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When Milk Is Not Milchig: FROM BOVINE TO BIOTECH



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Basar b'cholov – the Torah's prohibition against mixtures of meat and milk and its Rabbinic guardrails – constitutes one of the most fundamental laws of kashrus. Repeated thrice in the Torah, the *posuk* of *lo sevasheil g'di bachaleiv eemo*¹ – do not cook a young goat in its mother's milk – proscribes three distinct actions: (1) cooking meat with milk (*bishul*);² (2) eating the mixture (*achilah*); and (3) deriving benefit from the mixture (*hana'ah*).

Conventionally, *milk* is defined as the mammary gland secretion of a lactating mammal. This definition usually aligns with the halachic parameters of what's considered *milchig* for purposes of keeping it separate from meat in a kosher kitchen. But is that always so? Can milk sometimes be *pareve*?³

Certainly, the whitish liquid derivatives of beans and nuts – called “milk” using borrowed terminology – are *pareve*. Resembling actual milk, plant-based milks may be subject to halachic restrictions due to *maris ayin*.⁴ Moreover, they are commonly processed on equipment shared with dairy, which may compromise their *pareve* status.

But how about mammalian milks? Are they ever conferred a *pareve* designation?

Exegetical Expansions and Exceptions

Despite the reference in the *posuk* to a *g'di*, a young goat, Chazal determined that the prohibition encompasses the meat of all kosher *beheimos* – cattle,

sheep and goats – regardless of age. Furthermore, despite the possessive form *eemo* – referencing the animal's own mother – *basar b'cholov* precludes cooking meat in the milk of any kosher *beheimah* – and even in the animal's own milk.⁵

Nevertheless, since the possessive *eemo* suggests a degree of equivalence between the sources of meat and milk, Chazal deem some cases of milk to be excluded from the prohibition, at least on a *d'Oraysa* level:

► **Non-Kosher Animals** – Milk from a non-kosher animal is not kosher – *ha Yotzei min hatamei tamei*. When non-kosher milk is cooked with kosher meat (e.g., camel milk and flanken) and imparts taste, the meat, too, becomes non-kosher due to absorption.

But does the mixture become *basar b'cholov*? The answer is *no*. Just as *g'di* by definition connotes a kosher animal, *eemo* – its mother – likewise alludes to milk derived from a kosher source. Since non-kosher milk does not create *basar b'cholov*, not only is cooking such a mixture allowed, but deriving benefit is also permitted (Y.D. 87:3). Accordingly, one may cook kosher meat with non-kosher milk (or vice-versa, non-kosher meat with kosher milk) on behalf of a non-Jew or to feed a pet, provided one addresses any issues of *maris ayin*.

► **Kosher Chayos** – Meat of a kosher *chayah* (e.g., a deer) does not become *basar b'cholov* *mi'd'Oraysa* when cooked with *beheima* milk (e.g., venison cooked in cow's milk). So too, *chayah* milk

1 *Mishpatim* 23:19, *Ki Sisa* 34:26, *Re'ei* 14:21.

2 *Poskim* (Y.D. 87:1) dispute whether *basar b'cholov* through roasting and frying is a Torah or Rabbinic prohibition. If Rabbinic, only *bishul* and *achilah* are prohibited but *hana'ah* is permitted.

3 The word *pareve* belongs to a small set of Yiddish words of Slavic origin. Related to the Polish word *para*, meaning “pair,” *pareve* signifies a food that is halachically *pairable* with either milk or meat.

4 Rama 87:3. See “Optical Allusions: Avoiding *Maris Ayin*” by Rabbi Chananya Jacobson, *Kashrus Kurrents*, Fall 5782/2021.

5 *Shulchan Aruch* Y.D. 87:2 and *Pri Chadash*.

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HEAVEN SCENT: A Discussion of Birchas Harei'ach



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When Covid-19 turned the world upside down not so long ago, many people sickened with the virus reported a most unusual symptom: they had lost their sense of smell. Suddenly, the world became dull and flat. Food was tasteless. They could not enjoy the aroma of a just-baked challah or the scent of a bouquet of flowers. Upon recovering, survivors gained a newfound appreciation for the blessing of smell and rejoiced in its restoration.

As with all the myriad *brachos* bequeathed to us by Hakadosh Baruch Hu, the Torah provides us with guidance as to how to properly express our appreciation for each. I thought it would be interesting to investigate the topic of *birchas harei'ach*, the blessing on scents.

The source of these *brachos* is a Gemara (*Brachos* 43b) that asks: what is something that only the *neschama* derives pleasure from and not the body? The Gemara answers: The sense of smell. The Chazal derive this from the very last verse in Tehillim, “*kol haneschama tehalal Kah*” – every soul should praise Hashem. We are mandated to make a blessing whenever the soul derives a benefit – in this case, from a pleasant aroma.

