

In-Vitro Fertilization, Embryo Transfer, and Embryo Freezing

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Part from intense public interest in the rapid developments of research and technology which have made possible in vitro fertilization (IVF) and embryo transfer (ET), these procedures pose ethical, legal and halachic problems. Practical questions in these new fields are being put to experts in Jewish law, who must find answers on the basis of established halachic principles. In this essay we shall look into the halachic principles which respond to modern problems in general, and to IVF, ET and embryo freezing in particular.

I. GENERAL PRINCIPLES

A. Proof of Prohibition or Permissibility

The Mishnah¹ emphasizes that only *prohibitive*, strict decisions require juridical substantiation while *permissibility* or leniency needs no supportive precedent. The absence of a prohibitive substantiation is to be equated with halachic permissibility.² This implies that any technological innovation is permissible unless there is a halachic reason for prohibiting it. If in the broad range of halachic sources no reason is found for their prohibition, Jewish law permits the use of new technologies.

B. Who Decides?

In order to be sure that there is no halachic prohibition against a new procedure, an accepted halachic authority must be consulted. Jewish law differentiates between the authority to abrogate a temporary prohibition and the authority to determine permanent permissibility. Faced with uncertainty or insufficient information, one is entitled to be strict with oneself; no special authority is needed for prohibition by the individual. On the other hand, in order to *establish* permissibility,

there must be unequivocal information.³ When there is no clear precedent in *halachah* to decide the issue at hand, one must be thoroughly versed in all halachic sources before definitely confirming that no halachic reason for prohibition exists.

C. Issues without Clear Precedents.

Step 1: An attempt is made to find related precedents in halachic literature.

Step 2: If there are no related precedents, a halachic study is made of conceptually connected rulings. In examining these, we attempt to infer the reasons upon which they are based. If these reasons are confirmed, or at least not contradicted, by other halachic sources, they could be accepted for drawing conclusions regarding new issues under consideration.

Because of the vast range of halachic material, there often arise differences of opinion among the accepted authorities, though these differences are usually of short duration. Consensus is finally achieved and an unequivocal decision is reached.

There are well-known halachic rules for deciding controversial issues. If, for example, there is a doubt in a matter prohibited by the Torah (דאורייתא—*D'orayta*), the ruling is prohibitive; if the doubt is related to a rabbinic ruling (דרבנן—*D'rabbanan*), the decision is usually permissive.⁴

II. SPECIFIC PRINCIPLES OF INFERTILITY TREATMENT

There are three basic principles which, with certain restrictions, favor the permissibility of fertility-increasing manipulation:

A. The commandment "Be fruitful and multiply."

B. The *mitzvah* of lovingkindness (גמילות חסדים—*G'miluth hassadim*).

C. Family integrity.

A. The Commandment "Be fruitful and multiply" (פרו ורבו) *P'ru urvu*)

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This commandment, the first in the Torah, is based on the verse: "Be fruitful and multiply and replenish the earth."⁶ In halachic literature the fulfilment of this command is considered of greatest importance⁶ because the fulfilment of all other commandments depends on it. One of the reasons behind it is "God's will that the world be populated," as Isaiah said: "I le did not create it as a waste, but formed it for habitation."⁷

Despite the importance of this commandment, Halachah does not permit *indiscriminate* multiplication of genetic offspring to enhance the biological efficiency of natural increase. On the contrary, a system of laws and marital restrictions (laws of incest)⁸ limiting sexual activity to a closed family framework emphasizes not only the dissemination of biological genes, but also the equally important transmission of cultural and moral traditions from generation to generation.^{9,10}

Thus any increase in fertility is evaluated not only by its capacity to increase the number of offspring, but also by the effect

It may have on the continued existence and adequate functioning of the family nucleus that hands down cultural content to following generations.

B. Personal Suffering and the Commandment of Lovingkindness

In cases of personal suffering we are duty bound to practice the *mitzvah* of *G'milut hassadim* which originates in the verse "Love thy neighbor as thyself."¹¹ Accordingly, one must use one's possessions,¹² physical strength¹³ and talents¹⁴ in order to lessen the suffering of one's fellow man.

