with G-d and our belief in a caring divine power. Having a mindful experience through prayer three times a day is an advanced form of meditation that is accessible to all. When we trust that G-d is benevolent and that we are where we are meant to be, we have a calm certainty and reach our ability to cope with problems and challenges in an effective way.

Mindfulness is also integrated into Judaism in the practice of reciting blessings before eating. Mindful eating includes bringing an appreciation to where our food comes from and acknowledging the energy that goes into its creation [9]. When we make a blessing before we eat or drink, we express gratitude for the nourishment with which we are provided. Once again, this Jewish practice takes on new meaning when we make an effort to be more conscious of this tradition. A mindful eater eats without judgment or guilt. Mindful eaters do not ignore body cues or eat when they are satiated. Being mindful means being aware of one's body and knowing how it feels at all times. The individual becomes aware of tastes, textures and smells. This practice becomes a lifestyle that an individual can adopt to live more fully and healthily.

There are many aspects of mindfulness seen in the daily rituals of Judaism, and we can further apply this practice to even our most basic activities. One place to begin applying this practice into our lives is with simple relaxation exercises that involve bringing attention to the breath or other bodily sensations. Breathing is usually done automatically and is, therefore, normally under control of the unconscious mind [2]. Unless we consciously alter our breathing, it will mirror our unconscious mood. Yet, if we wanted to, we can control our breathing. Thus, breathing is a link between the conscious mind and the subconscious. If we can learn to concentrate on and control our breath, we can then learn how to control the subconscious mind. This is one of the most powerful benefits of practicing mindfulness. One learns to use the conscious mind to control mental processes that are ordinarily controlled by the unconscious. Gradually more and more of the subconscious becomes accessible to the mind until the person can control the whole thought process. With the link of the conscious and subconscious mind, an individual can gain a certain self-mastery.

The individual is aware of his emotional temperature and has power

over his own thoughts and body. The person gains control of himself, never doing something he knows he really does not want to do. According to many opinions, self-mastery is one of the most important goals of meditation.

Attaining a peaceful soul, a core Torah value, can become integrated into our lifestyle if we open up to mindfulness. Increased quality of life comes with mindfulness. The meditator's world becomes richer; with increased awareness he or she begins to enjoy things other people may not notice. Meditative practices enable us to live life with mental calmness and composure and can guide us toward making good choices. We can meditate on how to rearrange our lives, and we might find ourselves thinking about fundamental questions such as what we ultimately want out of life, what gives our lives meaning, or what brings us happiness more than anything else in the world [4]. The Jewish tradition teaches that everything is in G-d's hands and that G-d is good to us. Through meditation, we truly internalize this perspective, and we attain a peaceful soul. In this way we can experience life at its best.

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Seeing is Believing: Synesthesia at Sinai

Kate Rosenblatt

According to the Biblical text, the Jewish people “saw the voices (of G-d), the lightning, and the sound of the shofar” (Exodus 20:18) at Mount Sinai [1]. Essentially, an estimated two million people experienced sensory stimuli in one modality but perceived sensation in a different modality. Specifically, the Biblical text states that the sensory stimuli of G-d’s voice and the sound of the shofar were perceived by the Jewish people as an image(s), which, of course, is the typical perception evoked by a visual stimulus, not an auditory one.

This phenomenon seems to share similar characteristics with an interesting neural condition known as synesthesia, a subject of study that has more recently become accepted in consciousness research. Synesthesia is a neurological phenomenon in which stimulation of one sensory pathway produces involuntary and spontaneous perception in a different sensory pathway. Although synesthesia used to be considered a rare condition, recent estimates report that its incidence in the human population may be as high 4%. Synesthesia can involve any of the senses, but the most commonly reported form of synesthesia is perception of graphemes – printed numbers or letters – with a colored hue [2]. Rarer forms of synesthesia also include unusual tactile, olfactory, and gustatory perceptions, such as tasting shapes or smelling numbers [3].

Some of the classic Biblical commentaries provide explanations for this perceptual phenomenon recorded in the Torah, and their descriptions are apparently consistent with our modern understanding of synesthesia. For example, the Ibn Ezra states that “all the senses were connected into one” [4]. Stimulation of any given sensory pathway led to experience in one or more different sensory pathways, giving rise to the perception that the senses were somehow connected to one another.

Since the early 20th century, one popular theory has attributed this perceptual anomaly to “crossed wires” in the brain. Over recent years, competing theories have emerged through increased understanding of brain anatomy and function. One of these newer theories proposes an excess of neural connections, enabling heightened communication between brain regions that are functionally unconnected in typical brains. Dr. Daphne Maurer, a psychologist at McMaster University, has further posited that all humans might be born with an excess of neural connections, but that most people lose those connections as they grow, a process known as “pruning.” Insufficient pruning may give rise to the unusual multisensory perceptions experienced by synesthetes [5].

All these hypotheses are intriguing, but the theory that might best explain the mass synesthetic experience at Mount Sinai is one suggested by Dr. Peter Grossenbacher, a psychologist at

Naropa University. He speculates that in the typical brain, sensory information is first processed in multisensory areas and then “fed back” through neural connections to its proper single-sense area. While this is happening, a process of inhibition also occurs to prevent information from being sent to inappropriate sense areas. In synesthesia, the process of inhibition is somehow disrupted, giving rise to perceptions of jumbled senses [5].

According to the Psychology Corner and Dr. Peter Grossenbacher, the latter theory is consistent with the fact that hypnosis, meditation, and hallucinogenic drugs can temporarily induce synesthesia, a concept that might explain the jumbled senses experienced by our ancestors at Mount Sinai [5].

According to Dr. Zvi Rosenstein, a professor on the medical faculty at Hebrew University in Jerusalem, synesthetic perceptions are often associated with deeply spiritual and creative experiences, a phenomenon that has been confirmed by many synesthetes [6].

Dr. Rosenstein points out a relevant Midrash stating that while crossing the Red Sea “each maid servant saw more than the prophet Ezekiel saw in the course of his prophecy.” While this Midrash might not literally be true, it serves to convey that the spiritual level of the Jewish people was tremendously elevated. Given this information, Dr. Rosenstein posits that the mass synesthetic experience at Kabbalat Ha’Torah is testament to the dramatically elevated spirituality of the Jewish people at the time [6].

Interestingly, an article in Psychology Today speculates that all humans are capable of experiencing synesthesia under suitable conditions, such as those that entail feelings of intense spiritual awareness, which are often achieved through hypnosis or meditation [7]. The latter was actually a bona fide and important part of mainstream Judaism up until the 18th century, its traditional roots observed even in Biblical times [8]. For example, our patriarch, Isaac, is described as having gone “lasuach” in the field – a term interpreted by Rashi in Genesis 24:63 as a kind of meditative practice [9]. While there is no evidence that our ancestors achieved spiritual elevation through meditation at Mount Sinai, it might have been employed as a preparatory exercise in the days leading up to *Kabbalat HaTorah*.

Synesthetic experiences such as “seeing sounds” and other altered perceptions of reality are also known to occur under the influence of hallucinogens. Interestingly, many drug users have also reported that hallucinating with drugs can lead to life-altering spiritual enlightenment [10]. While no suggestion is being made here that our ancestors achieved spiritual elevation through the use of psychedelics, these points further the notion that experiences of synesthesia and spiritual enlightenment tend to occur together.

Based on the Biblical descriptions of our ancestors' unusual perceptions, as well as scientific explanations for similar neurological experiences in the modern human population, it is plausible that our ancestors experienced mass synesthesia at Mount

Sinai. Taken a step further, we can use scientific knowledge to support the veracity of traditional teachings and understand our ancestors' perceptions of jumbled senses as evidence of their intense spiritual awareness at *Kabbalat HaTorah*.

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Mythical Creatures in Rabbinic Literature: The Adnei Hasadeh and the Mud-Mice

Michal Schechter

Centuries ago, new reports of a strange and ferocious creature reached rabbinic leaders and scholars. This creature, called the adnei hasadeh (literally: man of the field), was described as a man-like creature that was connected to the ground through its navel by an umbilical cord. Its movement was limited to the cord that tied it to the ground, and anything that entered the adnei hasadeh's domain was immediately killed. Upon hearing this description, the rabbis were faced with a predicament: Under Jewish law, was this creature considered to be a wild beast or a human being? This distinction would have practical ramifications, for if the adnei hasadeh was to be classified as a human being, it would have the ability to impart spiritual impurity.

A mishnah in Tractate Kilayim (8:5) relates that the adnei hasadeh was considered to be a wild animal. Rabbi Yose disagrees and maintains that, under Jewish law, it should be treated as a human being. In the Talmud Yerushalmi, Kilayim (8:4), Yose Arkei describes the adnei hasadeh as a mountain-man who was sustained through its navel. Years later, other scholars attempted to further explain the adnei hasadeh. According to Rabbi Ovadia MiBartenura, the famous 15th century commentator, the adnei hasadeh was an animal that grew from the ground and remained attached to the ground through an umbilical cord. When hunters would find such an animal, they would shoot arrows at its cord until it broke, causing it to die instantly.

Interestingly, the Vilna Gaon, a revered 18th century scholar, used the corded version of the adnei hasadeh to better explain the plague of wild animals that befell the Egyptians when the Jews were slaves in Egypt. The verse states that as punishment, the Egyptians would be attacked by wild animals and "the ground upon which they are." The Vilna Gaon comments that one of the wild animals brought to attack the Egyptians were the adnei hasadeh, who came with the ground to which they were attached [1].

A 19th century rabbi, Rabbi Yisrael Lipschutz, questions whether such a creature that lived through a cord connected to the ground was even viable. He defines the adnei hasadeh as entirely different creatures, maintaining that they were, in fact, orangutans. Rabbi Lipschutz states that the adnei hasadeh were similar to people in build and could be trained to dress and eat like humans. In regards to the adnei hasadeh, Maimonides also notes that "those who bring news from the world state that it speaks many things which cannot be understood, and its speech is similar to that of a human being." This depiction seems to accurately describe the great apes. The term adnei hasadeh may not only include orangutans, but all other apes, too [1].

Scholars who doubt the biological viability of the adnei hasadeh as described by Rabbi Ovadia MiBartenura have pondered the origin of this idea of a creature attached to the ground by an umbilical

cord. A possible answer may be found in the Talmud Yerushalmi in Tractate Kilayim (8:4), where Yose Arkei states that the adnei hasadeh was a "man of the Tor [literally 'mountain'] and lived from his umbilical cord. If the umbilical cord was severed, it could not continue to live." Dr. Daniel Sperber, a professor of Talmud at Bar-Ilan University, argues that Yose Arkei was prompted to provide a translation of the term adnei hasadeh due to the problematic nature of the title, which caused halachic discord over its status as part human being, part wild animal. Yose Arkei provided a literal translation for adnei hasadeh, using his local Galilean Aramaic to translate the term as "man of the field/mountain" [2].

