

HALACHIC AND HASHKAFIC ISSUES IN CONTEMPORARY SOCIETY

SERIES 2: 67 - CULTIVATED MEAT **OU ISRAEL CENTER - SUMMER 2023**

A] WHAT IS CULTIVATED MEAT?

1. What is cultivated meat?

Cultivated meat, also known as cultured meat¹, is genuine animal meat (including seafood and organ meats) that is produced by cultivating animal cells directly. This production method eliminates the need to raise and farm animals for food. Cultivated meat is made of the same cell types that can be arranged in the same or similar structure as animal tissues, thus replicating the sensory and nutritional profiles of conventional meat.

Dutch scientist Mark Post unveiled the first cultivated meat burger on live television in 2013. Two years later, the first four cultivated meat companies were founded. The industry has since grown to more than 150 companies on 6 continents as of late 2022, backed by \$2.6B in investments, each aiming to produce cultivated meat products. Dozens more companies have formed to create technology solutions along the value chain.

How is cultivated meat made?

The manufacturing process begins with acquiring and banking stem cells from an animal. These cells are then grown in bioreactors (known colloquially as cultivators) at high densities and volumes. Similar to what happens inside an animal's body, the cells are fed an oxygen-rich cell culture medium made up of basic nutrients such as amino acids, glucose, vitamins, and inorganic salts, and supplemented with growth factors and other proteins.

Changes in the medium composition, often in tandem with cues from a scaffolding structure, trigger immature cells to differentiate into the skeletal muscle, fat, and connective tissues that make up meat. The differentiated cells are then harvested, prepared, and packaged into final products. This process is expected to take between 2-8 weeks, depending on what kind of meat is being cultivated. Some companies are pursuing a similar strategy to create milk and other animal products.

What are the benefits of cultivated meat?

..... cultivated meat is expected to have a variety of benefits over conventional animal agriculture. One study showed that cultivated meat, if produced using renewable energy, could reduce greenhouse gas emissions by up to 92% and land use by up to 90% compared to conventional beef. Additionally, commercial production is expected to occur entirely without antibiotics and is likely to result in fewer incidences of foodborne illnesses due to the lack of exposure risk from enteric pathogens. Over the next few decades, cultivated meat and other alternative proteins are predicted to take significant market share from the \$1.7 trillion conventional meat and seafood industry. This shift will mitigate agriculture-related deforestation, biodiversity loss, antibiotic resistance, zoonotic disease outbreaks, and industrialized animal slaughter.

When will cultivated meat make it to market?

As of late 2022, several leading cultivated meat companies are transitioning to pilot-scale facilities that will manufacture the first wave of commercialized products following regulatory approval.

In November 2022, UPSIDE Foods completed the first United States Food and Drug Administration (FDA) pre-market consultation for its cultivated chicken product. UPSIDE Foods will need to acquire a grant of inspection from the United States Department of Agriculture (USDA) prior to being able to sell its product, which is anticipated to occur in 2023. Other countries are at various stages of developing regulatory frameworks to permit the sale of cultivated meat.

The Science of Cultivated Meat²

1. It is also known as lab-based meat, cell-based meat, in vitro meat, slaughter-free meat, GM meat or 'clean meat'. There are obvious marketing implications to these names!

2. <https://gfi.org/science/the-science-of-cultivated-meat/>

- Globally, we consume 350 million tons of meat a year and 72 billion animals a year are slaughtered for human consumption³.
- The UN estimates that global meat consumption will increase by 73% by 2050, due to an increase in world population and increased meat consumption in India and China.
- Breeding cattle in such numbers created enormous waste and environmental pollution.
- As early as 1931, Winston Churchill wrote “we shall escape the absurdity of growing a whole chicken in order to eat the breast or the wing, by growing these parts separately under a suitable medium”
- It has been projected that by 2040, 35% of the global meat supply will be cultivated meat and a further 35% will be from plant-based meat alternatives⁴.

The prospect of cultivated meat becoming available (assuming that it is also producible at an economic cost⁵) raises certain issues:

- Ethics: the ethical concerns of cruelty to animals could be alleviated by cultivated meat.
- Environment: the environmental ‘footprint’ for cultivated meat is significantly lower.
- Health: balancing the potential dangers of Genetically Modified (GM) production, with the existing health risks of conventional meat production - growth hormones, antibiotics, high fat content etc. Cultivated meat can also be made with added vitamins etc.
- Cost: kosher meat is currently much more expensive than non-kosher (often more than double the price⁶). Cultivated meat may bring these costs down significantly.

B] HASHKAFIC AND HALACHIC ISSUES

- One major hashkafic issue is the opportunity to reduce tzar ba’alei chaim⁷. So much meat is produced today in environments which are unacceptably cruel. To reduce this would be a significant spiritual and ethical gain for humankind.
- Ultimately, some thinkers (notably Rav Kook) see the world moving towards an ultimately vegetarian diet. Would a move to synthetic meat precipitate this⁸?
- There is a concept that for every non-kosher taste there is a kosher alternative⁹. So there should in theory be a halachically permitted food that the same tastes as pork or a cheeseburger. But is it appropriate for it to look and taste identical!?¹⁰

The major halachic issues are as follows:

- If the cell is taken from a non-kosher animal, will the synthetic meat be non-kosher?
- If the cell is taken from a kosher shechted animal, will the burger be meaty?
- If the cell is taken from a live animal, would that constitute *basar min hachai* - taking flesh from a live animal. This could be a Torah prohibition and render the burger treif.
- Even if we decide that the burger is kosher and parev, will there be a ma’arit ha’ayin problem to eat it with cheese?
- Are the ingredients of the medium used to grow the tissue kosher?

C] WHEN IS MEAT REALLY ‘MEAT’?

- Kosher meat generally comes from (i) a kosher animal; (ii) which is healthy (ie not a treifa) and; (iii) which was properly shechted.¹¹
- What is the halachic status of ‘synthetic’ meat or food?