Obviously, a childless couple is within this category and there exists a clear obligation to assist them in every permissible way, as long as no one else is thereby harmed.¹⁵ Therefore, if manipulation of fertility brings into the world offspring which may be legally or otherwise seriously handicapped, such foreseeable harm and suffering of the progeny stand in contraindication to the *G'milut hassadim* that may be relevant to the parents.

C. Family Integrity

Domestic peace and the integrity of the family are extremely important in Jewish law. In order to restore good relations and mutual trust in the event of serious marital difficulties, the Torah sometimes permits the actual erasure of the holy name of God.¹⁶

This may tip the scales in favor of leniency^{17, 18} when there is halachic uncertainty constituting a real obstacle to permissibility.

III. HALACHIC PRINCIPLES CONCERNING IVF PROCEDURES

In the light of the three principles elaborated in the previous section we shall examine halachic attitudes towards:

- A. IVF + ET as solution to the problem of infertility in lawfully wedded couples.
- B. IVF + ET with sperm donated by a third party to a married woman (IVF-Ds).
- C. IVF + ET with an oocyte donated from a third-party donor (IVF-Do).
- D. Freezing of embryos.

A. IVF + ET for Lawfully Wedded Couples.

This procedure has seven steps:

1. Collection of semen.
2. Extraction of oocyte.
3. Artificial capacitation of spermatozoa.
4. In vitro fertilization.
5. Transfer of the fertilized ovum to a medium in which it can develop and divide.
6. Freezing of fertilized ova.¹⁹ (This step is not essential, but it increases the efficiency of the procedure and the chances of its success).
7. Implanting of the embryo in the uterus (= ET).²⁰

Jewish law deals with both the permissibility of the procedure itself and the legal status of the IVF offspring. Although these are separate issues, there is a close connection between the legal status of the offspring and the attitude towards the procedure as such.

Artificial insemination using the husband's semen (AIH), an issue which has been dealt with at length in recent responsa literature,²¹ is also relevant to this discussion.

Is a child born as a result of technical manipulation (without normal sexual relations) recognized by Jewish law as the child of his biological parents? This question is important in Jewish law because genetic kinship and legal kinship do not always correspond. For example, if a gentile family converts to Judaism, the legal bonds between parents, children, brothers, and sisters are severed in accordance with the dictum: "One who converts to Judaism is like a newborn babe."²² This applies to a variety of laws. The act of conversion creates a situation in which the genetic relationship is severed in the eyes of Jewish law.

The converse is also possible. If human parthenogenesis is ever demonstrated²³ and a married woman bears a parthenogenetic daughter, it is possible that Jewish law would recognize a father-child relationship between the husband and the parthenogenetic child although there be no genetic bond between them.²⁴

Although experts in Jewish law are divided in their attitude toward the paternity of offspring resulting from AIH, the majority would probably concede legal paternity to the biological father.²⁵

Nevertheless, even among those who recognize the paternity of AIH offspring, there are some who reject this legal relationship in the case of an IVF offspring.²⁶ The lack of recognized paternity not only affects laws of inheritance, lineage, and support, but also bears directly on the genetic father's fulfilling the commandment to be "fruitful and multiply."²⁵ Noncompliance with this commandment nullifies one of the important principles which favor IVF. For this reason Rabbi E. Waldenberg totally forbids IVF, though he approves AIH under certain conditions.²⁶

On the other hand, R. Ovadiah Yosef permits IVF when there is no other way of fulfilling the commandment to be "fruitful and multiply."²⁷ His colleague, R. S. Goren, agrees with him in an unpublished statement,²⁸ and R. A. Nebenzahl is of a similar opinion.¹³ Domestic happiness and integrity of the family were weighty factors in favor of this procedure.

The halachic aspects of the seven steps of the IVF + ET procedure are as follows:

Step 1 -- Collection of Semen:

Collection of semen by masturbation presents a halachic



problem because of the prohibition of onanism.²⁹ This problem applies equally to AIH. The most acceptable halachic means of obtaining semen is by postcoital collection, since the purpose of the act is to bring children into the world, not the mindless spilling of seed frowned upon by the Torah.³⁰ Some halachists would permit other methods, classified by degree of acceptability,³¹ whenever postcoital collection is impossible.