The word Tor, meaning mountain, is usually spelled with the Hebrew letter "vav" in the middle. Later on, this expression was misread and erroneously interpreted as Tavor, meaning navel, which is spelled with the letters "vav" and "bet" in the middle.⁷ This led scholarly commentators from the medieval time period to mistakenly read Yose Arkei's translation as "navel-man" and then proceeded to associate various medieval traditions with the new translation. These glossators added what they thought was a more accurate description to Yose Arkei's translation and wrote in the Talmud Yerushalmi, Kilayim (8:4) that the adnei hasadeh was a creature that lived by its umbilical cord and would die if the connection between it and the earth was severed [2].

Professor Sperber additionally comments that in medieval times, beasts and primitive men were often confused with each other, leading these creatures to develop legendary characteristics [2]. Primitive societies continue to exist today, without contact by the developed world. In total, they number several thousand people and are separated into many different tribes. Each tribe has its own social code and normally views outsiders as a threat, leading tribesmen to often behave violently upon meeting strangers [3]. It is quite probable that the witnesses who came across these indigenous tribes thought that they were observing wild beasts, when in reality they had come across primitive men. These isolated peoples may in fact be the modern day version of adnei hasadeh.

The Jewish sages also received other reports of mysterious and strange beings. Witnesses reported seeing a creature that initially grew from the earth and then developed into a mouse. This mud-mouse eventually morphed into a full mouse. A mishnah in Tractate Chullin (9:10) states that, "A mouse which is half flesh and half earth, if someone touches the flesh part, he is spiritually impure, if someone touches the earth part, he is spiritually pure." The mud-mouse was also mentioned in Tractate Sanhedrin (91a) as a proof for the resurrection of the dead: "A certain sectarian said to Rabbi Ami: You say that the dead will live again-but they become dust,

1. It is possible that some editions of the Talmud Yerushalmi spelled "Tor" as having two vav's in the middle, and in the Yerushalmi, the letter "bet" is frequently interchangeable with two vavs.

and can dust come alive? He replied...Go out to the field and see the rodent that is one day half flesh and half earth, and on the next day it has transformed into a creeping creature and has become entirely flesh” [1].

Maimonides discusses the mud-mouse and writes, “This is a well-known matter; there is no end to the number of people who have told me that they have seen it. This is despite the fact that the existence of such a creature is astonishing, and I do not know of any explanation for it.” In his commentary to Maimonides’ writings, Rabbi Yosef Kappach maintains that Maimonides did not believe that such a creature existed, as his comments noted doubt as to whether the mud-mouse was biologically viable. Many witnesses, claiming to have observed these creatures, told Rabbi Kappach that these mice appeared in the fields after rainy periods. Rabbi Kappach relates that he personally searched the fields for these mud-mice, and, while he did find mice that looked like they were partly made of earth, after handling them he notes, “It became clear that their hindquarters are covered with mud and they are really just mice like all other mice.” Rabbi Kappach concludes that the mud-mice do not exist by stating that “they remain fictional like our master [Maimonides] implied” [1].

In contrast to his approach to the adnei hasadeh, Rabbi Yisrael Lipschutz argues in favor of the existence of the mud-mouse and writes that it is the “heretics” who “mock” the possibility that such a creature existed. It is peculiar that while Rabbi Lipschutz questions the biological viability of the adnei hasadeh and even suggests that it may actually be an orangutan, whereas he strongly defends the existence of the mud-mouse and states that those who do not believe in it are “heretics.” It is important to remember the context in which he wrote. In reference to the mud-mouse, Rabbi Lipschutz argues against the “heretics,” as possibly they were using the example of the mud-mice to ridicule the whole Torah. This led him to reject any other possible explanations of such a creature in order to repudiate the “heretics” [1].

Rabbi Yehoshua Heller of Telz maintains that if the Sages mentioned and described any creature, it must exist. Rabbi

Natan Slifkin, widely known as the “zoo rabbi,” contends that denying the existence of these mysterious creatures does not make someone a heretic. He writes that the suggestion that the Jewish Sages believed in the incorrect scientific data of their time does not necessarily belittle or degrade the Sages. This concept is far from a new and revolutionary idea, as Maimonides also did not believe that the Sages’ descriptions of animals were always meant to be taken literally. Maimonides spoke disparagingly of the people who believed that every scientific idea stated by the Sages must be absolutely true, and stated that “this is the group of the intellectually weak. One should bemoan their foolishness; for they think that they are honoring and elevating the Sages, but in fact they are degrading them with the ultimate degradation, yet they do not realize this” [1].

Rabbi Samson Raphael Hirsch writes in his letter entitled *Trusting the Torah’s Sages* that the Sages’ rulings on these mythical creatures were not meant to give credence to their existence. Rabbi Hirsch maintains that if a renowned scholar nowadays traveled to a distant country and, upon his return, would report that:

In some distant land there is a humanoid creature growing from the ground or that he had found mice that had been generated from the soil and had in fact seen a mouse that was half earth and half flesh and his report was accepted by the world as true, wouldn’t we expect the Sages to discuss the Torah aspects that apply to these instances? What laws of defilement and decontamination apply to these creatures? Or would we expect them to go on long journeys to find out whether what the world has accepted is really true? And if, as we see things today, these instances are considered fiction, can the Sages be blamed for ideas that were accepted by the naturalists of their times?

Rabbi Hirsch argues that the Sages were simply presented with reports of these strange creatures and proceeds to make various rulings in reference to them. The actual existence of these cases does not reflect the credibility of the Sages [1]. While the Sages had good reason to believe that the creatures they received reports about existed, we can be certain today that neither of these mythical creatures is real.

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Grapes in Medicine: From the Talmud Until Today

Naomi Schwartz

The medical benefits of grapes have come under recent scrutiny, with hundreds of published papers exploring different aspects of this fruit's role in human health. Many biochemical studies on the reactive chemicals within grapes, in addition to clinical and epidemiological studies on the consumption of grapes, have analyzed the health effects of grapes on several medical conditions, joining the multiple research studies already in the field. In fact, a quick search on the National Institute of Health's scientific research search engine "PubMed" for articles published within the last five years yields over 400 results for the key term "grape and health" and over 750 results for the key term "wine and health." However, the current interest in grapes does not mark the beginning of their role in human health: The medicinal properties of grapes have been utilized over the course of Jewish history for thousands of years and have been documented as such in Jewish sources as early as 500 CE with the publication of the Talmud Bavli.

Grapes were used to treat various maladies during the Talmudic era, ranging from inflammation to intestinal problems. In Gittin 69b, the Gemara mentions that eating grapes whose vines were grown trailed on palm trees was a treatment for internal fever and inflammation [1]. Written roughly around the same time period, Genesis Rabbah 34:15 states that in the town of Gabath Shammai, unripe grapes were used to ward off insect bites and were therefore rubbed on the heads of newborn babies [2]. Grapes are assigned another health benefit in Mishna Nedarim 9:8, where old grape juice is listed as a beverage beneficial for intestinal health [2].

Although there are several references to grapes in the Talmud, most medicinal references specifically discuss grapes' most famous product, wine. Wine was considered the ultimate cure for disease in the time of the Talmud, as noted in Bava Basra 58b, "At the head of all cures am I, wine: in a place where there is no wine, medicine is required." Many detailed remedies requiring wine are listed throughout the Talmud, ranging from cures to heart problems, digestive disorders, and skin diseases. In Gittin 67b, it recommends eating lean meat with watered down wine to cure a three-day fever and eating fatty meat and drinking undiluted wine to cure a chill. Strong wine is listed as the remedy for drinking water poisoned with snake venom, and, when mixed with red aloe, wine is mentioned as the cure for abscesses. Differing strengths of wine were judged effective against different heart ailments: Heaviness of the heart was cured with watered down wine and spiced barley bread, palpitations of the heart were cured with full-strength wine and honeyed wheat bread, and Eiruvin 24b mentions that weakness of the heart was cured with diluted wine and roasted meat [1]. Wine was considered beneficial to the heart in general, as noted in the verse in Psalms 104:15, "wine gladdens the heart" [2]. The Talmud also mentions that wine opens closed hearts, as seen in Bava Basra 12b, a statement that is still under study today in current heart

health research [1,11]. After medicinal bloodletting during the time period of the Talmud, wine was deemed crucial for healing, and in Shabbos 129a, it states that one was required to sell the shoes off one's feet to obtain red wine after bloodletting. The Talmud explains that the red wine was necessary to replace the missing red blood and describes several scholars who drank excessive amounts of wine for healing purposes after bloodletting [3].

The Talmud describes two cures involving wine for a swollen spleen: one through drinking dried water leeches in wine for three days and another through opening a barrel of fine wine for the patient's personal use (Gittin 69b). Stomach pains were cured by drinking 100 kernels of long pepper in wine for three days, and intestinal worms were remedied by drinking wine with a laurel leaf [1]. The Talmud (Shabbos 134a) also mentions wine as a cure for dysentery: One would rub his stomach with a mixture of oil and wine for its healing effects. The Gemaras Yerushalmi Shabbos (14, 14d) and Yerushalmi Avodah Zarah (2, 40d) state that the life-threatening colon disease "kolos" could be cured by drinking crushed cress in aged wine, another mention of wine's beneficial effects in the digestive system [2]. Gittin 70a notes that eating fatty meat with undiluted wine helps lengthen the time remaining before death for one stabbed with a poisoned Persian spear. It writes that to cure the disease "achilu" (fever of the bones), one had to eat a porridge of lentils and aged wine on a full stomach and then sleep wrapped in blankets until recovery. Wine boiled with saffron is listed as a male fertility treatment (Gittin 70a), and a contraception potion is described containing Alexandrian gum, liquid alum, and garden saffron, all powdered and mixed in wine (Shabbos 110a) [1]. The Talmud also suggests that wine is beneficial for lactation (Kesubos 65b) [3].