Borei Minei Besamim: The All-Encompassing Bracha

We are all familiar with the *Borei Minei Besamim* blessing recited each week during Havdalah on a sachet of cloves or perhaps cinnamon sticks

Borei Minei Besamim is the appropriate bracha if an aroma emanates from something that *does not grow from the ground*. The classic example from the *Shulchan Aruch* (216:2) is musk. The *poskim* provide varying definitions for musk. The Oxford dictionary defines it as a “strong-smelling reddish-brown substance ... secreted by the male musk deer for scent-marking and ... an important ingredient in perfumery.” Synthetic musk is used now almost exclusively in the perfume industry. No bracha is made on synthetic aromas. More on this later.

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Hot Sauce

on the Front Burner



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The global spice trade has thrived for millennia. Whether over land or ancient maritime routes, merchants sold their aromatic wares as they competed to expand their markets. The spice traders who kidnapped Yosef HaTzadik on their way to Mitzrayim attest to the long history of this commodity. But the reference to spices in the Torah goes back even further. We find it by *briyas haolam: barasi yetzer hara, barasi Torah tavin vo* – I have created the evil inclination, I have created Torah as a “spice” (i.e., an antidote) to counter it.¹

The word *spice* originated from the Latin *species*, meaning *sort* or *kind* (interestingly, the same meaning that *species* has today) and it referred to an item of special value. Ancient Roman merchants deeply prized Indian black pepper which they considered more precious than gold, terming it “black gold.” This pungent and versatile spice has an estimated heat rating on the Scoville scale ranging from 10,000 to 30,000 Scoville heat units (SHU).

I was on a *hashgacha* assignment in Louisiana’s Bayou Country many years ago when I was introduced to the Scoville scale, a metric that measures the spiciness of chili peppers and other fiery substances.² Scoville heat units are based on the concentration of capsaicin and other components in the pepper. Habanero peppers topped the scale with an average score of 100,000 SHU, followed by tabasco at 80,000; cayenne and jalapeno each at 20,000; and trailed by the banana pepper at a paltry 500. By way of contrast, the lowly green pepper has a SHU score of zero. These hot chili peppers comprise the base ingredient of the popular condiment we know as “hot sauce.”

Trending From Hot to Hotter

Middle Eastern countries have long imported Louisiana hot sauce in little bottles that grace their supper tables and which are basically emptied by the end of the meal. In Israel, those hot sauces are popularly referred to as *charif* – superhot! Today, hot sauces are becoming even hotter. New trends in consumer preferences are emerging, with a notable shift to spicy foods and condiments. Demand for *charif* has traveled from Middle Eastern to mainstream kosher cuisine. Our tables may now feature fire poppers and spicy tuna poke bowls alongside our traditional foods. Hot honey is fast becoming a pantry staple alongside barbecue sauce and ketchup, spurring the new “swicy” (sweet and spicy) trend.

The hot sauce market is projected to reach \$4.9 billion by 2026, a 78 percent increase from 2020. The hottest peppers of yesterday which had a SHU score in the hundreds of thousands have since been overtaken by new scorches rating in the *millions*. At one point, the Naga Viper pepper (1 million SHU) was thought to be the hottest in the world. Crossbreeding the Habanero (100,000 SHU) with the Naga Viper gave rise to the Carolina Reaper, with a tongue-scorching Scoville rating of 2.2 million SHU. There’s now an even hotter crossbred variety called Pepper X (2.6 million SHU), and if the trend continues, it won’t be the hottest for long.

While there are no exceptions to Koheles’ insight that there is nothing new under the sun, the Ribono Shel Olam has imbued man with

the *chochma* to constantly innovate using what is already available in His *briyah*. Thus, through the wonders of crossbreeding, we are seeing peppers getting hotter and hotter alongside consumers’ growing tolerance and demand for all things hot.

The Miracle of Crossbreeding

The process to crossbreed pepper varieties is no different than developing different varieties of apples: to create a new variety, breeders take pollen from one parent apple and use it to pollinate the flower of another parent apple.³ The resulting seeds are planted and the new apple variant is cultivated from the seedling that grows from them.

The popular Honey Crisp apple is a hybrid of Honey Gold and Macoun which was first introduced in 1991. Breeders have since taken the Honey Crisp and crossed it with an Enterprise apple to produce the Cosmic Crisp. Thousands of new apple varieties were developed – and continue to be developed – this way. The emergence of new “super-hot” peppers is the result of similar efforts.

The Secret Behind the Heat

The secret to a hot and flavorful sauce is to slowly age the peppers. The fresh peppers are sun-dried, washed, ground blended with salt, fed as a mash into a brining tank, then left to mature for one to two years. Even in 1994, when I made my first acquaintance with a pepper mash, the working principle was “the longer the aging, the hotter the mash.”

At the end of the aging period, the mash is homogenized and pumped into holding tanks. The mash is then mixed with grain vinegar in the brining tanks. Typically, brining consists of a saltwater solution, but brining hot sauce requires vinegar as the media. Finally, the mash passes through cutters and filters to produce the fiery red liquid in its distinctive hot sauce bottle. Note that the only kosher-sensitive ingredient in this entire process is the vinegar.