Step 2 – Extraction of Oocyte:

There is no basis for halachic opposition to the extraction of an oocyte, for there is no prohibition against destroying an oocyte.³² However, Jewish law is opposed to any nonessential surgical procedure because of the possible risk entailed.³³ This latter consideration would be waived in favor of the duty to be "fruitful and multiply," just as it is waived during pregnancy, where the risks are such that a prayer of thanks (הגומל ברכת) must be recited after the safe delivery of the baby.³⁴ This halachic consideration of reducing risk as much as possible also requires that a less drastic procedure be utilized in preference to one that entails a greater risk. Therefore, it is halachically preferable to remove the oocyte by ultrasonically guided puncture,^{35,36} rather than perform a laparoscopy.

Step 3 – Capacitation:

There is nothing halachically forbidden concerning the preparation of the semen, since the whole procedure is aimed at improving the chances of fertilization. For the same reason there is no halachic problem with regard to the actual fertilization (step 4) or the nourishment of the fertilized egg (step 5).

Step 6 – Embryo Freezing:

Freezing of the embryo is not essential for the success of the procedure, but it does increase the chances of an IVF attempt per surgical recovery.³⁷ It also allows the use of several withdrawn oocytes by fertilizing them at one time, so that in case of failure

they can be used one after another with better timing and preparation. A foreseeable legal question involves the law of primogeniture. If the freezing were to extend over a long period, and in the meantime a child were born from sperm taken from the father at a date later than that of the first sperm, which would be the "firstborn" for purposes of inheritance, the first embryo or the first born? Jewish law is clear on this. The moment of birth is paramount, not the date of fertilization.^{38, 39} Though a different opinion is cited in the literature,⁴⁰ the definitive ruling remains unaltered.^{38, 39}

Step 7 – Embryo Transfer:

There appears to be no halachic problem in ET, even according to those who hold that IVF offspring are not recognized as the legal children of their biological parents. According to these scholars, an embryo transplant leads, legally speaking, to the birth of a parentless child, just as in the case of conversion of an infant together with its family.

The Problem of the Reliability of the Medical Establishment

Even those who sanction IVF-H (husband) stress the problem of the trustworthiness of the medical establishment. Basing themselves on their own experience, some claim that the medical establishment is not to be trusted, and that the more IVF-H is performed, the greater the likelihood of IVF-D

(foreign donor), as was the case in artificial insemination, which began as AIH and led to AID. One of the most outspoken authorities on this subject is R. E.Y. Waldenberg⁴¹ who is today held to be one of the leading halachic experts on issues of modern medicine.

IV. IVF-D (from foreign [third party] donor)

In recent years many lengthy discussions have been devoted to the ethical and legal aspects related to AID for childless couples. The discussions focus on two issues:

- A. Is AID halachically permissible, or is it adultery?
- B. What is the status of AID offspring?

All halachic experts agree that artificial insemination using the semen of a Jewish donor (other than the woman's husband) is forbidden;²¹ it is only the severity of the prohibition which is debated. Some hold that AID constitutes adultery and is thus strictly forbidden by the Torah.⁴² Most experts, however, hold that the prohibition is based primarily on legal ramifications relating to the birth of an AID offspring.

Some authorities would permit AID if the donor were a non-Jew, thereby eliminating some of the most important legal complications concerning the personal status of the offspring.^{43, 44}

The personal status of the AID offspring presents a serious problem, even for those who hold that AID does not constitute adultery and that the debatable issue is whether the AID offspring is a *mamzer* (ממזר) according to the criteria of Jewish law.

Jewish law severely restricts the prospects of marriage of a *mamzer*.⁴⁵ This is a serious functional handicap from social and judicial points of view.