There are many other medicinal usages of wine listed in the Talmud, both for internal and external healing. The Talmud (Shabbos 109a) states that a knocked hand or foot could be rubbed with warm wine for healing and that wine-soaked bread could be used as an effective eye compress. In Talmudic times, an eye-remedy paste known as "collyrion" was based in a healing liquid such as wine, and a mixture of wine and vinegar was used as a lotion to cure pain of the loins [2]. The Mishnaic supplement Tosefta Shabbos lists a similar lotion of wine and vinegar to cure the skin disease "chatatin" and notes that when extraordinary healing was necessary, children were bathed in wine [2]. Other claims of the Talmud regarding the beneficial effects of wine include the restoration of memory and giving "strength to the body and light to the eyes" [2]. In Pesachim 42b, old wine is given the ultimate recommendation: It is deemed "good for one's entire body" [1].

Jews continued to use grapes for healing purposes throughout the ages, even after being dispersed throughout the world following the destruction of the Temple. Centuries after the Talmud's medicinal

recommendations, Maimonides, a Torah scholar and prominent physician in Egypt during the Middle Ages, expounded on the health benefits of grapes in his medical writings, praising them as one of the healthiest fruits [4]. Maimonides believed that most raw fruits were harmful to the body, but wrote in his Treatise on the Regimen of Health that “there [we]re some [fruits] which [we]re less bad, [and were] close to being good, like... grapes” [4]. In another book on Jewish Law, Mishneh Torah Hilchos De’os, Maimonides is even more complimentary to grapes, calling them “the most beneficial of fruits,” and writing that they are valuable both when eaten fresh and dried [5]. In his Treatise on Asthma, Maimonides lists several medicinal usages for grapes: He writes that unripe grapes can be used for loose stools and that an opium potion in a liter of grape juice can be used to prevent catarrh (a condition characterized by inflammation of the mucous membranes), bring sleep, thicken thin material, and assist in expectoration [6]. Maimonides also records a poultice containing congealed grape juice as a treatment to “sooth [the] severe pain of acute inflammation of external parts of the body,” another mention of grapes’ anti-inflammatory effects [7]. Maimonides additionally praised raisins for their health benefits, writing that their consumption is good for the liver, eliminates heartburn, cleanses the lungs, and provides a calming effect [6].

Maimonides also extolled the health benefits of wine, listing many medicinal uses throughout his writings. In his work The Medical Aphorisms of Moses, Maimonides writes that wine strengthens the weak and enfeebled [8]. He mentions that diluted wine can be used to cure ulcers, while undiluted wine can help relieve dizziness, because it dissolves the gases that have filled the head [7]. Maimonides writes that wine mixed with cold water tranquilizes fainting spells, spiced wine helps those with syncope, and undiluted wine cures strong headaches because of its warming and blood-thinning effects. Maimonides lists many beneficial roles of wine diluted by half with water, writing that it “neutralizes bad liquids and warms the stomach, aids digestion, dissolves cold gases, and helps combat shivering.” It “warms the entire body and stimulates all limbs to more rapid movement... [and] also improves or moistens the liquids of the body and eliminates the bad thereof.” Maimonides also writes that wine “give[s] rise to good blood, normalize[s] the body constitution, and digest[s] that which is in the stomach and blood vessels. [It] also improve[s] the function of organs, extract[s] superfluities, and promote[s] their excretion to the outside” [8].

In his Treatise on the Regimen of Health, Maimonides states that wine is “the best of all nutriments or nourishing foods” because “it is abundantly nourishing, good, thin, and rapidly digested” [4].

He specifies that wine becomes more beneficial as a person grew older, becoming more effective in the elderly [4]. Maimonides quotes Tana debay Eliyahu Zutra, who proclaims that wine restores the vision of the old, similar to the claim of the Talmud that wine brings “light to the eyes” [2,4]. In his Treatise on the Causes of Symptoms, Maimonides mentions that a small amount of wine “assists digestion, helps the elimination of superfluities through increased urine flow, [and] cleans the blood of the gaseous vapors.” He later describes a medicinal beverage made of sugar and wine, which was “extremely praiseworthy in fortifying the stomach and the heart” [4]. Maimonides mentions that wine can help cure liver afflictions that do not contain inflammation and, when mixed with larch fungus as an antidote against poison, it produces “a marked effect and cleansing of the brain so much so that it overshadows all other medications” [7]. Many of these prescriptions mirrored those mentioned in the Talmud, such as grapes’ uses against inflammation, stomach pain, chills, poison, and digestive problems, and grapes’ restorative properties on the eyes, heart, and blood. In Maimonides’ admission that wine “overshadows all other medications,” one sees a clear echo of the Talmud’s statement that wine is “at the head of all cures,” showing a strong adherence to tradition and a chain of medical advice going back hundreds of years [7].

Today, scientists are beginning to study the medicinal values of grapes that have been reported throughout ancient Jewish writings, focusing on details that the Talmud and Maimonides discussed many years earlier. Although more research is still required, grape products, including wine and grape seed extract, have been correlated with many positive health benefits. Polyphenols, natural compounds found in grapes, have been shown to inhibit inflammation by decreasing inflammatory cytokines of the immune system [9], protect against Alzheimer’s cognitive deterioration [10], induce coronary vasodilation [11], and prevent carcinogenesis [12]. Resveratrol, one particular grape polyphenol, has demonstrated cardioprotective effects and effects in improving metabolic health [13], prevents cardiac hypertrophy and ischemic injury [14], increases endothelium-dependent vasodilation [15], activates a known regulator of aging [16], and inhibits ocular inflammation [16]. Grape seed extract has additionally been proven to protect against ethanol- and aspirin-induced ulcers [17], normalize blood pressure in individuals with hypertension [18], and reduce ventricular tachycardia and ventricular fibrillation after reperfusion [19]. These health benefits, more detailed references to the cures in the Talmud and Maimonides’ writings listed above, are among the myriad uses of grapes in medicine that are being studied today. Grape products have been used for healing for centuries, and as current research validates those practices, the world seems likely to see more treatments utilizing grapes in the future.

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1. Cardiac hypertrophy is problematic thickening of the heart muscle.
 2. Ischemic injury is damage that results when blood supply to the tissues is restricted.
 3. Endothelium-dependent vasodilation may help prevent cardiovascular disease.
 4. The activation of the known regulator of aging aids longevity.
 5. The inhibition of ocular inflammation prevents vision-threatening retinal diseases, such as diabetic retinopathy and age-related macular degeneration.
 6. Ventricular tachycardia and ventricular fibrillation after reperfusion are deadly heart problems that occur when the blood supply returns to the tissues after a period of restriction.
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Coffee: The Jewish Energy Drink

Julia Regina Segal

Coffee is more than a drink. Coffee is a beverage recognized globally as an energizer due to its powerful caffeine content. From the time coffee was discovered, people in various cultures, including the Jewish population, have taken advantage of coffee's awakening effects and made it a staple food in their lives. In fact, Jews have utilized coffee as a stimulant to allow better focus and greater involvement in religious practices. Thus, Rabbis regarded this caffeinated drink differently than other beverages. To best comprehend coffee's tremendous influence in religious life, one must be aware of its biological and psychological effects. With this understanding, one can perceive its influence in Halakha in regards to its consumption before the morning prayers of Shacharit.

Coffee contains caffeine, a 'psychoactive drug' that induces changes in functioning of the nervous system leading to alteration in mood, perception, or consciousness [1]. Caffeine begins to express itself within one hour of consumption, and its effects last between three and four hours. Upon consumption, caffeine first stimulates the central nervous system (CNS) at the cerebral cortex and medulla level and, if taken in higher doses, then stimulates the spinal cord. Chemically, caffeine is a methylxanthine, a compound that contains a chemical group that stimulates the CNS and cardiac muscles, relaxes smooth muscles, and acts as a diuretic. Most importantly, caffeine's main effect is to reduce fatigue and improve mental performance [2].

The psychological effects of caffeine consumption are dependent on its dosage. When taken in low doses, caffeine can make one more alert, less tired, and in a better mood. An average consumption of caffeine allows one to perform better on alert-dependent tasks. Although it is unclear whether caffeine can improve one's performance on complicated cognitive tasks, studies in older people have shown that coffee consumption is related to better activity performance [2].

Despite caffeine's beneficial features, one must be wary of its adverse effects. A high level of caffeine consumption leads to an intoxication state called caffeinism. Symptoms of caffeinism include agitation, excitement, restlessness, insomnia, and rambling speech and thought. According to the American Psychiatric Association, four caffeine-related syndromes include caffeine intoxication, caffeine induced anxiety disorder, caffeine induced sleep disorder and a nonspecific caffeine disorder [2].

Thus, like with all foods, it is important to be wary of one's coffee intake. As noted by the Rambam, overeating is the cause of most illnesses, despite whether or not the food is healthy [3]. Therefore, it is advisable to maintain a "middle path" caffeine diet, so that one can avoid the adverse effects of caffeine consumption but still enjoy caffeine's cognitively helpful features.

With a proper diet, caffeine can have a tremendously positive influence in Jewish life. Caffeine's potential to enhance one's religious performance is noted in the Halakha regarding the prohibition of eating and drinking before the Shacharit morning prayer. The Mishna Berurah specifies that it is prohibited to consume food or drink before Amidah prayer. In fact, it is prohibited to even taste food before one prays [4]. The Shulcan Aruch cites this prohibition from, "Don't eat on the blood" (Va-Yikra 19:26). The Sages explain that it is inappropriate for one to eat before one has prayed for one's "blood," self-being. Furthermore, the Kitzur Shulcan Aruch cites this prohibition from, "You have cast Me behind your back" (I Melachim 14:9). Since the word "gabecha - back" is very similar to "geyecha - arrogance," the words are interchangeable; therefore, it can be derived from the verse that one is haughty when one takes care of one's physical needs prior to acknowledgement of the Source for one's sustenance[5].

However, there are two exceptions to this prohibition. One may eat or drink for medical reasons or if one feels weak. Under such circumstances, one should try to recite the first passage of Shema before eating. The second exception is that one may drink water, tea, or coffee without sugar. The Mishnah Berurah explained that it is not haughty for one to drink caffeinated tea or coffee, especially in places where it is customary to drink such beverages, since they make one better able to focus on prayer and allow mental relaxation. The Acharonim explain that these permitted caffeinated beverages cannot include sugar and/or milk, perhaps to maintain a discrepancy between its intent as a stimulant versus as a tasty drink. Yet other Acharonim, such as the Radvaz, are lenient in this regard by allowing one to put a small amount of sugar into the mouth as one drinks the coffee. Furthermore, one should not drink caffeinated beverages in a social gathering, lest the performance of the time bound mitzvah of Shacharit get pushed off and thus not performed appropriately [4].