2. רבי שמעון בן חלפתא הוה קאזיל באורחא. פגעו בו הנך אריותא דהוו קא נהמי לאפיה. אמר: (תהלים קד:כא) הַכִּפְיִרִים שָׁאֲנִים לְטָרֵף. נחיתו ליה תרתי אטמתא, חדא אכלוה וחדא שבקוה. איתיה ואתא לבי מדרשא, בעי עלה: דבר טמא הוא זה או דבר טהור? אמרו ליה: אין דבר טמא יורד מן השמים. בעי מיניה רבי זירא מרבי אבהו: ירדה לו דמות חמור מהו? - אמר ליה יארוד נאלא! הא אמרי ליה: אין דבר טמא יורד מן השמים.

סנהדרין נט:

The Gemara tells of an episode where meat fell from heaven to save R’ Shimon ben Chalafta from wild animals. Some of the meat was left over and the psak was that such meat is kosher since it fell from Shamayim.¹²

3. <https://www.theworldcounts.com/challenges/foods-and-beverages/world-consumption-of-meat>.

4. Genetically modified plant material can now mimic taste-to-texture experiences of other foods. For instance, DNA from raspberries can be introduced to yeast cells which then develop a raspberry taste. See <https://jewishaction.com/cover-story/meet-the-new-meat-plant-and-cell-based-alternatives/>. See also <https://cor.ca/2020/04/meaty-kashrus-issues-for-vegans/concerning-other-halachic-questions-concerning-vegi-burgers>.

5. In 2013, the world’s first lab-grown burger was served at a London news conference. It cost \$330,000 to create and was made from 20,000 strips of muscle tissue. The price of cell-cultured meat has decreased from \$330,000 to about \$9.80 per burger. Prices are falling because the scale of production is improving, and materials cost less.

6. For kosher meat, only around 20% of the slaughtered cow is usable due to the removal of the gid hanashe, hindquarters and also animals rejected as not glatt.

7. See <https://rabbimanning.com/wp-content/uploads/2017/03/Tzar-Baalei-Chaim.pdf>

8. For a more in depth shiur on vegetarianism see <https://rabbimanning.com/wp-content/uploads/2017/03/Vegetarianism.pdf>

9. Chullin 109b - we saw this recently in our shiur on milk.

10. On the issue of whether Torah has a problem with intervening in the natural order see <https://rabbimanning.com/wp-content/uploads/2022/03/Surrogacy-2021.pdf>

11. Of course, fats and the sciatic nerve need to be removed and the meat needs to be kashered by draining the blood etc.

12. It is not clear if the meat was made by a miracle and thus not at all natural, or whether a miraculous storm lifted regular meat from somewhere else and dropped it on him.

- Of course, cultivated meat is NOT miraculous, so this source appears to be irrelevant, unless it establishes that only meat from a regular living creature is subject to the laws of kashrut.

3. אמר אביי: הלכות כשפים כהלכות שבת. יש מהן בסקילה, ויש מהן פטור אבל אסור, ויש מהן מותר לכתחלה מותר לכתחלה - כדרך חנינא ורב אושעיא. כל מעלי שבתא הוו עסקי בהלכות יצירה ומיברי להו עיגלא תילתא ואכלי ליה. (רש"י - וממילא אצרו לכו עגלא תילתא על ידי שהיו מזרפים אותיות השם שבהם נצרא בעולם. ואין כאן משום מכשפות דמעשה הקדוש צרוך הוא הן, על ידי שם קדושה שלו הוא.)

סנהדרין סז:

The Amoraim were able to use the mystical Sefer Yetzira to create a choice calf to eat on Shabbat, which was kosher!

- According to the Shelah¹³, the resultant cow did not even need shechita¹⁴!

4. (ב) בבהמה. בשל"ה דף ש"ג כתב דבהמה שנצראה ע"י ספר יצירה, כמו דמלינו בגמרא דצרא עגלא תילתא בכל ערב שבת, מותר לאכלו בעודו חי. וזה היה מעשה השצטים שהביא יוסף דבתם רעה אל אחיהם שאכלו אמ"ה, כי יוסף סצר שהיא בהמה גמורה ע"ש. ונראה דמ"מ אסור לאכלו בלא שחיטה מדרבנן משום מראית עין ...

פתחי תשובה יורה דעה סימן סב

This story is in fact quoted in the Pitchei Teshuva on Shulchan Aruch in the halachot of Ever Min Hachai. Although the mystically created cow does not need shechita according to Torah law, the Rabbis required a shechita derabbanan because of ma'arit ha'ayin. Pitchei Teshuva uses this halacha to explain the midrash about Yosef speaking lashon hara concerning the brothers eating 'ever min hachai'¹⁵.

5. שלקח חמאה וחלב ובן הבקר אשר עשה ר"ל יען שעשאו ע"י ספר יצירה היו יכולים לאכלו עם חלב. אבל בפשוט לא קשה כי נתן לפניהם תחלה חמאה וחלב ואכלו ואח"כ שעשה בן הבקר נתן לפניהם הבשר ...

מלבי"ם בראשית יח:

Many mefarshim have questioned how Avraham could serve meat and milk to the melachim. One answer given by the Malbim is that the beef in question was created through the Sefer Yetzira and was therefore parev¹⁶!

6. ודע דבשר בהמה שנברא ע"י ספר יצירה מותר לבשל בחלב דאין לו דין בשר כלל. וכן כתב הגאון אמתי מו"ה מלבי"ם

חשק שלמה על הש"ך יו"ד סימן צח ס'ק ז

The Malbim's apparently mystical drash is also brought in the halachic sources!¹⁷

- Do these sources impact on the issue of synthetic meat? This meat is NOT made through mystical access to the Sefer Yetzira but scientifically in a lab. As such, the sources may not be directly relevant, but they DO indicate that there could be something which looks like meat and tastes like meat, but is which is not halachically meat. Again, does the kashrut of food depend on it coming from a 'normal' source through a 'normal' process?

7. בעי ר' זירא: חיטין שירדו בעבים, מהו? למאי? אי למנחות, אמאי לא? אלא לשתי הלחם מאי? ממושבותיכם אמר רחמנא - לאפוקי דחוצה לארץ דלא, אבל דעבים שפיר דמי. או דלמא ממושבותיכם דווקא, ואפילו דעבים נמי לא?