At the root of this debate is the determination of which of the following two factors creates the *mamzer* status referred to in the Torah:⁴⁶

1. The act of prohibited intercourse that leads to the birth of the child.⁴⁷
2. The birth of a child sired by a genetic father who is other than the mother's husband,⁴⁸ so that the child is a product of a prohibited⁴⁹ genetic union.⁴³

According to the first proposition, the AID offspring is not a *mamzer* if there was no act of prohibited intercourse, while on the basis of the second proposition the AID offspring is a *mamzer*. This halachic dispute creates a situation of "doubtful *mamzer*."⁵⁰ Hence the accepted halachic prohibition of AID in Israel.^{43, 44}

Compared with the complex legal status of AID offspring, the IVF offspring is in a better position. The reason for this is the clear distinction between donor sperm being injected into the uterus and an embryo being implanted there (IVF-D + ET). Some halachists hold that AID is included in the prohibition "Thou shalt not lie carnally with thy neighbor's wife to defile thyself with her."⁵¹ However, IVF-D + E involves the implantation of an embryo, which is nowhere cited as forbidden. But there are still two questions which must be answered:

1. Is fertilization by the semen of a third-party donor permitted?
2. What is the personal status of the IVF-D + ET offspring?

Although it is difficult to equate test-tube fertilization with an act of adultery (even if this involves IVF-D), there may still be legal prohibition against in vitro fertilization of the oocyte of a married woman with a third-party's sperm.⁵² This implies that even if it be forbidden to perform IVF-D on an oocyte of



a married woman, the same prohibition would not affect an unmarried woman.

Once fertilization has taken place, there is no reason not to implant the embryo, as long as the possibility of *mamzer* status is excluded. Obviously, if the offspring would be a *mamzer* (e.g. if the oocyte were fertilized by sperm of an incestuous relative), it would be morally and legally unjustifiable to perform IVF-D, as the embryo carried in the womb for nine months would be born an unfortunate creature.

The personal status of an IVF-D offspring of a married woman is of interest. Those scholars who say that there is a parental relationship in IVF + ET,⁵³ and that the biologic father is thereby fulfilling the *mitzvah* of "be fruitful and multiply," may also regard the IVF-D offspring as a *mamzer* if it is true that the AID offspring is a *mamzer*.⁵⁴ On the other hand, scholars who take a stricter position, holding that there is *no* parental relationship in IVF according to the *halachah*,^{26, 55} may thereby be giving the IVF-D offspring an advantage. If there is no kinship, the offspring cannot be regarded as the product of a forbidden union and is thus at least as acceptable as the progeny of sperm of a non-Jew fertilizing an ovum of a married Jewess. In such a case, the paternity of the non-Jewish genetic father is not legally recognized, while the status of the offspring could be that of a Jew, almost without restrictions.⁵⁶

Halachah so far has not reached definitive conclusions on these fundamental issues. Arguments can be found for both sides, so that for the time being they still remain open question. However, one practical conclusion is obvious. If we must choose between AID and IVF-D in the case of a married woman, the latter is preferable from the standpoint of *halachah*.

V. IVF + ET WITH OOCYTE FROM THIRD-PARTY DONOR (IVF-Do)

The donation of an oocyte raises two problems:

1. If the donor is a married woman (which is more practical for the gynecologist, because when a married woman is treated with drugs to stimulate ovulation preceding IVF-H, there is usually a surplus of oocytes available for fertilization, without the need for further operative procedure), is it permitted to fertilize her oocyte with sperm other than that of her husband, as discussed in the previous chapter?

2. The fundamental problem is that of establishing who, according to *halachah*, is the mother. Is it the genetic mother or the nutritional (surrogate) mother? Or, perhaps, there is no legal mother. Or, perhaps, both are considered to be mother. (The possibility of two legal mothers for one child need not be related to the halachic rules of IVF-Do. There can even be two *genetic* mothers if two fertilized oocytes of two different women are joined, and the resulting chimera combines the genetic components of both.)

The Babylonian Talmud⁵⁷ discusses the firstborn of a kosher animal: "Two wombs were combined and [the embryo] left one and entered another." The question whether the offspring is considered the firstborn only of its genetic mother, or whether it is also considered the firstborn of the host mother, remains unsolved in the Talmud. This might mean that the genetic mother is surely to be considered the legal mother and that the Talmud expresses doubt only concerning the status of the host mother. On the other hand, the talmudic discussion could be dealing with a specific issue of

bechorot (firstborn) without relation to the issue of motherhood that concerns us here.