Coffee is not the typical beverage. As noted in the above Halakhic discussion, caffeine's biological and psychological effects elevate its status to a stimulant that can be useful in religious life. Since the sixteenth century, coffee was perceived as a medicinal item that decreases the required amount of sleep and better enhances focus and concentration in prayer. Interestingly, some scholars argue that more people attended nocturnal religious rituals during the seventeenth and eighteenth centuries because they drank coffee and therefore had the energy to attend such events. For example, the Safet practice of Tikkun Hatzot, a religious custom where one mourns the Temple's destruction and prays out of spiritual piety late at night, used to be practiced by just a few people before coffee was popularized. However, during the Lurianic Kabbalah influence in the late sixteenth century, more people attended the prayer service as noted by the increased number of publications about

the event [6]. Yet, one does not need to look so far into the past to perceive coffee's great influence in Judaism. Coffee has helped Jews all over the world to focus on their prayers and studies and to stay

up late learning Torah. After all, what would a Shavout all-night learning program be without coffee?

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“Are You My Mother?”: An Exploration of Legal Motherhood with Regard to Surrogacy

Chaya Spigelman

Surrogacy, as a solution to infertility, while seemingly wonderful, raises a slew of halachic questions: namely the legal determination of the status of motherhood according to Jewish law. The question is simple: who is the legal mother of a child born of a surrogate? The woman who carries the fetus to term and births the child (gestational mother), or the woman from whom the ovum originates (genetic mother)?

Halachic opinions on this matter date back to the late 1800’s when a certain medical report was published by a physician claiming that he had successfully performed an ovary implantation that resulted in pregnancy and live birth. This publication prompted Rabbi Yekusiel Aryeh Kamelhar to respond. He attributes the legal status of motherhood to the gestational mother alone based on an analogy to the biblical agricultural law of orlah. He suggests that just as the fruit of a two year old branch that was grafted onto a six year old tree is considered permissible to consume because it has become part of the older tree, the same is true of a body part grafted into a person, it becomes part of the body into which it has been grafted and any offspring of the ovary is the product of the body [1]. Meaning that nurturing and birth is the determinant of maternal status, and the origin of the ovum is not significant.

One support for this position is the halachic term *ubar yerech immo* “that describes the fetus as being considered a limb of the pregnant woman” thereby acquiring her religious status. The implication of the religion of the pregnant woman informing the religion of the fetus identifies the gestational mother as the legal mother of the child. An additional support of this position originates from a statement made by Rashi in a commentary on Megilat Esther. In this commentary explaining the redundancy of the text in calling Esther an orphan and then reiterating that she had no father or mother, Rashi asserts that this teaches that “motherhood begins with birth and that the act of giving birth confers the status of motherhood” upon a woman [2].

However, at the time that Rabbi Kamelhar’s response was published, the fact that the ovum contains genetic information was not yet known. When this knowledge, that is now taken for granted and published as fact in scientific textbooks and other literature, was revealed, Rabbi Ezra Bick published a response to the question of legal motherhood that directly contradicts that of Rabbi Kamelhar. He states that the genetic mother is the sole legal mother, because it is her genetic contribution that informs the looks, habits, and all other attributes of the child born, whereas the gestational mother merely carries the child in her womb [1].

There is Torah support for this claim in Gemara Yevamot 42a that discusses the case of a married couple’s conversion to Judaism and states that the husband and wife must observe a three month separation period in which they do not engage in marital

intercourse following their conversion. This is to be done in order to ensure that any child born subsequent to their conversion is a Jewish child conceived after the husband and wife converted. This assertion suggests that it is conception that establishes legal motherhood rather than gestation and birth making the genetic mother the legal mother of a child born of a surrogate [2].

Since then, new scientific data has emerged contradicting the abovementioned position that the genetic mother alone determines all attributes of the child born. The field of epigenetics that explores “chemical reactions that control which proteins a specific cell type produces by switching genes off and on at strategic times during a person’s lifetime” has revealed the phenomenon of horizontal gene transfer, bidirectional cellular exchange between the gestational mother and the fetus. What this means is that stem cells, both of the fetus and the gestational mother, travel between these individuals in both directions via the placenta and implant in the tissue of the other party during the process of pregnancy. This phenomenon has many varied implications and values. Clinically, it allows the gestational mother’s immune system to tolerate the fetus which is technically a foreign body, and cells of the fetus remain within the gestational mother’s tissue even following the birth of the child. While genetic information in the form of DNA is encoded within the haploid gamete that is the ovum and informs the genotype of the fetus, the phenotypic expression of the genetic code is regulated by epigenetics. This implies that the chemical reactions taking place as a result of the fetal environment affects which alleles of certain genes are expressed and which are not. In other words, attributes such as the dietary habits and medical history of the gestational mother may affect the expression of genes encoded in the ovum and thereby inform certain characteristics of the fetus [2].

This discovery led to changes in the positions of rabbinic authorities. The view that both the gestational mother and the genetic mother are legal mothers has been adopted by Rabbi Bleich and Rabbi Auerbach. The implication being that a child born of a non-Jewish surrogate must be converted due to the fact that this woman is considered a legal mother of the child according to the dominant halachic opinion. There is also the alternate minority opinion of Rabbi Menachem Rabinovitch who applies the principle of *mafkir zaro* to women in saying that they may waive their rights to the offspring that results from fertilization of their ova. He asserts that there should be a preference for the presumption that the source of the ovum, the genetic mother, is the legal mother unless she is *mafkir zara*, in which case the legal mother is the one who nurtures and gives birth to the child, the gestational mother [1].

The evolution of this debate regarding the status of legal motherhood in the case of surrogacy clearly demonstrates how

the position of Jewish law can and does change in response to the advancement of scientific knowledge in an area that impacts halacha. While based on certain fundamental principles, both

science and Torah are dynamic entities of which we gain greater understanding over time.

Footnotes:

1. There are multiple forms of surrogacy. One in which a husband's sperm is donated and inserted into a surrogate mother who is not the wife, with the intent that the offspring be transferred in custody to the husband and wife following birth. A second in which the husband's sperm and the wife's ova are fertilized in a petri dish and the fertilized ovum is then implanted into a surrogate mother with the intent that the offspring be transferred back to the husband and wife following birth. A third in which the husband's sperm donated via artificial insemination and an ovum donated by an ovum donor, who is not the wife, are fertilized in a petri dish and the fertilized ovum is then implanted in the wife; in this case, the fetus would be nurtured in the wife's womb, but it would not be biologically related to her. This article deals with the second and third cases mentioned here.
 2. The law of orlah states that one may not eat the fruit of a tree within the first three years since it was planted, during which time it has the status of orlah. In the fourth year, the fruit of the tree obtains the status of neta revii and it must be offered up at the beit hamikdash before it can be eaten. The Gemara in Sota deals with the law of orlah and asks the question: what if you have a tree that is two years old and another tree that is six years old and you grafted a branch from the two year old tree onto the six year old tree and fruit grew on the grafted branch the next year; do we view the status of the fruit on that branch as orlah and forbidden, or seven years old and permissible to eat, asks rabbi abahu? It was determined that there is no law of orlah that is applicable to the fruit of the grafted branch, because once the branch is grafted onto the seven year old tree, its entire support system is that of the older tree and it acquires the status of permissible fruit.
 3. Mafkir zaro is the halachic concept that a man may waive his rights to his offspring by giving away his sperm, such as is the case when a man donates his sperm to a sperm bank in order to be used for in vitro fertilization (IVF).
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Sarah's Infertility: A Diagnosable Case?

Allison J. Tawil

Given the limited descriptions the Torah presents regarding Sarah Imenu's infertility, one may assume that there have not been many attempts made to diagnose Sarah. This, however, could not be further from the truth.

There have been numerous descriptions of Sarah Imenu's infertility, and many efforts have been made to determine the underlying cause of her barrenness. The book of Genesis first describes, "Sarah was barren; she had no child" (Genesis 11:30), and "it had ceased to be with Sarah after the manner of women" (Genesis 18:11). Commentaries such as Rashi, Radak, and S'forno take the latter pasuk to mean that Sarah is postmenopausal [1]. The rabbis of the Talmud give many possible explanations. They include the possibilities that Sarah was an aylonit, a tumtum, or missing a beit valad, and they reference a pasuk in Sefer Yeshayahu that hints to Sarah's clinical problem (Yebamot 64b).

An aylonit, by Rashi's description, is a woman who is missing certain female characteristics and thereby is rendered infertile. An aylonit may also have a deepened voice (Arba'a Turim, Eben Ha'ezer, 172:4). A tumtum is a person born with ambiguous genitalia [2].

The Ralbag, a 12th century rabbi and physician from France, speculates that Sarah was obese. Obesity decreases the chances for a woman to naturally conceive. Therefore, she told her husband Abraham to marry their maid to provoke animosity, which would help Sarah lose weight and conceive [3].

In a provocative article, Joshua Backon, professor at the Hebrew University Faculty of Medicine and editorial secretary of the journal Jewish Bible Quarterly, puts together some of these sources to produce a more detailed diagnosis for Sarah. Polycystic ovarian syndrome (PCOS) is recognized as one of the most prevalent endocrine disorders in women of reproductive age, affecting approximately 1 in 15 women [4]. The syndrome was first discovered by Drs. Stein and Leventhal in 1935 and was previously called Stein-Leventhal Syndrome. The symptoms of PCOS include ovulatory and menstrual dysfunction, androgen excess, and infertility [5]. According to Backon, the Torah provided this clinical description thousands of years earlier.

The redundancy in the pasuk, "Sarah was barren (akarah); she had no child (ein la valad)" is the key to Backon's explanation. If the Torah noted that Sarah is akarah, why does it need to say she has no valad? The Talmud explains that the redundancy is there to teach us that Sarah was lacking a beit valad, a housing for the fetus - i.e. a uterus (Yebamot 64b). Genesis 18:11 noted that the way of women "ceased to be with Sarah," which connotes that she had formerly menstruated but ceased to do so. If Sarah had once menstruated, then she did in fact have a uterus and ovaries, thus invalidating the Talmud's claim that the meaning of valad is beit valad.

Backon speculates that the redundancy in the pasuk must have a different meaning. Some commentaries write that the use of the words "ein la" show that Sarah does not have a valad at that moment, but that she will have one later. The Radak notes that Sarah has a valad in Ur Kasdim, but does not have one in Canaan. Based on these descriptions, valad cannot mean child. Backon also suggests that, perhaps in this pasuk, akarah does not mean barren but rather "unattached" or "uprooted," the word's literal meaning. Finally, Backon makes the connection that valad means dominant follicle. Here, the pasuk is teaching us that Sarah was infertile due to immature follicles [6].