Concerns When Blending with a Davar Charif

Blending with a *davar charif* (a “sharp” spice) can be a cause for kashrus concerns if the recipe calls for natural chicken or beef flavors or meat hydrolyzed proteins. If these are hot when blended, the mixing vessel will be rendered non-kosher and possibly impact the next *charif* chili blend as well. Similarly, if a hot dairy blend calls for non-kosher cheese, the mixing vessel will compromise the status of a subsequent kosher *pareve* chili blend.

Chili Production By-Products

As the **Chili Processing Flowchart** below shows (see Fig. 1), hot sauce is but one of the many products resulting from a chili pepper production. Others include:

Dried/Dehydrated Products (peppers, flakes, powders) – produced by sun-drying, grinding, and sifting; these present few to no kashrus concerns.

Wet-Processed Products (canned/frozen items, product mixes) – these require strict kosher supervision.

Oleoresin Extractions (used as a natural red colorant in condiments and cosmetics) – if alcohol is used to extract the resin from the spice,

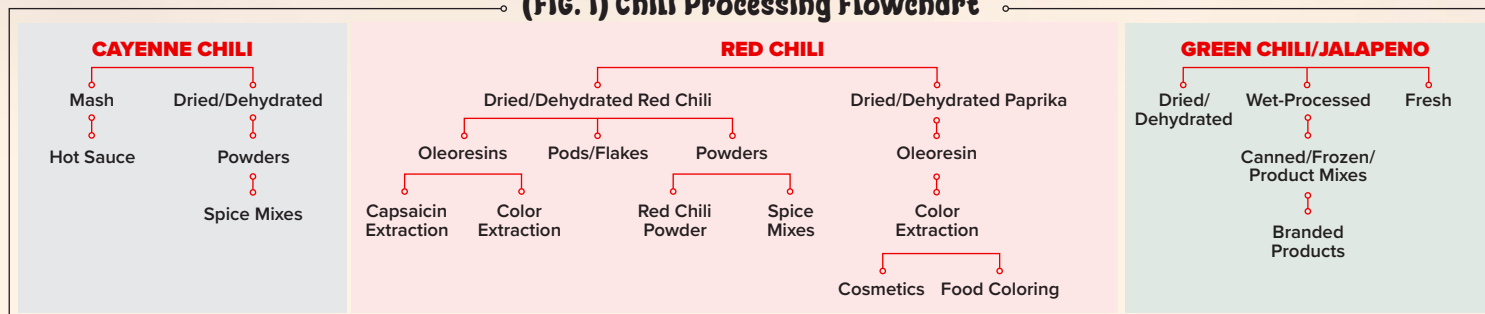
1 Kedushin 30b.

2 Unlike chili peppers, which contain *capsaicin*, the heat in black pepper comes from *piperine*. While the Scoville scale is designed to measure the capsaicin content of chili peppers, the heat from piperine can be similarly measured.

3 Crossbreeding involves *kilayim*, which is a forbidden act for a Yehudi but permitted for an *aino Yehudi*. According to halacha, however, any produce that results from this action is permitted. Thus, we can freely enjoy the consumption of pluots (plum-apricots), tangelos (tangerine-pomelos) and Jonagold apples (Golden Delicious-Jonathans), among many, many others.



(FIG. 1) Chili Processing Flowchart



the alcohol requires kosher certification; for Passover productions, the alcohol must be certified Kosher for Pesach.

Essential Oil Extractions (used as flavorings in savory items) – usually cold pressed or extracted with steam and without the use of solvents; these present few to no kashrus concerns.

A Closing Thought

As we pause to reflect on Shlomo Hamelech's words of wisdom, *ain kol chadash tachas hashemesh*, we can't help but be astounded when observing how the Ribono Shel Olam's world unfolds when He gives us the insight to unlock these natural discoveries. ☆

When Milk Is Not Milchig: From Bovine to Biotech

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does not confer a *basar b'cholov* prohibition when cooked with *beheimah* meat (e.g., deer milk cooked with flanken).⁶ Rabbinically, however, the mixture is designated *basar b'cholov*. But that is only with respect to *achilah*; *bishul* and *hana'ah* are permitted when done in a manner that avoids *maris ayin* (*Shach* 87:6).