Among present-day halachists, too, there is heated discussion. R. S. Goren tends to regard the genetic mother as the only legal mother for all intents and purposes, but no consensus has yet been reached.⁵⁸ This creates serious problems, especially if the genetic mother and host mother are of different religions. Since *halachah* must prohibit BIVF-Do in cases of doubt,⁴ no oocyte may be donated when the physiologic and genetic mothers belong to different religions,⁵⁹ even if the oocyte donor is an unmarried woman.

A detailed discussion of the outcome of IVF-Do by a donor of another religion would require the analysis of talmudic texts beyond the scope of this article.

VI. EMBRYO FREEZING

As we have already mentioned, there is no halachic injunction against freezing embryos. Even if it should become possible to freeze living persons without causing death, there would be no direct halachic prohibition, apart from taking of unnecessary risks³³ or intentionally producing a state of continuous sleep in which one cannot perform one's religious duties. However, if freezing is carried out to preserve life or to cure serious illness, there is no reason to forbid it. As we stated at the beginning of this article, if there is no reason to forbid a certain procedure, it is implicitly permitted.

The status of a person during freezing, when physiological systems are not operating (the cardiovascular system, the nervous system and all the other cells of the body) is halachically important. Is the patient legally alive or dead (temporarily)? Based on other parallels in *halachah*, the answer is simple. As long as an unconscious person can naturally recover, he is held to be "alive."⁶⁰ This means that a frozen person who can be unfrozen and brought back to a normal physiological state, is considered to be "alive" according to *halachah*.

If the object of freezing an embryo is to increase the chances of success of an IVF attempt per surgical recovery and to develop normally towards birth, there should be no objection. If the freezing is performed for other reasons, such as research, the matter would depend on the halachic status of the embryo during the first forty days after fertilization. During this period, until the completion of organogenesis (on the 41st day, according to Jewish law), the embryo is considered "just (ordinary?) water"⁶¹ with respect to certain laws. If this is accepted, then the matter is easily settled. "Water" may be frozen, as studies of the same nature may be performed on human semen.⁶² However, the status of the embryo during its first forty days is not necessarily so simple.⁶³

The problem which arises from IVF + ET after the death of one or both of the parents⁶⁴ is similar to that which arises from the use of sperm from a deceased husband in artificial insemination of his widow. Those who permit AIH in the case of a lawfully wedded couple would find it difficult to argue against AIH after the husband's death or against the freezing of an embryo after IVF for implantation after the father dies.⁶⁵

This raises an important halachic problem associated with the *mitzvah* of bearing children. If a man dies without issue, but leaves a frozen embryo (or frozen semen) which is implanted in his widow's uterus, resulting in a live birth, has the deceased fulfilled the *mitzvah* or not? The answer would depend upon the moment at which a person is held to fulfil the commandment "be fruitful and multiply." If one fulfils the

mitzvah only at the time of birth,⁶⁶ then it cannot be fulfilled after death^{67, 68} (and the same is true for the birth of a natural son after the father's death). But if one fulfils the commandment at the moment of fertilization, then the commandment is performed by the IVF during the father's lifetime, on condition that a live child is subsequently born. According to this view implanting the embryo into the uterus of the widow would conform to the requirements of the commandment, whereas AIH with frozen semen of the deceased husband would not conform. If one performs the *mitzvah* by providing semen,⁶⁹ there would be incentive for ET as well as using frozen semen for AIH after the death of a childless man. These approaches would only be acceptable to those halachic scholars who permit AIH or IVF-H as pointed out in Section III.

CONCLUSION

Jewish law contains much material directly related to the newer gynecologic technologies of AIH, AID, IVF-H + ET, IVF-Ds, IVF-Do and embryo freezing. Some of these issues

are still being debated by various halachic experts. The halachic principles associated with fertility-increasing technology are discussed in Sections I-II.