A normal menstrual cycle is regulated by hormones that promote the growth and development of egg follicles within the ovaries. Each follicle holds an egg, and, in any given cycle, there will be one dominant follicle from which the egg will be released for ovulation. It is from this egg that the woman can conceive. As the egg is released from the follicle, it must be swept into the fimbriae of the uterine tube to be in the proper location for fertilization. However, in PCOS, the follicles fail to develop normally because the hormones are not properly balanced. Therefore, there is no dominant follicle and there is no ovulation. Instead, the ovaries are filled with many undeveloped follicles that resemble cysts on an ultrasound, hence the name "polycystic ovaries" [7]. If the meaning of the pasuk is that the egg follicles were persistently immature, the consequence could have been that Sarah was not ovulating.

Due to the absence of ovulation, menstrual periods can be very infrequent, or there may be no menstruation at all. This would explain why Sarah ceased to have menstrual periods, and anovulation would explain her infertility. Another characteristic of women with PCOS is androgen excess, as these undeveloped follicles can produce excess male hormone [7]. This may be the reason the Talmud designates Sarah an aylonit. Androgen excess in a female can cause a deepened voice and lack of breast development, which are some criteria of an aylonit. Furthermore, women suffering from PCOS are more likely to be overweight or obese, which would support the Ralbag's commentary that Sarah was obese.

Of course, Backon's theory is just speculation of Sarah's problem. A criticism of the PCOS diagnosis is that the meaning of aylonit is not exactly clear-cut, so there is no legitimate basis to the claim. Although the laws of an aylonit are described in Eben Ha'ezer, it is not known exactly what the Talmud means when Sarah is called an aylonit. In other places, the Talmud describes Sarah as a beautiful woman (Baba Batra 58a), so it is possible that when the Talmud terms her an aylonit, it does not mean that she was a woman lacking secondary sexual characteristics and with a deepened voice. Another point that should not be overlooked is that the Talmud explains the pasuk "ein la valad" as Sarah was lacking a beit valad. If it is true that Sarah did not have a uterus, the possibility of PCOS is com-

pletely eliminated. What the Talmud seems to be leaning towards is that Sarah had some sort of anatomical abnormality, as she was missing a *beit valad* and was described as a *tumtum* (as well as the hint in Yeshayahu). A diagnosis based on these ideas found in the Talmud certainly is one to consider.

A possible conclusion based on the description of absent or inadequate reproductive organs is Müllerian agenesis. Müllerian agenesis, or MRKH, is an anatomical abnormality that affects approximately 1 in 4,000 women. In Müllerian agenesis, ovaries can still be present, and women are able to experience monthly ovulation, although not bleeding [8]. Therefore, the pasuk “it had ceased to be with Sarah after the manner of women” (Genesis 18:11) can be taken to describe that Sarah’s ovulatory cycle ceased; this explanation brings back the validity of Rashi, Radak, and S’forno, who explain that Sarah was postmenopausal. In this case, Sarah would have been a postmenopausal woman lacking reproductive organs capable of gestating a child, so one would fully be able to appreciate the miracle that occurred for her to get pregnant.

Lastly, it is possible that Sarah and Abraham had a form of unexplained infertility. If Sarah Imenu, along with her husband Abraham, were to walk into a modern day doctor’s office complaining

of infertility, it is not definite that doctors would be able to give them a cause for their infertility. As much as we would like to think that doctors have an explanation for all ailments, they do not always have an answer. Approximately 15% of couples with infertility have unexplained infertility, meaning that doctors do not know why the couple is struggling to have a baby even after rigorous testing procedures [9].

Whether or not Sarah Imenu indeed had any of these forms of infertility is, of course, a matter of conjecture. As our sages explain, “there are 70 faces to the Torah,” and there certainly are many acceptable explanations to Sarah’s barrenness. It is unfortunate that we will never be sure of the true cause of Sarah and Abraham’s struggle to have a baby for many years. What is known for sure, however, is that when a present-day couple is struggling with any sort of infertility (whether the woman is postmenopausal, obese, diagnosed with PCOS, Müllerian agenesis, unexplained infertility, etc.), assisted reproductive technologies are able to help most of them conceive. Nevertheless, prior to these modern technologies, the only cure for most types of infertility would be to wait for a miracle. Undoubtedly, Sarah and Abraham were zocheh to have this miracle transpire for them.

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Delaying Ovulation for the Sake of Fertilization

Liat Weinstock

The Jewish ritual purification bath, or mikveh, is widely discussed in Jewish law. Dating back thousands of years, women have been required to fully immerse themselves in a bath of rainwater or in a flowing spring following menstruation and prior to engaging in sexual intercourse. The rules governing the immersion preparation process, timing, and procedure are very detailed and broad, touching on many other areas of halacha, Jewish law. Amazingly, an ancient Talmudic text discusses artificial insemination while bathing. Ben Sira was the child born of artificial insemination. His father, Yirmiyahu, was attacked while bathing, causing him to ejaculate into the water. Later, Yirmiyahu's daughter immersed into the bath and was impregnated from this ejaculate; Ben Sira was the child born from this incident (Even Hazer, Chelkat Mechokek Os 1:8).

It comes as no surprise that infertility and its ramifications in Jewish law are highly interconnected with the laws of mikveh. Not only are treatments like in vitro fertilization (IVF) complicated by the laws of mikveh, but, in some cases, the laws of mikveh themselves may even be the cause of infertility.

A brief overview of the basic rules of mikveh is necessary in order to understand the complications that the mikveh may cause for infertility treatment. Women are required to immerse in the mikveh following a period of niddah, or menstruation (Vayikra 15:19). According to rabbinical Jewish law, a woman is considered ritually unclean for a minimum of twelve days during her menstrual cycle. This twelve-day period has two phases, a menses period and a clean period. According to rabbinic Jewish law, the menses period lasts as long as she has menstrual bleeding, but it must be for a minimum of five days. Therefore, if a woman bleeds for less than five days, she must still wait five days before the second "clean period" begins (Yoreh Deah 196:11). When the second phase begins, a woman must count seven clean days, called sheva neki'im. Until this count is successfully completed, she remains ritually impure and forbidden to engage in sexual and other intimate activity with her husband. To ensure that seven clean days elapse, a woman must conduct periodic self-examinations. If a woman finds uterine blood during those seven days, she must restart her count and may only go to the mikveh once she has concluded seven consecutive full days with no bleeding (Niddah 66a).

For couples wishing to observe the rules of mikveh and to maintain normative sexual relations, IVF treatments pose a problem. The procedure of egg retrieval may cause the woman to bleed from the laceration. In halacha, only blood from the uterine lining will cause a woman to restart counting, whereas dam makkah, or blood as a result of trauma, does not make a woman ritually impure (Niddah 66a). Thus, a woman with non-uterine bleeding caused by egg retrieval does not have to restart counting her clean days. On the other hand, uterine bleeding would trigger a restart of the count. When a woman conducting a self-examination following egg

retrieval discovers blood staining, she may not be able to distinguish between dam niddah, uterine blood, that would cause her to recount, from dam makkah, which would not cause her to recount the sheva neki'im. It is for this reason that many rabbis recommend women undergo egg retrievals only after immersing in the mikveh.

If rabbinic advice is followed, it may conflict with typical IVF procedures, which generally call for egg retrievals on the eleventh day of the menstrual cycle; one day short of the minimum number of days preceding mikveh dictated by halacha. Medical advances offer a solution to this problem for many Jewish women. By delaying ovulation, doctors can postpone egg retrieval until a woman has immersed into the mikveh, thereby rendering her no longer niddah and not at risk for these potential halachic issues. A recent study was done by physicians at The Ronald O. Perelman and Claudia Cohen Center for Reproductive Medicine, Weill Cornell Medical College, examining the effect of delaying ovulation to allow women to immerse in the mikveh before egg retrieval [1].

In normal ovulation, the process is quite simple. The hypothalamus releases the hormone gonadotropin releasing hormone, or GnRH. This hormone then stimulates the pituitary gland to release the luteinizing hormone (LH) and follicle stimulating hormone (FSH), which are responsible for stimulating the production of estradiol (a specific estrogen), and, in turn, ovulation. Knowing this, the physicians in the study delayed ovulation by treating the patient with GnRH antagonists and estradiol patches. The GnRH antagonists interrupted the functioning of GnRH, thus delaying ovulation, while the estrogen patches curtailed menstrual bleeding and further suppressed FSH. The study found that overall, extending the menstrual cycle by an average of four days allowed women to go to the mikveh prior to egg retrievals without decrement in pre-embryo implantation, clinical pregnancy, or live birth rates as compared to controls [1].

Researchers have found that delaying ovulation benefits infertility treatment in non-IVF patients as well. The laws of mikveh prevent sexual intercourse for at least the first 12 days of the menstrual cycle, even for women with short periods of menstrual bleeding. As a result, women who have short periods ovulate sufficiently before going to the mikveh, making conception unlikely once they are able to engage in sexual intercourse, since they have missed the optimal window of fertility. In these cases, estradiol treatments can lower FSH levels and allow for extension of the follicular phase until she can immerse in the mikveh [1]. Therefore, by delaying ovulation, these women can observe the laws of mikveh and increase their chances for conception.

This study is an example of the symbiotic relationship between science and halacha, where science comes to the aid of couples wishing to observe halacha and takes advantage of the toolbox of scientific solutions to fertility problems.

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Cancer in Tanach

Samantha Wilder

While much of modern medicine has been focused on cancer, it is not an exclusively contemporary phenomenon. Many classic biblical accounts in Tanach can be explained or understood with contemporary scientific knowledge on cancer. Ancient stories that personify heroism, spirituality, and the triumph of good over evil become empirically and scientifically fascinating when looked at through the lens of modern medicine. Through examining several classic examples, we can explain some of the mystique associated with many biblical tales and connect to them in relevant, scientific ways.

One classic story in Tanach is the tale of David's triumph over the giant Goliath. From a young age, children are taught how the future King of Israel triumphed over the towering, menacing figure of this Philistine giant. Yet how did Goliath get to be this giant? According to one medical theory, Goliath suffered from a condition known as acromegaly, which is caused by an excess of growth hormone. His gigantism was a symptom of macroadenoma (large tumors located near the pituitary gland), which is characterized by a hypersecretion of growth hormone during childhood. Finally, Goliath suffered from a visual disorder. While David carried only one stick, Goliath saw several. The theory is that Goliath was suffering from visual field restriction, which has been seen with large pituitary macroadenomas due to pressure on the optic chiasma [1]. This theory also explains how David was able to kill Goliath with one stone shot at his forehead. In acromegaly, the frontal sinuses become enlarged, causing the frontal bone to be thinner, weakening the barrier and allowing the stone to pass through. The stone then lodged itself in Goliath's enlarged pituitary gland and caused a pituitary hemorrhage [2]. This knocked Goliath unconscious, where after David was able to kill him via decapitation.