מנחות סט:

The Gemara asks about the status of wheat that fell down from the sky and concludes that the wheat is certainly kosher for use in the Temple as regular menachot flour offerings.

8. שירדו בעבים - עם המטר כששתו העצים באוקיינוס בלעו ספינה מליאה חטין.

רש"י שם

Rashi understands the case to be one of regular wheat which was sucked up by a storm and dropped elsewhere.

13. Shnei Luchot HaBrit Vol 2, Torah Shebichtav, Vayera Bereishit 18:8). See also Pirkei de-rebbi Eliezer, cited in Yalkut Reuveni, Vayera.

14. However, other poskim disagree and require shechita for such an animal - see Shu't Rivevot Efraim 7:385.

15. In fact, the Shelah goes on to explain that, just as with Yosef's accusation that the brothers were eating *ever min hachai*, the cow was a golem cow, so too, in his accusation that they were acting immorality with women, they had created golem women!! The Chafetz Chaim quotes this in Shemirat Halashon, Vol 2 Chap 11 s.v. *vayavei Yosef*(end).

16. See also Sanhedrin 59b which discusses Adam eating roasted meat that the angels prepared for him. The Gemara explains that, although Adam was not permitted to eat normal meat, this was from the heavens and not considered halachic meat. Rav Aviner quotes this midrash in his discussion on cultivated meat.

17. Cheshek Shlomo - Rabbi Shlomo haKohen of Vilna (19th century).

9. חיטין שירדו בעבים - פירש זקונטרס ששתו באוקיינוס וזלעו ספינה מלאה חיטין. וקשה לר"ת אלא נראה לי דעל ידי נס ירדו זעזים כי הכבו אטמתא דפרק ד' מיתות (סנהדרין דף נט:).

תוספות שם

Tosafot reject Rashi's understanding and understand that the wheat descended through a miracle. As such, according to this understanding, miracle wheat is still wheat!!

10. יש לומר דפשיטא דלחם איקרי דאפילו מן נקרא לחם מן השמים.

שפת אמת במנחות שם:

The Sfat Emet understands that bread made from such wheat would be halachic bread, since it is no worse than the manna which descended from heaven and which the Torah calls 'lechem'¹⁸.

- Accordingly, cultivated meat - which looks, tastes and has the same chemical constitution as meat, may well be meat.

11. בשיחה [עם הרב צבי שכטר שליט"א] בכ"ב באדר תשע"ב הבהיר הרב שכטר שלדעתו בשר הוא רק דבר שמקורו מבעל חיים שנוצד מאם בדרך הטבע. כל בשר שמוצר בדרך אחרת אינו בשר לעניינים הלכתיים

ר' חנוך קאהן, כשרותו של הבשר המלאכותי, המעין 216 (טבת 5776)

Rav Herschel Schachter is quoted as saying that only meat which came from a normal animal through natural means has the halachic status of meat.

12. לענייננו יצירת בשר במעבדה מתא גזע אינה 'נס', אך ברור שהבשר לא נוצר בדרך הרגילה שבה נבראו כל בעלי החיים. זו מציאות חדשה של 'יצירה' הנעשית על ידי התערבות ידי אדם ויש לדמותה לבריאה ע"י ספר יצירה. מעתה עלה בידינו טעם נוסף להתיר את אכילת הבשר המשובט.

ר' צבי רייזמן, בשר בתאי גזע, תחומין ל"ד (2014)

Indeed, some poskim have concluded that, since manufacturing meat from stems cells is not the 'normal' manner of production, this could still be considered not to be 'real' meat and this may be a factor in permitting it.

- Would this analysis change if we reached a stage when most meat is cultivated and this became the 'normal' manner of production? Or will the biological rearing of cattle always be intrinsically more 'normal'?
- Nevertheless, synthetic meat DOES come from a normal animal and IS derived through natural means, not through a miracle! As such, Rav Ya'akov Ariel and others have argued¹⁹ that the process in question is not in any way miraculous or supernatural but simply a newfound technology. Indeed, the entire aim of the process is to mimic the natural growth process which takes place inside the body of the animal as closely as possible in a laboratory setting.
- The talmudic sources quoted above were, to a significant degree, aggadic, and the general halachic approach is that we do NOT learn halachic details from aggadic sources.²⁰ In the following section we will examine the purely halachic issues which surround the production of cultivated meat.

D] STAGE 1 - OBTAINING THE STARTER CELLS

- There are 3 stages to creating cultivated meat²¹:
 - Stage 1 - obtaining the cells from the original animal
 - Stage 2 - placing the cells into a growth medium to enable them to proliferate and then to differentiate into the different types of cell needed to constitute meat. However, this produces only thin layers of loose cells. In order to produce meat, the manufacturing process also requires injection of the cells into a 3D scaffolding structure on which the new cells can grow.
 - Stage 3 - adding flavorants, colorants, preservatives and binding agents to manufacture the final product.
- Stage 3 does not raise any new kashrut issues which are specific to this topic. As with all modern food production, kashrut supervision will be need to ensure that the additives are approved.

18. According to the Rema MiFano, the beracha on the manna was *hamotzi lechem min hashamayim!*

19. See Techumin 35 and 36 where various articles on this topic were published.

20. See <https://rabbimanning.com/wp-content/uploads/2019/01/Learning-Halacha-From-Midrash.pdf>

21. It is impossible for poskim to give definitive answers on all the halachic issues at this stage since the technology is still developing fast. By the time cultivated meat becomes a large-scale global means of production many of the technological details are likely to have changed and the halachic issues will need to be readdressed at that time.

- A number of halachic issues are raised at Stage 1:
 - whether obtaining the cells is permitted
 - the halachic status of those initial cells - are they 'meat', non-meat animal derivative products, or halachically insignificant?