Mutual trust between gynecologists and halachic experts (as mentioned at the end of Section III) is of utmost importance in order to carry out procedures which are permissible to the religious

Mistrust not only impedes the research but may even result in demands for major histocompatibility complex (HLA) tests to ascertain paternity prior to sanctioning marriage. The halachic validity of this test is dealt with elsewhere.^{70, 71}

References and Footnotes

1. *Yadayim* 4, 3.
2. R. E. Wassermann, *Kovetz He'arot Yevamot* 87b, sect. 67, (550).
3. Rashi, *Beitza* 2b.
4. Talmud *Bavli Beitza* 3b.
5. *Genesis* 1:18.
6. *Sefer Hachinnuch*, *Mitzvah* 1; *Tosafot, Bava Batra* 13a.
7. *Isaiah* 45:18.
8. *Leviticus* 18:1-30.
9. *Genesis* 18:19, *Deuteronomy* 6:7, 11:19. This principle is repeated many times in biblical and halachic literature.
10. Compare Julian Huxley, *Evolution in Action* (New York: Harper & Brothers, 1953), p. 149.
11. *Leviticus* 19:18.
12. *Leviticus* 25:35, *Deuteronomy* 14:7-12.
13. Talmud *Bavli, Sukkah* 49b.
14. Rabbenu Yonah Girondi, *Sha'are T'shuvah* 3:13.
15. Hillel the First in Talmud *Bavli, Shabbat* 31a: "What is abhorrent to you, do not unto others."
16. Talmud *Bavli, Hullin* 141a according to *Numbers* 5:23.
17. R. Ovadiah Yosef, *Responsa Yabbla' Omer* 2:12 (cf. note 18).
18. R. A. Nebenzahl, *Assia* 34 (1982), p. 5.
19. C. B. Coulam, "Freezing Embryos," *Fertility and Sterility* 42:2 (1984), pp. 184-186.
20. Pramila V. Dandeker and Martin M. Quigley, "Laboratory Setup for Human In-Vitro Fertilization," *Fertility and Sterility* 42:1 (1984), pp. 1-11.
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22. Talmud *Bavli, Yevamot* 22a.
23. See U. Mittwoch, "Parthenogenesis," *J. of Med. Genetics* 15 (1978), pp. 165-181.
24. M. Halperin, "Interpretation of Anomalous Findings in MHC Tests and Practical Methods of Clarification," *Assia* 35 (1983), pp. 32-37.
25. Steinberg (cf. note 21 above), notes 25 and 26.
26. R. E. Waldenberg, "In-Vitro Fertilization: a Medical-Halachic Discussion," *Assia* 33 (1982), pp. 5-13.
27. Unpublished responsum. Parts of this responsum are cited in M. Drori, "Genetic Engineering - Preliminary Discussion of Its Legal and Halachic Aspects," *Techumim* I (1980), p. 287; the halachic conclusion was published in A. S. Abraham, *Lev Avraham* I 3rd ed. (Jerusalem, 1977), chapter 30, section C, note 8.
28. R. S. Goren, in an unpublished response to S. Mashlah dated 10 November 1982.
29. *Shulchan Aruch, Even Ha'ezer* 23:1-2.
30. *Genesis* 38:9-10.
31. See A. Steinberg, *Jewish Medical Law according to Tzitz Eliezer* (Jerusalem: Mossad Harav Kook, 1978), pp. 156 ff.
32. Rabbenu Tam, in *Tosafot, Yevamot* 12b. Even according to those *rishonim* who in principle disagree with Rabbenu Tam (see *Talmudic Encyclopedia* 11, p. 134, section 4), this does not refer to harming the oocyte. (See *Hazon Ish, Ishut* 36, c; *Ma'adane Yom Tov, Niddah*, chapter 2, b.)
33. M. Halperin, "Smoking - A Halachic Review," *Assia* 37 (1984), pp. 21-30, footnote 7.
34. A. S. Avraham, *Nishmat Avraham, Orach Chayyim*, (Jerusalem: Schlesinger Institute and P'ri Ha'aretz, 1984), 219a.
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37. J. Testart et al., "High pregnancy rate after early human embryo freezing," *Fertility and Sterility* 46:2 (1986), pp. 268-272.
38. *Responsa Sho'el U-meshiv* 3, no. 52.
39. R. N.Z.Y. Berlin (=Han'tziv mi-Volozin), *Ha'amek Davar, Deut.* 21:15.
40. *Sefer Se'arat Eliyahu* (Vilna, 1890) in the name of the Vilna Gaon (cited in *Kol Eliyahu and Divre Eliyahu, Parashat Ki Teltze*).
41. Waldenberg (cf. note 26 above), p. 7.
42. R. Y.L. Zrelson, *Responsa Ma'arche Lev, Even Ha'ezer* 7:3 (Kishinev, 1932), p. 138. Further sources in Steinberg (cf. note 21 above), note 39 and *Tzitz Eli'ezer* 13:97.
43. R. S.Z. Auerbach, "Artificial Insemination," *Noam* 1 (1958), pp. 145-166.
44. R. M. Feinstein, *Responsa Iggerot Moshe, Even Ha'ezer* 2:11 (pp. 322-324).
45. *Mishna Kiddushin* 4:1-3.
46. *Deuteronomy* 23:3.