Another qualification for milk to be considered *milchig* arises from the word *eim* (mother) itself. Liquid milk remaining in the udder of an animal after it is no longer alive – whether because it underwent a kosher *shechitah* or otherwise died and became a *neveilah* – is not *milchig mi'd'Oraysa*, since its source is an animal no longer capable of being an *eim* (Y.D. 87:6). *Mi'derabanan*, this milk may not be cooked with meat and, if it was, the mixture may not be eaten. Deriving *hana'ah*, however, from this mixture is allowed by many *poskim*.⁷

Milk of a Bas Pekuah

This last exclusion of milk taken from a *shechted* animal has ramifications for the milk of a *bas pekuah*. A *ben* or *bas pekuah* is a calf born after its mother underwent a kosher *shechitah*. Halachically, the mother's *shechitah* is effective for its yet unborn calf and, *mi'd'Oraysa*, the calf may be eaten without any additional *shechitah*, even after it has lived for many years. (As a matter of procedure, on account of *maris ayin*, halacha requires *shechitah* for a *ben pekuah* once it walks on the ground, Y.D. 13:2.) The question is: if a female *bas pekuah* calf grows into a lactating cow, what is the status of its milk?

Shaar HaMelech (Izmir, 18th century) and *Maharit Algazi* (Izmir-Yerushalayim) proposed that *mi'd'Oraysa* milk of a *bas pekuah* is *pareve* since, after all, it comes from an animal that is halachically classified as a *shechutah*.⁸

On the other hand, the *Noda BiYehudah* rejected this suggestion, arguing there is no categorical exclusion of milk from a *shechutah*.⁹ Rather, once a cow is *shechted*, any remaining milk is *pareve* because the criterion of *eimo* (coming from a potential mother) is no longer applicable. But a *bas pekuah* is fully capable of being a mother, and thus its milk is unquestionably *milchig*.

Milk of Metaphysical Matter

Following the position that *bas pekuah* milk is *pareve*, *Mitzpeh Ayson* (commentary to *Bechoros* 6b) finds a creative solution to the question of how Avraham Avinu served his guests butter and milk together with meat (*Parshas Va'yeira* 18:8). The *Midrash* (cited in *Daas Zekeinim*) indicates they were served a mixture that, *mi'd'Oraysa*, constituted *basar b'cholov*. How could Avraham, who observed all precepts of the Torah before they were formally given (*Yoma* 28b), benefit from *basar b'cholov* by serving it to his guests?¹⁰ Furthermore, the Talmud (*Bava Metzia* 87a) explains that Avraham removed bread from the menu upon learning it became *tamei*.

If he was so scrupulous to abstain from a merely laudatory practice (not serving *tamei* food at a non-consecrated meal to assumed heathens), surely, he would have avoided serving milk and meat together – an outright prohibition? These difficulties are resolved by asserting that Avraham's milk source was a *bas pekuah* and was actually *pareve*, and not subject to *basar b'cholov*.¹¹ This answer, however, is unsatisfactory according to the *Noda BiYehudah*, who holds that *bas pekuah* milk is in fact *milchig*.



6 Following Y.D. 87:3, *Shach* (4) and *Pischei Teshuvah* (4).

7 *Badei HaShulchan* 87:77.

8 *Shaar HaMelech*, *Issurei Mizbei'ach* 3:11; *Maharit Algazi*, *Bechoros* I:2:6; R. Akiva Eiger, Y.D. 87:6, considers the issue.

9 *Tinyana*, Y.D. 36; *Yad Yehudah* (87:12) also *paskens* that milk of a *bas pekuah* is *milchig*.

10 Rav Moshe Heinemann *sblit"a* (*Kuntres Derech Kochav*, p. 7, BMG, Lakewood 5775) adduces that serving guests is a forbidden form of *hana'ah* from the halachah (S.A. *Orach Chaim* 448:6, M.B. 28) that one may not feed *chometz* on Pesach even to ownerless animals because of the satisfaction one derives from doing so.

11 *Meshech Chochmah* accepts this resolution, too. Evidently, Avraham was not concerned about *maris ayin*.

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HEAVEN SCENT: A Discussion of

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Birchas harei'ach includes more than the *Borei Minei Besamim* we make during Havdalah. That bracha is akin to the *Shehakol* bracha – an “all-purpose blessing” – which in certain circumstances covers all foods. So, too, *Borei Minei Besamim* is an “all-encompassing blessing” in that it includes all scents that require a bracha. However, just as we recite specific *brachos* for various food items, we should do the same for various fragrances.

A Blessing for Every Fragrance

One of the general rules of *Birchas Harei'ach* is that the item being sniffed be something whose key purpose is to provide a pleasant aroma. According to the Gemara (*Brachos* 43a), the bracha recited on a fragrance depends on its source. The various *brachos* include:

- *Borei Atzei Besamim* – scent from a tree or type of wood; examples are *hadasim*, roses on a bush, jasmine and rosemary.¹
- *Borei Isvei Besamim* – scent from grasses; for example, mint leaves.
- *Hanosen Rei'ach Tov B'Peiros* – scent from fruits, but since the primary purpose of fruits (though they may be enticingly fragrant) is to eat them, this bracha is only required if you have the *specific intention* to smell the fruit.²
- *Borei Shemen Arev* – said on *shemen afarsemon* (balsam oil). The Gemara says this oil gets a special bracha because it grows in Israel around the city of Yericho and other parts of that region. Yericho's name derives from the word *rei'ach* (smell) because of the fragrant balsam trees that grew there. Because of its connection to the Land of Israel, Chazal instituted a special bracha for this oil.³

Wake Up and Smell (the Coffee and a Bunch of Other Things)

Let us imagine a typical day, keeping our noses primed for *birchas harei'ach* opportunities. Most of us begin our day by taking care of our hygiene. We may encounter several scent situations right in our bedroom and bathroom.