Another classic biblical story that can be explained using modern medicine is that of King Jehoram. The story goes that God caused him to have an incurable disease of his bowels, and, after two years, his bowels fell out, ultimately killing him. One theory

states that Jehoram suffered from colorectal carcinoma, or colon cancer. Because the text explicitly states that the disease was incurable and that he died because of it, most other causes for his bowel issues are applicable, with colorectal cancer probably the most likely of his death. Additionally, it is most likely that Jehoram reached stage 4 cancer, which is characterized not only by tumors in the body, but also metastases to other organs of the body, which likely contributed to the malignancy of his disease and his ultimate death [3].

One last biblical account that can be further understood using modern medicinal tactics is the case of Titus. The story goes that a gnat invaded his brain, and, for seven years, it lived within his skull, finally killing Titus. Rabbinic Sages taught that when they cut open his head, the gnat was the size of a small bird. Since there is hardly enough space in the intracranial region to accommodate a bird of any size, this must be interpreted differently in order to make sense of it. The Maharal suggests that Titus died of a brain tumor [4]. This is consistent with the understanding of the Sages, that God chose the smallest of agents (generally understood as a gnat) to undermine the biggest of dictators. This small agent was symbolized by a gnat but was not necessarily an actual gnat. It is possible that the tumors slowly grew in his brain, weakening him further and further, ultimately killing him. The marvel that the Sages seem to have at the size of the gnat after cutting open Titus' head could be the marvel of the size of the tumor that had taken over his brain [4].

While in no way exhaustive, these three stories demonstrate how modern science and technology, specifically knowledge of cancer, can further our understanding of ancient accounts in Jewish tradition. By looking at these stories through the lens of modern medicine, we can view these stories not as archaic fairy tales, but as relevant, powerful accounts that affect us even in contemporary times.

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Awareness and Prevention: The Need for Genetic Screening in the Syrian Jewish Community

Farha Zibak

Syrian Jewry originated from the combination of two different populations. One segment of Syrian Jewry, often referred to as the Mizrahi Jews, ascribes its origins to the time of King David. His army general, Joab, conquered Aram Zoba (II Samuel 10), an area of Syria that was tentatively identified as Aleppo. In Roman times, approximately 10,000 Jews lived in Damascus [1]. The other segment of Syrian Jewry, known as the Sephardi Jews, arrived in Syria after their expulsion from Spain in 1492. In the beginning of the 20th century, with anti-Jewish sentiment rising, many Syrian Jews migrated from Syria to the United States, Latin America, and Israel [2]. The next major emigration occurred in 1948, after Israel declared its independence. Those Jews who remained in Syria were permitted to leave in 1992, with most settling in Brooklyn, New York, the world's largest Syrian Jewish community [3].

Because the Syrian Jewish community is a close-knit community, there is a tendency for close blood-relatives to marry. Marriages between an uncle and a blood-related niece or between blood-related first cousins are common. Such blood related marriages may be clinically problematic, as these individuals share 1/8 of their genes and there is a greater probability of recessive deleterious genes for a specific disorder being transmitted from each partner to a common offspring. Even in Biblical times this was an issue, as we see in *in parashat Acharei Mot (Vayikra 18:6-23)* the prohibition of *arayot*, or illicit sexual conduct between close relatives, such as between a father-in-law and a daughter-in-law, between a mother-in-law and a son-in-law, between a parent and a child, or between a sister and a brother are noted. Marriages between uncles and blood-related nieces and between first cousins are not in the category of *arayot* and are *halachically* permitted. Yet, such marriages lead to increased incidence of genetic defects in the offspring. Recognizing this, Rav Waldenberg recommends that one abstain from such marriages [Tzitz Eliezer 15: simon 44]. Rav Avigdor Miller notes that such marriages were common in biblical times and thereafter, without the worry of producing children with adverse health effects [14]. However, those generations were closer to *Adom HaRishon*, whose genome was perfect, as it was created by *HaShem*. Over the generations, defective genes arose and accumulated within the human genome, making marriages between close-blood relatives clinically problematic, and increasing one's risk of producing offspring with hereditary diseases.

Marriage between first cousins is still very common in many cultures today, particularly in Moslem countries. For example, in Qatar, the current rate of marriage between first cousins is 22% [6]. First cousin parents have about a twofold higher risk than unrelated parents of having a child with a multifactorial polygenic disease which is a disease that is affected by multiple genes and can be influenced by environmental factors [7]. Consanguineous marriages (a union between two individuals related as second cousins or closer) are also linked to increased risk for fetal death and infant

mortality, congenital heart disease, coronary arterial disease, deafness, and for preterm birth at less than 33 weeks of gestation [8, 9, 10, 11, 12]. In the mid-1970s, a study was published showing that the increased incidence of leukemia in females within the Syrian Jewish community in Brooklyn correlated with first cousin marriages [13].

This article will shed light on several common genetic disorders in the Syrian Jewish community, as well as issues (*i.e.*, consanguineous marriages) that magnify the incidences of genetic defects within the community. As an isolated population within the Middle East, the Syrian Jewish community developed genetic disorders unique to their specific group. According to the Victor Center for the Prevention of Jewish Genetic Diseases [4], the five most prevalent genetic disorders within the Syrian Jewish community are glucose-6-phosphate dehydrogenase (G6PD) deficiency, anophthalmia, renal tubular acidosis, Roberts syndrome, and striate keratoderma.

The first of these five genetic disorders, glucose-6-phosphate dehydrogenase (G6PD) deficiency, is the most common among the Syrian Jewish population. It is characterized by a yellowish colorization of the skin, as well as the possibility of anemia. Individuals with this disorder are advised to avoid consumption of fava beans and aspirin, both of which may induce anemia. The defective gene for G6PD deficiency is located on the X chromosome. Because males have only one X chromosome, Syrian Jewish males either carry or do not carry the defective gene. As females carry two X chromosomes, Syrian Jewish women may be homozygous (both X chromosomes carry the defective gene or neither X chromosome carries the defective gene) or heterozygous (only one X chromosome carries the defective gene). The carrier frequency for this defective allele which is one of two or more alternative forms of a gene that arise by mutation and are found at the same place on a chromosome, is 1 in 27 within the Syrian Jewish population .

The second of these five genetic disorders, anophthalmia, is the absence of eye tissue in the socket, which along with microphthalmia, abnormally small eyes, is a birth defect occurring in 1 to 3 children of 10,000 births. In the Syrian Jewish community, this defective gene was traced to a mutation on autosomal chromosome 14.

Another Genetic defect found among the Syrian Jewish population is known as renal tubular acidosis. It is associated with defective kidney tubules, causing acid to accumulate in the blood. Rickets, poor growth, calcium deposition in kidney tubules, and hearing loss are some of the clinical symptoms of this disorder. About 33% of patients with this syndrome experience progressive and irreversible hearing loss, beginning as young as 3 months of age. The defective gene is located on the shorter arm of chromosome 2, an autosome. The carrier frequency of this defective gene is unknown.

Fourthly, Roberts syndrome is a prenatal condition of growth malformations of the bones of the skull, arms, legs, and face. Facial abnormalities are common, and most cases of Roberts syndrome are associated with mental retardation. The defective gene is located on the short arm of chromosome 2, and its carrier frequency is unknown. There is no cure for this disorder.

Lastly, Striate keratoderma is a dominant genetic disease affecting the palms, fingers, and soles of an individual and is manifested by a thickening and brown discoloration of the skin. The defective gene is located on chromosome 18, and the carrier frequency is unknown. As a dominant mutation, the carrier of this defective gene manifests the abnormal observable characteristics.

Some genetic disorders in the Syrian Jewish community are noted in other Sephardi communities as well such as G6PD deficiency. The commonality of a specific gene mutation may be indicative of

gene flow (marriages) between these communities. However, G6PD deficiency is an interesting genetic defect as it shows advantage, with carriers of this mutation having increased resistance to malaria. This mutated gene is commonly expressed in Middle Eastern communities in which the climate and environment allow for the existence of malaria-carrying mosquitoes. Higher frequencies of this defective gene were noted both in Jewish and non-Jewish populations in regions where malaria is endemic [5].

Sephardi individuals and communities, including those in the Syrian Jewish community, need to be informed of these genetic disorders. With an awareness of the significant risks posed to their offspring, two recommendations be made: limit the incidences of these diseases by curtailing consanguineous marriages, and propose a genetic screening program for this population of Jewry.

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Biblical and Talmudic Human Genetics

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Neither the *Ta'noch* nor the Talmud is a scientific genetics textbook, yet each contains information relevant to human genetic health issues, and each makes note of various pathologies linked to defective genes. For example, from a hereditary viewpoint of the transmission of traits, recommendations are presented concerning which couples are suitable marriage partners and which are not. The first recorded case history of a genetically transmitted disease (i.e., hemophilia) is cited in the Talmud. The interactions between the environment and genetics (i.e., nature and nurture) in molding phenotype are noted, as well as hints for the newly discovered science of epigenetics. Rather a new science, epigenetics is the study of mechanisms that alter gene expression that can be transmitted from one generation to the next, but do not involve a change in the DNA sequence (i.e., are not mutagenic). Traits controlled by autosomes and by the X and Y sex chromosomes are discussed, as are sex-limited and sex-influenced traits. This manuscript reviews some of the human genetics noted in the *Ta'noch* and in the Talmud.

Multifactorial, Polygenic Traits

Gregor Mendel is credited with uncovering the principles of genetics, or the transmission of traits from one generation to the next. One of the several reasons presented to account for his success was that he selected a test organism, *Pisum sativum* (the garden pea plant), that exhibits contrasting characteristics - i.e., traits that were clearly "yes" or "no" situations, without blending and without producing intermediate traits. For example, for the trait of height, the plants were either tall or short; for the trait of pea coloration, the peas were either yellow or green, etc. In his studies, intermediate traits were not noted. In contrast, most human traits, such as height and skin color, vary continuously, as they are governed by a series of polygenes [1, 2].