D1] THE STARTER CELLS AS MEAT - 'BASAR MIN HACHAI'

- In order to produce cultivated meat, starter cells must be removed from an animal. This can be done in a number of ways:
 - (i) using myosatellite²² stem cells removed from the biomass of muscle tissue of a live animal. This would be like a 'biopsy', often removed by syringe from the animal's neck.²³
 - (ii) using stem cells obtained from bone marrow.
 - (iii) using cells removed from non-edible parts of the animal or bird eg hooves, skin, hair or feathers.
 - (iv) using pluripotent stems cells from an embryo²⁴.
 - (v) using cells taken from a recently slaughtered animal.
- Clearly, the ideal manner of obtaining cells from a halachic perspective would be using cells taken from a kosher animal which has been properly shechted²⁵ (not a neveila) and is checked and found to be healthy (not a treifa)²⁶.
- However this is very unlikely to be the case for mass-produced cultivated meat and cells are likely to be removed from live animals²⁷.

13. (דברים יב:כג) [וְלֹא־תֹאכַל הַנֶּפֶשׁ עִם־הַבָּשָׂר - אִזְהָרָה לְאוֹכֵל אֶבֶר מִן הַחַי. וְנוֹהֵג בְּבִהֵמָה וְחַיָּה וְעוֹף וְאִינּוֹ נוֹהֵג אֲלֵא בַטְהוּרִים. לְפִיכֵךְ אֶבֶר הַפּוֹרֵשׁ מִן הַחַי, בֵּין שֵׁשׁ בּוֹ בָשָׂר וְגִידִין וְעִצְמוֹת בֵּין שְׂאֵין בּוֹ אֲלֵא בָשָׂר לְבַד כְּגוֹן הַלְשׁוֹן וְהַטְחוּל וְהַכְּלִיּוֹת וְהַבִּיָּצִים, אֲסוּר לְאוֹכְלוֹ - בֵּין אִם יֵשׁ בּוֹ כְּזֵית בֵּין אִם אֵין בּוֹ כְּזֵית. וְכֵן בָּשָׂר הַפּוֹרֵשׁ מִן הַחַי אֲסוּר. אִף עַל פִּי שְׂאֵין בּוֹ מִשּׁוּם אֶבֶר מִן הַחַי, אֲסוּר מִשּׁוּם (שְׁמוֹת כ"ב:ל) וְנִבְשָׂר בְּשָׂדֵה טְרֵפָה לֹא תֹאכְלוּ. ...

טור יורה דעה הלכות אבר מן החי סימן סב

The Torah mitzva of ever min hachai prohibits taking any limb from a live animal. Similarly the Torah mitzva of basar min hachai prohibits eating flesh from a live animal, no matter how small²⁸. If this were done, that meat is not kosher. But is removing microscopic cell considered to be 'basar' min hachai?

14. אמר רב חסדא: ... עד ארבעים מיהא בעלמא היא.

במות סט:

Chazal explain that, until 40 days gestation, an embryo is considered halachically as 'mere fluid' and this is ruled in halacha²⁹. Such an embryo contains many cells, including stem cells, and yet is considered to be simply fluid.

- Some poskim have ruled that a cell taken from a cow, similarly, has a halachic status of 'fluid' and not meat from the animal.
- Other poskim counter that the concept of 'maya be'alma' is specific to human embryos and cannot be applied in other areas.
- If cells were taken from a live animal but NOT from the flesh - eg from hooves, hair or feathers - this would not be a halachic issue.
- Would the cells be 'fleishig'? If taken from myosatellite muscle tissue, and assuming they are significant (see below) they would be fleishig. But what if they were from other inedible parts of the animal?

15. המבשל שליא או עור וגידין ועצמות ועקרי קרניים וטלפים הרכים בחלב פטור, וכן האוכלן, פטור.

רמב"ם מאכלות אסורות פרק ט הלכה ז

The Rambam rules that non-flesh parts of an animal are not fleishig!

- Nevertheless, some poskim counter that this applies to eating a hoof etc but should not apply to synthetic meat grown from the hoof starter cell, which is a far more similar to the actual meat of the animal and should not be considered actual meat.

22. Myosatellite cells, also known as satellite cells, muscle stem cells or MuSCs, are small multipotent cells with very little cytoplasm found in mature muscle. Satellite cells are precursors to skeletal muscle cells, able to give rise to satellite cells or differentiated skeletal muscle cells - see https://en.wikipedia.org/wiki/Myosatellite_cell.

23. Sometimes cells are removed from specific organs to create certain cultivated foods eg cells from mammary glands to cultivate milk or from liver cells to cultivate foie gras.

24. These are cells that are able to self-renew by dividing and developing into the three primary groups of cells that make up a body.

25. What would be the status of cells remove from embryos fertilized in vitro and never implanted into a uterus? Surely these should not necessitate shechita, since the embryo is not an animal yet. On the other hand, would they be kosher in any event?

26. It is not possible to extract the cells from meat which has been kashered since the salting process will denature the cells. However, we will see below that this is not halachically problematic.

27. Reasons for this include: (i) concern for animal welfare; (ii) aiming for a slaughter-free product; (iii) the viability of the cell is improved when taken from a live sample.

28. Even though one would only receive malkot for removing or eating a 'kezayit' of basar min hachai (Mishne Torah Hilchot Ma'achalot Asurot 4:10), the halacha is that 'chetzi shiur assur min haTorah' - even a tiny amount of non-kosher food is treif on a Torah level (see Beit Yosef, YD 62). Nevertheless, the prohibition of removing *basar* from the live animal may only begin if the *basar* was a at least size of a *kezayit*. On that basis, it may not apply to a microscopic cell.

29. Shach CM 210:2.

D2] THE STARTER CELLS AS A NON-MEAT DERIVATIVE - 'YOTZEI MIN HATAMEI'

16. ... בהמה טהורה שילדה כמין בהמה טמאה מותר באכילה. וטמאה שילדה כמין בהמה טהורה אסור באכילה **שהיוצא מהטמא טמא והיוצא מן הטהור טהור**.

משנה בכורות פרק א משנה ב

The Mishna rules that anything which comes out of a non-kosher animal is not-kosher. This would include not only offspring (even if it otherwise looks kosher), but also milk, secretions etc.

- As such, it would seem that any cell taken from a non-kosher or non-shechted animal would be a 'yotzei' and not kosher.
- It would therefore follow that cells taken from a kosher shechted animal will be kosher but a cell taken from a non-kosher animal - either a non-kosher species, neveila or treifa - would not be kosher (assuming it to be significant - see below).
- We will examine below whether the meat grown from such a non-kosher cell is kosher.
- Also, if the starter cell is considered a 'yotzei'/derivatives of the animal, will it be considered fleishig. Many derivatives of animals are NOT fleishig - eggs are pareve and milk is milchig! Will the situation be different if it looks and tastes like meat?