47. Steinberg (cf. note 21 above), note 63.
 48. See *Mishna Kiddushin* 3:12.
 49. According to the Talmud the Hebrew term *mamzer* (bastard) is derived from two words: *mum* (defect) and *zar* (foreign) (cf. *Yevamot* 76b).
 50. *Shulchan Aruch, Even Ha'ezer* 4:24.
 51. *Leviticus* 18:20.
 52. M. Drori, "Artificial Insemination and the Law of Adultery: Halachic Viewpoints," *Torah u-Madda* 10 (1984), pp. 28-36, note 50.
 53. R. S.Goren (cf. note 28 above); R. O.Yosef (cf. note 23 above).
 54. Steinberg (cf. note 21 above), note 69.
 55. R. M.Hershler, *Halachah and Medicine*, 1 (Jerusalem-Chicago, 1980), pp. 307-320.
 56. *Shulchan Aruch, Even Ha'ezer* 4:19.
 57. Talmud *Bavli, Hullin* 70a.
 58. R. Z.N. Goldberg, "Fetal Implant," *Techumim* 5 (1984), pp. 248-259; 269-274; R. A.Kilav, "Test-tube Babies," *ibid.* pp. 260-267; R. Y.M. Ben-Meir, "In-Vitro Fertilization: the Legal Relationships of the Embryo and the Surrogate Mother," *Assia* 41 (1986), pp. 25-40.
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 61. Talmud *Bavli, Yevamot* 69b.
 62. Unless we accept the opinion of the scholars brought by A. Steinberg, "Abortion According to Halachah," *Sefer Assia* 1, pp. 107-124, notes 44, 45. Even these scholars might agree that in order to fulfill the commandment to be "fruitful and multiply" the procedure would be permissible. [See *Chavot Ya'ir*, chap. 31 and *Sh'elat Yavetz* 1, chap. 34 about the use of semen for fertility tests; cf. references in *Sefer Assia* 1 (Jerusalem, 1976), pp. 177-178.]
 63. R. A.Wieder, "Abortion within First Forty Days of Pregnancy," *Bishvile Harefu'ah* 2 (1976), pp. 42-46.
 64. Coulam (cf. note 19 above).
 65. The rule of *המתנה* (Talmud *Bavli, Yevamot* 42a) applies in such situations, so that the widow may not marry for three months from the time of the AIH or the ET.
 66. *Minchat Chinnuch*, Mitzvah 1, b.
 67. Ecclesiastes 9:10, according to the explanation of R. M.C. Luzatto, *Mesillat Yesharim*, chapter 4.
 68. See notes on the *Minchat Chinnuch* (Jerusalem Institute), Mitzvah 1, b, footnote 3.
 69. *Tosafot, Bava Batra* 13a. (The reference to *g'mar bi'ah* might refer to insemination rather than providing semen.)
 70. D. Frimer, "Establishing Paternity by Means of Blood Type Testing in Jewish Law and Israeli Legislation". *Sefer Assia* 5 (1986), pp. 209-185; M. Halperin, C. Brautbar and D. Nelken, "The Basis for Halachic Discussion on Determination of Paternity by means of MHC (HLA)," *Torah u-Madda* 10 (1984), pp. 6-27.
 71. R. S.Deichowsky, "Proof of Non-Paternity by Means of HLA (MHC) in relation to Halachah: A Ruling of the Rabbinical Court," *Assia* 35 (1983), pp. 10-31.