SOAPS. Do deodorant soaps and shampoos require a bracha? The short answer is no. This is because a bracha is only required for things whose purpose is to impart a good aroma and is meant to be smelled. These products are made to remove or mask unpleasant odors. This applies to air fresheners as well. Another reason for not making a bracha is that most of the smells in these products are synthetic (see below).

SYNTHETIC SCENTS. Most modern perfumes that are synthetically produced do not get a bracha. In Rav Shlomo Zalman Auerbach *zt"l*'s opinion, no bracha is said on synthetic scents because the scent was created artificially from substances that may not be aromatic themselves – or may even have a foul scent.⁴ In the opinion of Rav Moshe Heinemann *shlit"a*, *brachos* on aromas include the word *borei* – referring to the Creator of All. Synthetic scents do not fall under this category.

LULAV AND ESROG. Assume today is Chol HaMoed Sukkos. As you take your *arba minim* before Hallel, it occurs to you that perhaps you should make a bracha on the pleasant fragrance of your esrog and *hadasim* in addition to the regular bracha. This is discussed in the *poskim*.

The *Shulchan Aruch* (216:14) brings the opinion of the Tur who states that someone who intentionally picks up his esrog to fulfill the mitzvah *and* to smell it makes a bracha of *Hanosen Rei'ach Tov B'Peiros* in addition to the regular bracha on the mitzvah.

Then he brings the opinion of Rabbeinu Simcha, who holds that since the esrog and *hadasim* are set aside during Yom Tov to be used for the mitzvah, they are not considered to be objects intended mainly for smelling, and so no bracha is recited. The *Shulchan Aruch* therefore *paskens* that it's best to avoid intentionally smelling the esrog during Yom Tov to avoid putting yourself in a *safeik bracha* situation.

The *Mishnah Berurah* brings the opinion of the *Magen Avraham* that if you pick up the esrog to smell it during Yom Tov when you are not holding it to fulfill the mitzvah, then you indeed should make a separate bracha on the scent.⁵ In the *Biur Halacha*, after arguing in favor of the *Magen Avraham*, *Mishnah Berurah* *paskens* that since there are opinions that disagree, it is better to avoid smelling the esrog intentionally during the entire Yom Tov, echoing the *Shulchan Aruch*.

If one picks up an esrog during the rest of the year to smell it, then the bracha of *Hanosen Rei'ach Tov B'Peros* is certainly warranted. The *Mishnah Berurah* (653:1) explains that when not set aside for the mitzvah, an esrog could be used for its primary purpose of eating. The only issue with smelling the esrog and making a bracha on it is the *safeik bracha* situation during Sukkos explained above.

The primary use of *hadasim*, however, is for their fragrant aroma. During Sukkos, they are dedicated to be used for the mitzvah, which precludes them from being enjoyed purely for their scent. Therefore, regarding the *hadasim*, the *Shulchan Aruch* *paskens* that one should not purposely inhale their fragrance during all of Sukkos. The *Mishnah Berurah* (653:1) stresses that although the *hadasim* are not used on Shabbos, smelling them remains forbidden the whole week, including on Shabbos; the esrog, on the other hand, may be sniffed on Shabbos since it's not being used for the mitzvah.

COFFEE AND FRESH BREAD. In our scenario, you need to go to work on Chol Hamoed. On your way, you stop at the local café and order your usual – a latte and a freshly baked chocolate croissant (being a STAR-K certified establishment, the café is required to build a kosher sukkah for their sit-down customers). The food smells glorious and your mouth is watering. Aside from the *Mezonos* and *Shehakol* *brachos*, do you need to make a *Birchas Harei'ach* on the coffee and croissant? (Note that these *brachos* questions apply on a regular weekday as well.)

1 *V'zos Habracha*, perek 19.

2 *Shulchan Aruch* 216:2.

3 See Rashi by *Brachos* 43. There is a fascinating debate in both the Torah and secular sources about the exact identity of the *afarsemon* tree. *Tzari* is mentioned in the Torah (Shemos 30) as one of the components of the *Ketores*, the incense offered in the Temple. It is often identified as *C. opobalsamum*, a type of myrrh that grows wild in the vicinity of Yericho and is often identified as the *afarsemon*. See toraland.org.il/אפרסמון-שמן-שמן/#_ftn19 for a full discussion of this topic.

4 *V'zos Habracha*, perek 19. See also the *Birur* 43:3 at the end of the *sefer*.

5 216:52; also see the *Biur Halacha*.