D3] THE STARTER CELLS AS INSIGNIFICANT - 'NIREH LE'EYNAYIM'

- Could we argue that the starter cells taken from the animal are microscopic³⁰ and irrelevant in halacha?
- Normally halacha does not take account of something which is visible under magnification but too small to be seen with the human eye. E.g.
 - spots on an etrog.
 - spots on a bedika cloth for hilchot nidda.
 - letters in a sefer Torah which are touching only when viewed under a lens³¹.
 - bugs on vegetables.
 - fish whose scales can only be seen under a microscope³².
- The cell which is taken from the animal is not visible with the naked eye. Does this mean it is halachically irrelevant³³?

17. ... שמעתי שבכל מיני מים וביחוד במי גשמים מלא ברואים דקים שאין העין יכולה לראותם ובילדותי שמעתי מפי אחד שהיה במרחקים וראה דרך זכוכית המגדלת עד מאד כרבבות פעמים במים כל המיני ברואים ולפ"ז איך אנו שותים מים ... האמת הוא דלא אסרה תורה במה שאין העין שולטת בו, דלא ניתנה תורה למלאכים. דאם לא כן, הרי כמה מהחוקרים כתבו שגם כל האויר הוא מלא ברואים דקים מן הדקים, וכשהאדם פותח פיו בולע כמה מהם ... ואף אם כן הוא, כיוון שאין העין שולטת בהם – לא כולם הוא. אמנם כמה שהעין יכול לראות אפילו נגד השמש ואפילו דק מן הדק הוה שרץ גמור.

ערוך השולחן יורה דעה סימן פד סעיף לו

The Aruch Hashulchan rules³⁴, in the context of checking for insects, that what is invisible to the naked eye is not halachically relevant³⁵.

18. בענין שאלתו בדבר הנדסה גנטית, שמכניסים חלקיקי תאים מבריה אחת לשניה, ובוזה משנים את תכונותיה של השניה. ועי"ז להתיר איסור כלאים מכיון שאין חלקיקים אלו נראים לעין האדם. כיון שאנשים מטפלים בחלקיקים האלה ומעבירים אותם ממין אחד לשני הרי זה חשיב ממש כנראה לעינים, ולא דמי כלל לתולעים שאינם נראים.

שו"ת מנחת שלמה תניינא (ב - ג) סימן ק"ז

Rav Shlomo Zalman ruled (in the context of grafting plants on a microscopic scale) that where magnification is the normal way to effect a procedure, that DOES become halachically relevant.³⁶

- R. Ya'akov Ariel³⁷ applied this principle to synthetic meat and argued that the principle of nireh l'eynayim is NOT relevant. In the case of microscopic bugs, one is unaware of them and uninterested in their presence. In the case of cultivation of meat, the stem cells are the main focus and their existence is paramount!

30. The average size of a human stem cell is about 12 micrometers in diameter and animal cells are of a similar size. A normal human eye with regular vision and unaided by any other tools – can see objects as small as about 100 micrometers.

31. See Moadim U'zmanim 2:124.

32. See Tiferet Yisrael Mishna Avoda Zara 2:6.

33. This argument is made by R. Tzvi Reizman in his article in Techumin 34.

34. This was also ruled earlier by the Chochmat Adam (Klal 38, Binat Adam #34).

35. However, he adds that once it is visible to the human eye, it IS relevant and some poskim say that one must then use a magnifying glass to check precisely what it is/ its colour etc.

36. See also Igrot Moshe YD 2:146.

37. Techumin 35.

E] STAGE 2 - GROWING THE CULTIVATED MEAT IN THE LAB

- In order to produce the cultivated meat, the starter stems cells are placed in special protein solutions to first cause them to multiply and then cause them to differentiate into the different types of cells which make up the meat (mostly muscle cells but also others).
- The cells are also placed onto a tiny 3-D scaffold to encourage them to grow in such a manner that they can be used to construct a piece of meat, and not simply minced into a pulp. The scaffold itself will also be edible so that the meat will not need to be harvested from it. The scaffold will also need to be able to stretch with the growing meat product and resemble the taste of the meat.

E1] GROWTH MEDIUM MADE FROM CALVES' BLOOD

- Historically, the growth medium used was often based on serum taken from the blood of fetal calves. Such blood is certainly NOT kosher. How would we view the role of the medium?
- Is it considered a non-kosher liquid in which kosher food is soaked, which will make the food non-kosher?
- Or is it considered like the 'food/nutrients' for the starter cells, in which case it may not be relevant. If a kosher animal eats non-kosher food, this does not affect the kashrut of the animal. But are the starter cells here like an animal eating food?
- This issue is likely to become less relevant as the industry is working hard to produce synthetic growth mediums³⁸. These will need to be assessed for kashrut issues but are likely to be far less problematic³⁹.

E2] THE HALACHIC STATUS OF THE NEW MEAT - BITUL

- Even if we say that an original starter cell will indeed be treif - eg it came from a non-kosher species, a neveila, a treifa or basar min hachai, what will be the status of the other cells grown from that original? Will they be considered new kosher meat or will they take on the same treif status as their 'parent' cell?
- Can we say the the original treif cell is now nullified (batel) in millions of new cells? Or is bitul irrelevant since it only applies when a treif substance mixes with a different kosher substance. Here, the original cell is simply surrounded by millions of other identical cells!

19. הטבל - גדוליו מותרין בדבר שזרעו כלה. אבל בדבר שאין זרעו כלה גדולי גדולין אסורין. איזהו דבר שאין זרעו כלה? כגון הלוף והשום והבצלים.

משנה תרומות פרק ט משנה ו

The Mishna rules that where a non-kosher seed is planted (in this case 'tevel' - produce which has not yet had terumot and ma'aserot taken) the growth from that seed is kosher. However, this only applies where the original seed rots away, as in the case of grain. If the original 'seed' remains, as with onions, all future generations of the original are still tevel!