Knowledge of the transmission of polygenic traits from parents to offspring was noted in Talmud Bechoros (45b), in which the following suggestions regarding marriage partners were presented: Reish Lakish said that a very tall man should not marry a very tall woman, lest a child as tall as a ship's mast emerge from them. Similarly, a dwarf should not marry a dwarf, lest a finger-sized child emerge from them. A very light skinned man should not marry a very light-skinned woman, lest an extremely white-skinned child will emerge from them. A very dark-skinned man should not marry a very dark-skinned woman, lest a very dark-skinned child emerge from them. The physical appearances of the offspring were presented as exaggerations to stress that individuals of marriageable age should try to produce offspring within the accepted norms of physical appearance. These enumerated human traits (i.e., height and skin color) are multifactorial, polygenic characteristics, influenced both by many genes and by environmental parameters

(e.g., nutrition, sunlight). Polygenic traits are controlled by two or more nonlinked, independently assorting genes, with each dominant allele exerting a small but equal contribution to the phenotype. The resultant phenotype is a summation of the contributions of all the genes, and the environment acts equally on all genes. The number of phenotypic classes within a polygenic trait assumes a bell-shaped distribution [1, 2].

Another suggestion regarding the selection of a marriage partner was proposed by Rava (Yevamos 64b). A person should not marry into a family in which three brothers or sisters of the prospective bride were afflicted with leprosy or with a "falling sickness," usually identified as epilepsy. It was presumed that the prospective bride would transmit these pathologies to her progeny. Epilepsy is a genetic disease; several variants of this disease are known, with defective genes on chromosomes 1, 2, 3, 6, 8, 10, 11, and 21 [3]. Leprosy, however, is not a genetic disease. In principal, there are two distinct types of leprosy: One is a spiritual leprosy induced by a person speaking *lashan hara* (e.g., as with Doeg (Sanhedrin 106b)), and the other is a microbial-based leprosy. The statement by Rava apparently referred to the type of leprosy caused by the bacterium, *Mycobacterium leprae*, with the genetic parameter accounting for susceptibility to infection by *M. leprae*, possibly due to the inheritance of defective gene(s) of the immune system.

Nature versus Nurture

During the Yom Kippur service, the *kohen gadol* scooped the incense (*ketores*) with his cupped hands and placed it into a ladle. The amount transferred to the ladle was dependent upon the physical size of the hands of the *kohen gadol*. Apparently, Rabbi Yismael ben Kimichis, a *kohen gadol*, had enormous hands, as he scooped four *kabin* of incense. He attributed the large size of his hands to his mother, "All women received *zarid*, but my mother's *zarid* rose up to the roof." There are two explanations of *zarid*. One explanation is that *zarid* is a nourishing cereal that was customarily served to pregnant women. Rabbi Yismael attributed his physical stature to the high quality of foods that his mother consumed while pregnant with him. Another explanation is that *zarid* is "that which is winnowed," referring to the quality of the specific sperm cell that fertilized the egg from which he was conceived. An ejaculate of male semen contains millions of sperm cells, of which only one fertilizes the egg. According to this explanation, Rabbi Yismael attributed his unusual physique to the superior quality of the sperm cell that fertilized his mother's egg from which he developed (Yoma, 47a; see Artscroll edition, 47a², see note 19). Both explanations are correct, as an individual is the product both of genetics and of the environment.

In the Talmud (Eduyos 4a), mention was made of polygenic traits transmitted from parents to children. Rabbi Akiva noted that a

father transmits beauty, physical strength, material wealth, wisdom, and long life to his son. Aside from wealth, the other four traits - overall appearance, physical stature, intelligence, and longevity - all have strong polygenic components coupled with environmental aspects [1, 2].

Many, but not all, behavioral traits are learned rather than are inherited. The Talmud in Bava Basra (100a) alluded to such behavioral traits with genetic components. It presented the suggestion that a man seeking to marry a specific woman should examine the character traits of her brothers. Furthermore, a *Baraisa* added that most sons resemble the brothers of the mother. A woman's brothers had the same upbringing that she herself received from her parents and that she, most likely, would transmit to her own children. If so, the values and character traits of the mother's brothers are an appropriate barometer of the behavioral character traits of her sons (Bava Basra 100a¹, Artscroll edition, see note 9). Although not specifically identified in the *gemora*, there are other behavioral traits with a strong genetic component, such as unipolar disorder, bipolar disorder, autism spectrum disorder, and schizophrenia [1, 2].

The interaction between genotype and phenotype, as mediated through the environment, is noted in *gemora* Shabbos (31a). A story is presented about an individual who asked Hillel many questions, with the intent to provoke Hillel to lose his temper. One question concerned why the eyes of Tarmodians were especially round and unattractive. These people dwelled in Tarmod, an oasis in the Syrian desert. Hillel explained that their rounded eyes also had smaller eye sockets, thereby affording them some protection from blowing sands during desert windstorms. Another question concerned why Africans have very wide feet. Hillel replied that these Africans lived in marshland and their wide feet protected them from sinking into the wet land. An alternative explanation was that their custom of not wearing shoes caused their feet to widen (Rashi). Although the relationship between these particular phenotypes and specific genes is not known, interactions between genes and environmental factors are well known, with natural selection favoring those genotypes most suited for a particular environment.

Another instance in which the Talmud discussed a trait with both genetic and environmental components involved the X-linked recessive gene for glucose-6-phosphate dehydrogenase (G6PD). Natural selection for the X-linked recessive gene for glucose-6-phosphate dehydrogenase (abbreviated G6PD) deficiency is seen in regions around the Mediterranean Sea where malaria is a major health risk. G6PD is a metabolic enzyme involved in red blood cell metabolism. The clinical severity of G6PD deficiency varies, with most individuals with G6PD deficiency being asymptomatic; severe symptoms, however, include hemolytic anemia. It has been suggested that the G6PD deficiency offers protection against malaria infection transmitted by mosquitoes carrying the protozoan, *Plasmodium falciparum*. Hemizygous G6PD-deficient males and homozygous G6PD-deficient females infected with *P. falciparum* are less prone to malaria than are non-G6PD-deficient individuals. Protozoan infection is usually not lethal in G6PD-deficient individuals. Jewish populations in Mediterranean areas that are endemic with malaria resemble their host populations, in which the mutant gene for G6PD deficiency is at an unusually high level, as it increases fitness in malarial environments [4].

Recessive Autosomal Traits

There are many causes of deafness, including a form that is related to a defective gene. In the general population, including the Jewish population, roughly 1 in 1,000 children are born deaf, with half resulting from hereditary deafness. In the late 1990s, a report emerged that identified a particular genetic mutation more common among deaf Jewish people than among deaf people from other backgrounds [5]. Familial deafness was cited in the Yerushalmi Talmud regarding the obligation of an individual to give *terumah*, with a distinction made between a person deaf from birth and a person born with normal hearing but who acquired deafness later in life (Terumos 1b). In addition, the sons of Rabbi Yochanan of Godgada were deaf, apparently indicating familial deafness (Tosefta, Terumos, chapter 1).

Dominant Autosomal Traits

In Dovid's later years, the Philistines again arose to make troubles for Israel. Dovid sent his troops into several battles, each against a specific giant from the family of Goliath. One of the gigantic warriors was described as "a man of huge dimensions, whose fingers and toes were six each, twenty four in number" (II Samuel 21: 20-21; I Chronicles 20:4-8). This trait, termed polydactyly, is manifested by extra fingers and toes and is controlled by the dominant mutant gene, *P*. Interestingly, the dominant allele (*P*) does not always express itself in the phenotype of the individual. Thus, a heterozygote (*Pp*) may or may not exhibit additional fingers and toes; this is termed reduced penetrance [6]. Thus, genetically, both Goliath and his brother may have been heterozygotes (*Pp*), but only the brother exhibited the trait.

Y-Linked Traits

There are relatively few genes on the Y chromosome. The most studied gene is SRY, sex-determining region of the Y chromosome. This gene, located at the upper 0.5% of the Y chromosome, encodes the protein TDF, or testis determining factor, which programs the fetus's undifferentiated bipotential gonads to develop into testes, resulting in a male child. SRY, activated on about day 40 of fetal development, may explain the *gemora* in Berachos (60a), which stated that 3 days after intimacy, the husband should pray that his sperm remains viable and from day 3 to day 40, he should pray that the fetus is a healthy male. What is so special about day 40?

The developing fetus, in theory, closely resembles the first human who was created. Regarding the creation of the first human, it is stated: "He created them male and female" (Bereishis 5:2), indicating some sort of fusion of a male and a female (Berachos 61a). Similarly, until day 40, the human fetus is a potential fusion of two sexes - it contains bipotential gonads, which will develop either into the testes or the ovaries. It also contains two sets of tubes: the Wolffian ducts, which are the forerunners of the male reproductive system, and the Mullerian ducts, which are the forerunners of the female reproductive system. If the fetal somatic cells have a Y chromosome, then on day 40 of fetal development, the SRY gene is activated, and TDF is produced. TDF programs the bipotential gonads to form the testes, producing testosterone and Mullerian-inhibiting substance, which stimulates the Wolffian ducts to develop

into the male reproductive structures and induces the degeneration of the Mullerian ducts, respectively. If there is no Y chromosome, then, by default, the fetus develops into a female. The biochemical events leading to gender determination are ignited on day 40 of fetal development. Thus, after day 40, to pray for a child of a specific gender is useless, as the biochemical pathways for maleness or femaleness have been triggered and are irreversible.

X-linked Recessive Traits

The somatic (or body) cells of human females contain two X chromosomes, and those of a human male contain an X and a Y chromosome. Genes on the X chromosome are said to be X-linked. For a defective, recessive X-linked gene, a male will exhibit the pathology, as he has only one X chromosome. An example of a sex-linked recessive trait is red-green colorblindness, which is more common in males than in females. A human female with a defective recessive gene on only one of her X chromosomes will not manifest the pathology, as the woman has another X chromosome with the normal functioning gene. However, for this “carrier” female, if she marries a normal male, there is 50% chance that a son will be normal and a 50% chance that a son will show the pathology. Another sex-linked recessive trait is hemophilia, a bleeding disorder. For a woman who is a carrier for the hemophiliac gene, of her sons, there is a 50% chance of the child being normal and a 50% of the child exhibiting hemophilia. Female hemophiliacs are rare, as both X chromosomes must carry the defective gene. A case history is presented in the Talmud (Yevamos 64b) that is credited as the first recorded report for the transmission of a genetic disease. The disease, thought to be hemophilia, involved the death of the eight-day-old infant following the *bris*. The case is related as follows: For it was taught in a *Baraisa*: If a woman had the first of her sons circumcised, and the child died as a result of the circumcision, and she then had the second of her sons circumcised, and this child, too, died as a result of the circumcision, then she should not have the third son circumcised. These are the words of Rebbe. But Rabban Shimon ben Gamliel said she should have the third son circumcised. If this son also dies, she should not have the fourth son circumcised.