Birchas Harei'ach



The coffee is derived from a fruit (coffee cherry) and the croissant is made from grain (wheat). Maybe you should make a bracha of *Hanosen Rei'ach Tov B'Peiros*? The *Beis Yosef*, while discussing the bracha on *besamim* for Havdalah, brings from earlier authorities that some would make a bracha on fresh-baked bread (croissants fall under this category) when they had nothing else to use for this bracha.⁶ He brings a subsequent discussion on the appropriateness of making a *Borei Minei Besamim* on bread that is not a type of *besamim*. Some *poskim* say the correct bracha is *Hanosen Rei'ach Tov B'Pas*.

In the end, the *Beis Yosef* says that no bracha is made on fresh bread, even though it smells great, because we don't find it mentioned anywhere in Shas.⁷ That leaves us with our coffee – bracha or not? The *Mishnah Berurah* (216:16) says that one who intentionally smells very strong smelling, freshly ground hot coffee should recite *Hanosen Rei'ach Tov B'Peiros*.

It's important to note that with all “scent” *brachos* made on foods or items that are not primarily used for their scents, you must have the specific *kavana* (intention) to smell the item for its aroma. If you smell the food just in the course of eating it, no “scent” bracha is required.

A BOUQUET OF ROSES. On your way home, you stop by the florist's to buy flowers for Yom Tov. As you step inside, you are immediately greeted by the overpowering scent of blooms filling the shop. As you inhale the perfumed air, you wonder if you should make a bracha on these scents.

Here, since you're smelling flowers in a shop, the need for a bracha depends on a question discussed in the Gemara (*Brachos* 53) and *paskened* in *Shulchan Aruch* (217:1) that asks if one who walks into a spice shop should recite a bracha. The *Mishnah Berurah* writes here that normally a bracha is made only on aromas that are meant to be smelled.

Spices in a spice shop are mainly meant as wares to be sold, so it's questionable if they deserve a *Birchas Harei'ach*. In the end, we determine that the spices are meant to be both *smelled and sold*, and thus a bracha is required. In the flower shop, the same thing applies. Even though the main purpose of the flowers on display is to spur sales, the shop owners also want their customers to be enticed by their fragrance,⁸ and thus a bracha is appropriate.

Note, that in this setting, since you are smelling a *blend* of fragrances – some from flowers that may require *Borei Atzei Besamim* (e.g., roses⁹) and some that may require *Borei Isvei Besamim* (e.g., daffodils) – the appropriate bracha is *Borei Minei Besamim*.

HAVDALAH. If Yom Tov was immediately followed by Shabbos, at its close you need to recite Havdalah. Now is the perfect opportunity to make the bracha on *besamim*. You're about to begin, then stop and think, I have cloves in my *besamim* box and I always say *Borei Minei Besamim*, but aren't cloves from a tree? Shouldn't the bracha be *Hanosen Tov B'Peiros*, or maybe *Borei Atzei Besamim*?

As stated earlier regarding *Birchas Harei'ach*, the bracha on cloves is not straightforward. Cloves are dried flower buds from clove trees that are native to the Far East and Africa. The *Shulchan Aruch* (216:2) writes that the bracha on cloves and cinnamon is *Hanosen Rei'ach Tov B'Peiros*, because they are used

mainly as food. This may seem strange to us who consider these items to be spices and enhancements to food, and not actually a food. And cinnamon is ground tree bark!

But the *Mishnah Berurah* (216:16) and the *Shar Hatzion* conclude that the bracha should be *Borei Minei Besamim* on these spices. This fits nicely with the Ashkenazi minhag of making a *Borei Minei Besamim* on all spices used during Havdalah in order to avoid mistakes by those who may not be expert regarding the appropriate *brachos*.

The *minhag* for Sephardim is to make the correct bracha of *Borei Atzei Besamim* on either cinnamon or cloves, and not *Borei Minei Besamim*.¹⁰

End of the Road

We have now reached the end of a fragrant journey through the wonderful world of *Birchas Harei'ach*. I will conclude with a fascinating Gemara in *Sanhedrin* (93b) that discusses a unique characteristic that the Melech Hamashiach will have.

The verses in Sefer Yeshayahu (11:2-4) referenced in the above Gemara describe Mashiach as being vested with various superior spiritual gifts and powers. Among these will be his sense of smell: he will “not judge with his sight or hearing, but with his ability to smell fear of Heaven.” As the Melech, he will judge the people, as all Jewish kings have done, but instead of relying on witnesses, he will be able to discern the truth with his sense of smell. Mashiach will literally be able to smell who is lying and who is telling the truth.

There are various explanations in the commentaries as to what this Gemara means. Among the human senses, the sense of smell is the one most associated with and connected to our souls and our *ruchniyus*, as the Maharsha says in an explanation of this Gemara: “The sense of smell is spiritual and a portion of the soul.”¹¹

May we merit soon to see Mashiach Tzidkeinu leading us in justice, as described in the words of Chazal. ☆



6 *Orach Chaim* 297.