- As such, if a cell is taken from a non-kosher source, even if the cell was originally batel (in 60) in the added nutrients, when the cell later replicates and forms a new mass of fibers, would this be considered 'gidulim' and be treif, and also too large to be batel?
- Furthermore, any suggestion of 'bitul beshishim' will be complicated by the following factors within the halachot of bitul:
 - (i) Is the original cell considered to be 'avidei leta'amei' - put there purposely to give taste⁴⁰ - in which case it may never be batel?
 - (ii) Since the added nutrients are all added for the specific purpose of nourishing the cell, can the cell ever be batel in this substance?
 - (iii) Is the original cell considered to be a 'davar hama'amid' - a key substance or catalyst that gives final form to the material - which is never batel?⁴¹
 - (iv) Can we apply the principle of 'zeh v'zeh gorem'? Where there are multiple catalysts, some kosher and some not, they will all be considered joint contributing factors and the regular principle of bitul b'shishim will apply, even to a ma'amid⁴².
 - (v) Will we invoke the principle of 'bitul issu lechatchila' - where the prohibited substance was introduced on purpose - and bitul will not apply? Many of the issues relevant to sherry-cask whisky⁴³ will apply here. Is the non-Jew introducing the issu for other non-Jews? (Also) for Jews? Because that's their job?⁴⁴

38. This is for a number of reasons, including: sustainability, cost, health considerations and the wish to create an entirely 'slaughter-free' product.

39. However, this will be relevant on Pesach for synthetic meat which was grown from a culture containing chametz.

40. This raises the question of where the taste of meat comes from. Is it the cell or the nutrients which help to grow the cell? Does the cell have any taste at all? Even in regular meat, is the taste a product of the cells in the meat - muscle, fat etc - or of the food that the animal ate?

41. See <https://www.theyeshivaworld.com/news/israel-news/1500262/tzohar-rabbi-is-incorrect-lab-grown-pig-meat-is-not-kosher.html> responding to R. Yuval Sherlow who ruled that even synthetic pork derived from pig cells would be kosher (see <https://www.calcalistech.com/ctech/articles/0.7340.L-3734932.00.html>) since the original cell loses its identity and is batel in the new mixture. In response, R. Yair Hoffman argues that the original cell will never be batel since it is a davar hama'amid - its presence remains tangible in the final form of the food. This is similar to the case of rennet in cheese where the halacha is that rennet from a non-kosher source is never nullified since it is a ma'amid. This is the psak of the Rambam (Ma'achalot Assurot 3:13 and 9:16) and the Shulchan Aruch (Orach Chaim 442:5 and Shach Yoreh Deah 87:30). We saw in the previous shiur on cheese that there is a dissenting minority view (Tosafot (Chulin 99b) and Maharshal) that even a ma'amid is batel in 60. We do NOT rule that way for cheese, but would this minority opinion be relevant in the case of cultivated meat, perhaps when viewed alongside other considerations for leniency?

42. *Zeh ve-zeh gorem* is not a blanket heter. It may only apply bedieved, and only if the treif *ma'amid* was not capable of acting on its own.

43. See <https://rabbimanning.com/wp-content/uploads/2017/09/Sherry-Cask-Whisky.pdf>.

44. Shu't Rashba (3:214) cited by the Beit Yosef (YD 134 s.v. *chametz*, towards the end) rules that bitul b'shishim is only applicable when it happens by accident. However, when it is

- (vi) Will we say that the original starter cell (assuming it to be halachically significant - see above) is a *davar chashuv* - an important item - which will not be batel?
- (vii) Even if we say that the new cultivated meat will not nullify original starter cells which were taken from muscle tissue, since the cultivated meat is intended to be as identical as possible to the original - in taste, texture and appearance, would we still argue that where the original starter cell was taken from a feather or a hoof, but the final product is meat?

E3] THE HALACHIC STATUS OF THE NEW MEAT - PANIM CHADASHOT

20. אמר רב פפא: האי מאן דגזל עפרא מחבריה ועבדיה לבינתא - לא קני, מאי טעמא? דהדר משוי ליה עפרא. לבינתא ועבדיה עפרא - קני, מאי אמרת? דלמא הדר ועביד ליה לבינתא, האי לבינתא אחריתי הוא, ופנים חדשות באו לכאן.

בבא קמא צו:

If a person stole dust and made it into a brick, the halacha does NOT see this as a fundamental change (which transfers the stolen item to the thief, requiring restitution by money and not the original item) since the brick could be ground back to dust. But if he stole a brick and ground it into dust, that WOULD be considered an irreversible change, effecting a transfer of ownership such that the thief would be liable to pay back the value rather than return the original stolen property. The Gemara asks - could the dust not be turned back into a brick!? The answer is that this would be a 'panim chadashot' - a new entity no longer having the same halachic status as the first.

- This is one of the key halachic issues concerning the status of gelatin⁴⁵. Gelatin is derived from collagen obtained from various animal by-products, including the bone and skin of cows and pigs. These are soaked in hydrochloric acid, then soaked in lime for a month, after which they are washed in sulfuric acid. Some poskim permitted gelatin made from cow bones⁴⁶ or even cow skins⁴⁷ on the basis that the original substance had been totally broken down and rendered entirely inedible, then reconstituted into something new - *panim chadashot*.
- Some poskim wish to apply this to synthetic meat. As such, EVEN if the source of the cells is treif, maybe the final product will be kosher.

21. י"א שהמוש"ק הוא זיעת חיה. ונכון יותר שחיה ידועה היא, שיש לה חטוורת בצווארה, ומתקבץ שם תחילה כעין דם, ואחר כך חוזר ונעשה מוש"ק. והרמ"ה הלוי ז"ל היה אוסר לאכלו מפני חשש דם; וה"ר יונה ז"ל פירש דאפשר ליתן בו טעם להתיר, ולומר דפירשא בעלמא הוא - אף על פי שמתחילה היה דם, לא חיישינן להכי, דבתר השתא אזלינן.

רא"ש ברכות פו:לה

This halachic discussion was applied by the Rishonim to the kashrut of deer musk (which is taken from a musk sac on the animal). Some Rishonim ruled that was not kosher since it comes from the blood. Others rule that it is now kosher since it is an entirely new entity⁴⁸.