This familial disease, described as that of thin blood (*i.e.*, blood that did not coagulate), is thought to be hemophilia, with the mother being the carrier of the defective gene.

A little later in the *gemora*, the following case was noted: There was an incident with four sisters in Tzippori in which the first sister had her son circumcised, and he died; the second sister had her son circumcised, and he died; and the third sister had her son circumcised, and he died. When the fourth sister came before Rabban Shimon ben Gamliel and asked whether she should have her newborn son circumcised, he said to her, “Do not circumcise him.”

This later case confirmed the familial transmission of this bleeding disease, with each sister being a carrier of a defective X-linked gene for hemophilia.

Shared Genes: *Arayos*

Ramban in *parashas Acharei Mos* (*Vayikra* 18:6-23) discussed the prohibition of *arayos*, or illicit sexual conduct between close

relatives, such as between a mother-in-law and a son-in-law, a father-in-law and a daughter-in-law, a parent and a child, or a brother and a sister. After noting the necessity of sexual relations for the preservation of the species, Ramban noted that the specific sexual relations specified in this *parasha* were forbidden as they produced children that will neither have a healthy existence nor succeed. Rabbeinu Bachya concurred and noted there is no preservation of the species from illicit sexual conduct between close relatives. Rabbi M.J. Broyde [7] suggested that Ramban maintained that one aspect for the inhibition of incest was because it eliminated genetic diversity.

Others, however, suggested that Ramban’s statement was directed to explain that incest led to the propagation of unhealthy progeny. Regarding these cases, the incest being referred to is that between blood relatives (e.g., between a brother and a sister, not between mother-in-law and son-in-law). Rabbi Y. Nachshoni [8] noted that it is apparent that what Ramban meant is that marriages between forbidden (blood) relatives do not succeed and do not produce a family, “as doctors have shown that such marriages harm the existence of the family.” On this topic, Rav Avigdor Miller [9] stated that among the benefits of avoiding *arayos* “is the prevention against a concentration of genetic defects. In the early days of Mankind’s history, men possessed extremely robust bodies; and down to Moshe they lived even more than 120 years. The sons of Jacob were therefore able to wed their sisters without apprehension, because their genes were much more perfect. When *HaShem* shortened men’s lives by adding various flaws to the human constitution, from then on interbreeding became highly undesirable because of the concentration of identical flaws of the siblings. In addition, the family of the Fathers were far superior in purity of character, and therefore they required less strictures to maintain their virtue.” According to Rav Miller, the accumulation of deleterious mutations increased the farther removed one is from the generations of the founding Patriarchs and Matriarchs, thus, negating the genetic health of consanguineous marriages.

Apparently, according to Rabbis Nachshoni and Miller [8, 9], the focus was on the subset of *arayos* in which the individuals share a high percentage of genes (*i.e.*, are blood relatives). Everyone carries recessive genes that are potentially harmful. However, the expression of a deleterious gene on one homologous chromosome would be masked by the normal dominant gene present on the homolog. A brother and sister share 50% of their genes, and a parent and child share 50% of their genes. For incest between such close relatives, there is a high probability of common deleterious recessive genes on similar pairs of homologous chromosomes coming together in the zygote, thereby producing a child with a genetic defect.

Although not related to *arayos*, a similar issue arises for *halachically* permitted marriages between close blood relatives, such as an uncle and his niece or between first cousins. An uncle and his blood-related niece and blood-related first cousins share one-eighth of their genes. Recognizing that such *halachically* permitted marriages often lead to offspring with genetic pathologies, Rav Waldenberg recommended against these marriages (*Tzitz Eliezer* 15: *simon* 44). Consanguinity at the level of first cousin unions increases the risk of congenital heart disease, a common birth defect [10]; fetal

and infant death [11]; and preterm birth at less than 33 weeks of gestation [12]. A study noted that the prevalence of childhood deafness in the Jewish population in Jerusalem declined as the rate of consanguinity of their parents decreased [13]. In the 1970s, an elevated risk for acute lymphoblastic leukemia was noted in the Jewish Syrian community in Brooklyn, NY. Over a 15-year period, six young females were diagnosed with leukemia, which was a frequency 30 times higher than the expected rate. The increased incidence of this blood cancer was correlated with the high frequency of first cousin marriages [14].

Sex-Influenced Traits

An incident regarding Elisha as he departed from Jericho is noted in II Kings 2:19-24. Outside of the city, youths accosted and derided him, saying, “Go away, bald one, go away, bald one.” Elisha was bald. There are many causes of baldness, e.g., poor nutrition, illness, and medications, and the cause of Elisha’s baldness is unknown. However, one type of baldness, termed male pattern baldness, is under genetic autosomal control. In sex-limited inheritance, an allele is dominant in one sex but recessive in the other sex. Thus, sex-influenced traits are phenotypically different in heterozygotes. Assume gene *B* codes for male pattern baldness and its allele *B'* for non-pattern baldness. *B* is dominant in males and recessive in females; *B'* is recessive both in males and females. A male *B'B* would be pattern bald and a female *B'B* would be non-pattern bald. Pattern baldness is governed by testosterone. The gene for male pattern baldness encodes the overproduction of the enzyme, 5-alpha-reductase, which converts testosterone to 5-alpha-dihydroxytestosterone, affecting cells of the scalp. Because males synthesize more testosterone than females, this condition is most evident in males [6].

Sex-Limited Traits

Sex-limited traits occur only in one gender and are controlled by autosomal genes. Examples of sex-limited traits include secondary sexual characteristics, such as breasts in the human female and facial and body hair and muscle mass in the human male. The sex hormones, testosterone produced in the testes and estrogen in ovaries, regulate the expression of sex-limited genes. In addition to their production in the gonads, humans produce lower levels of both sex hormones in the adrenal glands, which lie on top of the kidneys [6].

At times, an imbalance in these hormones may occur. If the level of estrogen is too high or is out of balance with the level of testosterone, the male may exhibit gynecomastia, or female-type breasts. Various health conditions and medications may evoke gynecomastia. An interesting trigger for gynecomastia is smoking marijuana, as one of the breakdown products in the combustion of marijuana is a xenoestrogen. Associated with gynecomastia is galactorrhea, or male lactation. The *gemora* in Shabbos (53b) related an unusual case history of a poor man, whose wife died and left an infant son who needed to be nursed. Unable to afford a wet nurse, the father grew female-type lactating breasts, which allowed him to nurse the infant. There is also a thought that Mordechai nursed Esther (Bereshis Rabbah 30:8)

Female facial hair may be due to an imbalance of sex hormones, in particular to elevated levels of testosterone, perhaps because of a tumor of the adrenal gland. Female facial hair is associated with polycystic ovarian disorder. As discussed in the *gemora* (Kiddushin 35b), a woman, but not a man, is permitted to destroy facial hair.

Genomic Imprinting

Rav Yochanan, an exceedingly handsome individual (Bava Metzia 84a), would sit by the women’s *mikveh*. The women finished their immersions, exited the *mikveh*, and viewed Rav Yochanan. Because of their viewing this handsome sage, they subsequently produced exceedingly beautiful progeny (Berachos 20a). Apparently, viewing this sage was a determining factor in the physical appearance of their offspring. A related incident is noted in Yalkut Shmoni (*parashas Naso* 606) regarding a black Arab king and black queen. The queen gave birth to a white baby, and the concerned king, who initially wanted his wife executed, asked Rabbi Akiva what the possibility was of this occurrence. Rabbi Akiva questioned the color scheme of the bedroom - was it painted black or white? The king replied it was white, to which Rabbi Akiva replied that, apparently, the thoughts of the queen when she was intimate with the king were focused on the white walls, thereby influencing the pigmentation of the child who was conceived. The Yalkut Shmoni concluded that if the reader is surprised with this occurrence, he should examine the story of Yakov and the cut sticks presented before the breeding sheep. Two recent articles have explained the incident of Yakov and the sheep as a case of genomic imprinting [15, 16]. Genomic imprinting, a rather new concept in genetics, refers to the situation in which a segment of DNA is marked (i.e., a gene is down-regulated or up-regulated), and that imprint is retained and recognized through the life of the organism that inherited the marked DNA. Transgenerational transmission of imprinted genes from grandparents to parents to grandchildren has been shown [17]. Thus, by regulating the activity of a gene, the phenotype of an organism may be altered without changing its genotype through mutation (i.e., by altering the sequence of nitrogenous bases in the gene) [6]. For the two cases presented above, i.e., the women who viewed Rav Yochanan and the black queen who viewed the white walls, their feelings were so intense that biochemical events were ignited to mediate gene activities, which were transmitted to their progeny. For example, the period preceding the Six Day war was nerve-wracking, as the fate of the State of Israel seemed to hang in the balance. Israeli women in the second month of pregnancy, when exposed to the psychological stress and anxiety of being in the war zone, gave birth to children who eventually developed schizophrenia. Female offspring were 4.3 times more likely to develop schizophrenia, whereas male offspring were 1.2 times more likely. Apparently, the excessive stress hormones produced in the pregnant mothers were responsible for gene imprinting in the fetuses [18].

Chromosomal Aberrations

The *gemora* (Shabbos 66b) discusses the permissibility of a woman carrying a “preserving stone” on *shabbos*. Such stones were believed to prevent miscarriage, and the importance of wearing it may be more psychological than physiological. A woman wore this stone

even on the possibility of pregnancy, so if actually pregnant, she would not miscarry. This case applied to a woman genetically predisposed to miscarriages, i.e., she was from a family whose females often miscarried (Artscroll edition, 66b⁴, see note #25). The incidence of aneuploidy, a significant cause of miscarriages, increases in maturing oocytes as a function of female age. Furthermore, females designated as inversion heterozygotes and translocation heterozygotes have an increased tendency to produce oocytes with unusual chromosomal numbers. Although the *gemora* noted only females, increasing age of the male and inversion heterozygotes and translocation heterozygotes in the male also may cause miscarriage of the fetus [6].

Concluding Remarks

The subject matter discussed above is interesting in itself; however, a basic knowledge of science adds to the understanding of these topics. Neither the Torah nor the Talmud are scientific sources and medical issues are discussed only in brief. Background knowledge in the sciences can add depth to such medical topics, as the Torah and science are not opposing entities. The *Torah U'Mada* approach has merit in that it deepens the analyses of such themes cited in the *Ta'ach* and in the Talmud.

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