7 See *Rema* 216:14 who writes that one should not purposely smell fresh-baked bread to avoid putting oneself in a doubtful *bracha* situation. He writes further that if one smells it, no *bracha* is recited.

8 A study conducted by the American Floral Endowment and researchers from the University of Florida on consumers' preferences found that fragrance is of top importance when purchasing flowers. See greenhousegrower.com.

9 Determining if the *bracha* on a flower or plant is *Atzei Besamim* or *Isvei Besamim* depends on what definition of tree you use. The *Tosfos Rid* in *Piskei Rid* (*Brachos* 43b) is unsure of the definition and writes that unless the plant is mentioned specifically in the Gemara as requiring an *Atzei Besamim*, you should make a *Borei Minei Besamim*. Some *poskim* use the definition of tree that is used regarding the eating bracha of *Borei Pri Ha'eitz*. The *Shita Mekuvetzes*, *Brachos* 43b, brings in the name of the *Ra'ah* that a plant is considered an *eitz*, a tree, regarding *birchas harei'ach* if it has woody stems, as opposed to an *ilan*, a broader term for trees, and more applicable in the *Borei Pri Ha'eitz* discussion whose definition encompasses additional characteristics such as growing seasons, and if it's perennial or not. According to this opinion, the bracha on hard-stemmed roses should be *Atzei Besamim*. This is the accepted *halacha*.

10 *Kaf HaChaim* 297:4, *seif koton* 31.

11 *Chidusei Aggados*, *perek* 11, *d.h. D'morach*.



CONTINUED FROM PAGE 3

An alternate approach is advanced by the *Malbim* (18:8). He cites a tradition that Avraham served his guests the meat of a calf he formed using the secrets of *Sefer Yetzirah*. Its meat is *pareve* because it does not have a mother as a biological precursor. The 19th century dayan, Rav Shlomo HaKohen of Vilna, in his glosses to *Shulchan Aruch* (*Cheshek Shlomo*, Y.D. 98, *Shach* 6), applies this ruling also to milk taken from such an animal, and to milk formed directly through *Sefer Yetzirah*. Although identical to cow's milk, it's not *milchig*.

Milk: Deconstructed and Reconstructed

No master of *Sefer Yetzirah* would dare exploit its supernal wisdom to fashion "dairy-esque" foods for commercial use. But food manufacturers are actively manipulating microscopic elements in the physical world to produce substances that are nearly chemically identical to dairy derivatives. It follows that if artificial milk made through *Sefer Yetzirah* – which fundamentally shares elemental properties with mammalian milk on the metaphysical plane – is *pareve*, then certainly, artificial milk made through a physical process with relatively superficial resemblance, should be *pareve*, too.

Established companies and startups alike are investing heavily in disrupting the dairy industry by putting the cows out to pasture – quite literally. Since the mid-twentieth century, the composition of cow's milk, one of the most scientifically studied food items, has been identified as comprising approximately 87% water, 4.9% carbohydrates (primarily lactose), 3.4% fat (depending on the breed and diet), 3.3% proteins, and minerals and vitamins. The protein fraction is about 80% casein (digested slowly) and 20% whey (digested rapidly). Various enzymes are a small but important part of the proteins, as well.

It should theoretically be feasible to synthesize this profile in a lab. Water is water. The minerals and vitamins can be gleaned from other natural sources. Plant sugars are not exactly the same as lactose but are a good enough substitute (and superior for those suffering from lactose intolerance). That leaves less than 7% of the entire formulation – the fats and proteins – as uniquely "milk."

Reproducing the full taste, mouthfeel, and nutritional profile of milk is not yet achievable. Milkfat is incredibly difficult to replicate since it is composed of more than 400 different fatty acids, making it the most complex of all natural fats. Consequently, for now, other sources of fat must suffice. Companies are attempting to synthesize milk proteins (absent their indigenous enzymes) which are ostensibly the components most responsible for providing the primary characteristics of dairy products such as ice cream, yogurt and cheese.

Precision Fermentation: Synthesizing Dairy Proteins

The main method for commercial production of lab-grown casein and whey is through *precision fermentation*. To understand this process, let's first review examples of what occurs in regular, *natural* fermentation:

► **Yeast fermentation in winemaking** – grape juice is exposed to yeast (a type of fungus, occurring naturally on grape skins or added by the winemaker) which ingests the grape juice sugars and converts them into ethyl alcohol (ethanol) and carbon dioxide (usually released but retained in fizzy varieties), resulting in wine.

► **Yeast fermentation in breadmaking** – water added to flour activates enzymes (amylase) that break down grain starch into sugars. Yeast transforms the

sugars into CO₂ and ethanol (which mostly evaporates during baking). When the gas bubbles are trapped by the grain's gluten network, the dough rises.