22. This "meat" undergoes many changes to the point that its entire identity is different. This is the same as gelatin from non-Kosher animals. The bones undergo so many changes that the product is considered an entirely new creation. While some authorities are strict about this issue, the basic Halachah is that gelatin is Kosher (see *Shu't Yabia Omer* 8:11).

Rav Shlomo Aviner, *Torat HaRav Aviner* 12 August 2013, *Kashrut of Laboratory-Grown Hamburger*⁴⁹

- However, many poskim⁵⁰ have ruled that gelatin from non-kosher sources is NOT kosher and they question the applicability of *panim chadashot* since the main element - the collagen - is present throughout. They also raise the issue of '*achshevei*' - that by relating to the product as food one is effectively treating it as edible.
- In the case of cultivated meat, the product not rendered as inedible as gelatin when being processing, but the early mass of multiplying cells is not yet edible to the same degree as regular food.

the normal mode of production - the laws of bitul do not apply. *Shu't Noda BeYehuda* (Mahadura Tanina #52) disagrees and rules that we do not limit when the laws of bitul apply, even if it is the normal mode of production. R. David Tzvi Hoffman rules that one can be lenient and rely upon the *Noda BeYehuda* only when kosher food alternatives are unavailable. However, once a kosher market has developed he rules that one must be stringent in accordance with the ruling of the Rashba. The *Mishna Brurah* (Siman 442) rules stringently in accordance with the Rashba, as does the *Magen Avraham* *ibid*. For a detailed analysis of these issues, and a fascinating account of how they related to early hashgacha of Coca-Cola, see *Genetically Engineered Meat* - R. Yehuda Spitz, *Journal of Halacha and Contemporary Society* Volume LXXII p.56. See also <https://ohr.edu/5518>

45. See <https://rabbimanning.com/wp-content/uploads/2019/03/Gel-Caps-and-Gelatin.pdf>

46. Including R. Chaim Ozer Grodzinsky (*Shu't Achiezer* 3:33, 5)

47. Including R. Ovadia Yosef (*Shu't Yabia Omer* Vol 8, YD 11)

48. R. Herschel Schachter rules that, in order to rely on this leniency, the substance must also undergo a chemical change and have a significantly different taste. This would not be the case for cultivated meat.

49. Rav Aviner's psak is not longer available on line, but is referred to in other articles.

50. This includes most senior poskim in America in the 1950's and 60's - R. Moshe Feinstein, R. Aharon Kotler, R. Yosef Henkin and almost all senior poskim in Israel. Mehadrin hechsherim in Israel will not permit gelatin from non-kosher sources. The regular Rabbanut hechsherim used to but no longer do.

F] IS CULTIVATED MEAT 'FLEISHIG'

- If we overcome all other halachic hurdles and conclude that the cultivated meat IS kosher, will it be fleishig or pareve?
- Interestingly, in the case of kosher gelatin, R. Moshe Feinstein ruled that it is pareve whereas R. Aharon Kotler ruled that it should be treated (at least lechatchila) as meaty. Would this translate into the debate on synthetic meat which is derived from a kosher source?
- A number of poskim - including R. Shlomo Aviner, R. Dov Lior, R. David Stav, R. Moshe Bigel, R. Yuval Sherlow, R. Zev Weitman of Tenuva and R. Oren Duvdevani of Tzohar - have ruled that the cultivated meat is kosher AND pareve.
- Chief Rabbi Lau ruled earlier this year⁵¹ that a steak of cultivated meat produced by Aleph Farms was kosher and pareve, although ruled that it should not be eaten with dairy because of ma'arit ha'ayin - see below.
- R. Moshe Tendler ruled that if the stem cells were taken from muscle tissue, the cultivated meat should be fleishig on a rabbinic level (ie for ma'arit ha'ayin - see below). But if the stem cells were taken from the skin, the cultivated meat should be pareve.
- In fact, many in the cultivated meat industry would prefer a psak that it is FLEISHIG in order to associated it with normal meat!

F1] MA'ARIT HA'AYIN

- Even if we conclude that cultivated meat is both kosher and pareve, will there still be a problem to eat it with milk/cheese because of ma'arit ha'ayin - that it looks like the person is doing something prohibited?
- This may depend on how common the new innovation is and whether people will assume that an issur is being done.

23. ואם זאנו לכוסיף מדעתנו יש לנו לאסור הרבה כיוולא זאילו. וכן כתבו התוספות זריש פרק כל הזשר [חולין קד. ד"ה וינגא] דאין לדמות גזירות חכמים זו לזו אלא במקומות שהם מדמה ע"כ.

פרי חדש יורה דעה סימן פז ס"ק ז

The Pri Chadash rules that we may not create new ma'arit ha'ayin situations today in addition to those specifically legislated by Chazal.

24. גם הגאון רבי יהונתן אייבשיץ בספר כרתי ופלתי הוסיף נופך לקיים דברי הרמ"א, שלא גזרו חז"ל משום מראית העין אלא כגון שתיית דם דגים שכנסו בכלי, כמבואר בכריתות (כא): שאין הדבר מצוי, והרואה לא יתלה שזהו דם דגים, אלא יחשוב שהוא דם בהמה ועוף שאסורים. וכן חלב אשה הכנוס בכלי אינו מצוי, ואם יאכלנו עם בשר יחשדוהו שאוכל בשר בחלב ולכן חששו לאסור משום מראית העין. אכל חלב שקדים שהוא מצוי ורגילים לבשלו עם בשר, והוא מוטעם מאד, אין לחוש בו משום מראית העין כלל. ועוד שחלב שקדים לא נקרא חלב אלא מי פירות. ולא משום שיש לו דמיון לחלב במראהו נאסור לבשל בו (חלב) [בשר]. והרי יין אדום מאד דומה לדם ולא נאסר משום מראית העין. ולא אסרו אלא דם דגים הכנוס בכלי שנקרא דם. אבל חלב שקדים אין עליו שם של (דם) [חלב] אלא מי פירות. ולכן אין לנו לאוסרו משום מראית העין ע"כ

שו"ת יחיה דעת חלק ג סימן נט

R. Ovadia Yosef quotes R. Yonatan Eiberschutz's ruling that: (i) ma'arit ha'ayin is not relevant in normal situations where observers understand that one may be using alternative ingredients - such as almond milk, which is commonly used to cook meat, even though it looks like milk, or red wine which is commonly used to cook meat, even though it looks like blood; (ii) ma'arit ha'ayin is not relevant unless the replacement food is significant similar to the normal one - eg mother's milk instead of cow's milk or fish blood instead of cow's blood.

- This is also the position of Rav Aviner, who rules that the cultivated meat can be eaten with cheese and that there is no concern of ma'arit ha'ayin.

25. וגם חידושו של הכרתי-ופלתי (יו"ד פ"ז:ז) שאוסרים משום מראית עין רק דבר שהוא דומה לאיסור ממש (למשל: חלב אם שהוא חלב ממש, ולא חלב שקדים או חלב קוקוס שהם מי פירות ונקראים חלב רק בגלל המראה; וכן דם דגים, ולא יין שרק צבעו כצבע הדם) אינו מוסכם בדברי האחרונים.

ר' יהודה שפיץ, בשר בתאי גזע, תחומין ל"ה (2015)

However, other poskim point out that this position of R. Eiberschutz is not accepted by all poskim and some poskim DO require the introduction of new applications of ma'arit ha'ayin, even when these are not mentioned by Chazal.

- Some poskim have ruled that, at least until cultivated meat products are well known in the market, there will be a potential ma'arit ha'ayin issue. Therefore, if served in a restaurant, accurate notices would be required on menus and menu boards in order to properly describe their identity. At home, product packaging should be used as a heker. And, at a catered event, a display sign should be put out to indicate that products served are actually pareve.⁵²

51. See <https://www.jpost.com/judaism/article-728978>

52. See R. Tsvi Heber - <https://cor.ca/2020/04/meaty-kashrus-issues-for-vegans/>

- Rav Asher Weiss has indicated that cultivated meat should be fleishig.
- Rav Herschel Schachter has indicated that cultivated meat should be parev.
- The OU has indicated that it is likely to rule that cultivated meat is fleishig.

G] DOES CULTIVATED MEAT NEED TO BE KASHERED?

- Regular meat requires kashering - washing, soaking, salting and then rinsing - before it can be eaten. What is the status of cultivated meat?
- Do we say that the original cells have no blood 'in them'? Even if they have blood in them, during the process of growth this 'blood' is rendered inedible. Even when the cultivated meat becomes edible again, this will not revive the halachic status of the blood.
- On that basis, some poskim have ruled that cultivated meat will not need to be kashered.⁵³

H] CONTEMPORARY POSITIONS

26. In sum: It seems that a lab-grown burger is not Treif, not considered a limb taken from a living animal and is Pareve (although it is not vegetarian) based on three reasons: A. It is not created in the regular process as the creation of meat. B. It has undergone many changes to the point that its entire identity is different. C. The stem cells from which it is taken cannot be seen by the human eye. However, since this is a new creation, the great Torah scholars must decide on the matter. And regarding eating such a burger with dairy, there is no problem of Maarit Ayin, since we do not add to the list of things forbidden in the Gemara on account of Maarit Ayin

Rav Shlomo Aviner, *Torat HaRav Aviner* 12 August 2013, *Kashrut of Laboratory-Grown Hamburger*⁵⁴

- See also an interesting video featuring R. Aviner, R. Dov Lior and R. Yuval Sherlow, who all take a lenient view on the issues. <https://www.youtube.com/watch?v=C1a9GHMm2Xk>⁵⁵

27. בסיכומו של דבר דינו של ההמבורגר המלאכותי יקבע על פי הרכב התאים ש"נולדו" בתהליך. כלומר, אם התא המקורי נלקח מבעל חיים לא כשר או שלא נשחט כדון, הרי שצמצאי תא זה נחשבים אסורים גם כן. ומכאן שגם ההמבורגר המלאכותי במקרה זה אינו נחשב ככשר אף הוא על פי כללי ההלכה היהודית.

Machon haTorah v'haAretz (www.toraland.org.il) - *Kislev 5774* - המבורגר מלאכותי כשר או לא כשר?

Other poskim have taken the view that the synthetic meat will follow the original cell. If that was treif, the burger will be treif. If it was taken from a kosher shechted animal, it will be kosher and fleishig.

- This is also the tentative conclusion of Rabbi Spitz and Dovid Lichtenstein in their respective articles.

I] AN ETHICAL MOVE TOWARDS A WORLD WITHOUT SLAUGHTER?

28. (ד) ואם-ימעט הבית מהינות משנה ולקח הוא ושכנו הקרב אל-ביתו במכסת נפשית איש לפי אכלו תכסו על-השנה:

שמות יב:ד

Even when the Jewish people are commanded to eat meat (for the korban Pesach) they are also warned not to OVEReat on meat, but only to eat what is needed.

29. אי אפשר כלל לצייר שאדון כל המעשים, המרחם על בריותיו, ברוך הוא ישים חק נצחי כזה בבריאתו הטובה מאד, שאי אפשר יהיה למין האנושי להתקיים כי אם בעברו את רגש מוסרו על ידי שפך דם, יהיה גם דם בעלי חיים ... בבא התור של המצב המוסרי לשקץ בשר בעלי חיים, מפני הגועל המוסרי שיש בו, הלא אז לא תאונה נפשך לאכל בשר, ולא תאכל.

הרב קוק (חזון הצמחונות והשלום)

Rav Kook's vision of an ultimate world of peace in the human race also requires a world without slaughter of animals.

53. See *Pareve Cloned Beef Burgers: Health and Halachic Considerations* By: John D. Loike, Ira Bedzow and R. Moshe D. Tendler, *Hakirah* 24 (2018) pp191-204, <https://hakirah.org/vol24Loike.pdf>

54. <http://www.ravaviner.com/2013/08/kashrut-of-laboratory-grown-hamburger.html?m=1>

55. Although note that the video was made by Supermeat, an Israel Biotech start up which is developing synthetic meat products!

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