► **Bacterial fermentation** – bacteria transform carbohydrates into lactic acid to make foods like cheese, yogurt and sauerkraut.¹²

The novelty of *precision fermentation* is that instead of letting nature decide the outcome of the fungal or bacterial conversion, scientists bioengineer fungi to yield a specific target protein of their choosing.

A foundational step in synthesizing milk proteins took place in the 1990s and 2000s when researchers mapped the bovine genome. Once the DNA sequence to produce milk protein genes was identified, the segment could be amplified using technologies like PCR (polymerase chain reaction). Scientists detach snippets of the cloned gene (via enzymes acting as molecular scissors) and introduce them into fungal DNA. This newly encoded recombinant fungus is placed in bioreactor – a controlled-environment vessel that facilitates biological processes – where it acts as a fermentation catalyst to convert sugary, nutrient-rich broth into a resultant mixture containing the target protein.

When fermentation is complete, the target protein is harvested and isolated from the mixture using the same filtering and refining technique already ubiquitous in the dairy industry to isolate whey protein from cow's milk. The synthesized protein is now ready to contribute dairy-like properties to foods. (How cows automatically generate these complex proteins in their rumens – all from plain grass – is truly one of the wonders of Creation!)

While the application of precision fermentation to synthesize dairy proteins is fairly recent, this technology has been widely used on a commercial scale since the early 1980s to manufacture synthetic insulin, replacing the older, resource-intensive process developed in the 1920s for extracting insulin from cow and pig pancreases.

Precision fermentation's profound impact on the dairy industry actually goes back to 1990, when the FDA approved a bioengineered food ingredient for the first time, allowing *chymosin* (also known as *rennin*) – the enzyme which coagulates milk into curds to make cheese – to be produced synthetically through fermentation. From the dawn of cheesemaking, chymosin was sourced from rennet extracted from a nursing calf's abomasum (fourth stomach compartment).¹³ That classical method has since been relegated to a small niche market. Within a decade, fermentation-produced chymosin (FPC) became the predominant source of cheese coagulant.¹⁴

Kashrus Considerations

Synthesized dairy proteins are *pareve* provided all the materials used to synthesize them derived from kosher *pareve* sources. This is unlike current attempts to produce lab-grown meat, which starts with stem cells obtained from animals. According to the *psak* of Rav Moshe Heinemann *shlit"a*, the kosher status of such lab-grown meat products follows its starter material and is subsequently either *fleishig* or a *neveilah*.¹⁵

Fungi, the living organisms responsible for fermentation, are inherently kosher.¹⁶ But as for all fermented foods items, kashrus oversight is needed for the growth media upon which recombinant fungi are propagated and the nutrients they are fed. Moreover, to maintain the very low temperature necessary to keep them alive, the fungal strain is dissolved in glycerin, a

12 Some cheeses also involve a *fungal-mold fermentation* stage during ripening. Enzymes, too, play a vital role in all types of fermentation, enriching texture, taste and appearance.

13 Vegetable rennin sources, such as fig tree sap, which produce a more bitter flavored cheese, have also been used in Mediterranean regions since ancient times.

14 This advent significantly changed the kosher cheese industry, lowering production costs and opening it up to more varieties.

15 See "It Depends Where They Stem From" by Rabbi Tzvi Rosen, *Kashrus Kurrents*, Spring 5782/2022.

16 Halachah deals exclusively with the world as observed by the rudimentarily trained, average, unaided eye and does not prohibit microscopic materials.



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When Milk Is Not Milchig: From Bovine to Biotech

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kosher-sensitive ingredient, and packed in cryovials. Glycerin is added to prevent formation of damaging ice crystals, which can rupture cell walls during shipping to production facilities.

At the facility where the fungus-to-protein conversion takes place, the kosher status of bioreactors must be determined in case they were previously used for batches containing non-kosher or dairy components. Finally, the missing fats and enzymes present in natural mammalian milk must be compensated for in final products by adding other kosher-sensitive oils and ingredients.

Some confusion has arisen among consumers about the labeling of foods like ice cream, where synthetic whey replaces cow-based dairy. Even though the products have no actual dairy content, FDA regulations still require labels to display a dairy allergen warning statement because the chemical structure of the synthetic version is similar enough to the real thing to potentially trigger an adverse allergic reaction.¹⁷ Confusion aside, this concern has no bearing

on the *pareve* (or “dairy equipment”) designation of the product.

Final Ruminations

Looking forward, food producers are banking on expanding the range of products made with precision fermentation. They anticipate that other synthetic proteins, mimicking egg whites, seafood, collagen, gelatin, and even meat, will soon join dairy proteins among consumer offerings – all potentially certifiable as kosher-*pareve*. Nonetheless, even if synthesized proteins replace natural sources, their kosher certification must still remain genuine. ☆



17 Dairy allergy is unrelated to lactose intolerance.

For additional information and sources on topics covered in this article, please see the expanded version posted at star-k.org/kashrus-kurrents.

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