

Pig Organs for Transplantation into Humans:

A Jewish View

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Abstract

In view of the shortage of human organs for transplantation, intense interest has focused on the use of pig organs. Although the early rejection of pig organs by a human recipient has not yet been overcome, scientists are actively seeking to solve this problem. If and when xenotransplantation from pigs or other animals becomes scientifically feasible, Judaism will look with favor upon this procedure to prolong or save the life of a human being who is ill or dying from organ failure. Although Jewish law forbids Jews to raise or eat pigs, no such prohibition exists for the use of pigs to cure human illness or to save human lives by xenotransplantation. **Key Words:** Transplantation, pig organs, xenotransplantation, Judaism.

Introduction

THE SHORTAGE OF HUMAN ORGANS for transplantation into patients suffering from organ failure has generated great interest in the use of animal organs as xenografts (1–4). For this purpose, organs from primates and pigs have received the most attention (5–6). The main reasons for the current lack of long-term success with xenografts are the immunological barriers to the acceptance of xenogeneic tissues (7–8), and the potential of transmitting both recognized zoonotic pathogens and unknown xenogeneic agents (9) by xenotransplantation. Recently, Paradis et al. reported that infection with porcine endogenous retrovirus (PERV) did not occur in any of 160 persons exposed to living pig tissue (10).

The rejection by the recipient of a xenograft is vigorous and often immediate, and is not adequately controlled by conventional immunosup-

pressive therapy used for allografts. The rejection is due to natural immunity by recipients never before exposed to xenografts, or to naturally occurring, pre-existing antibodies against the xenograft endothelium, or to activation of the alternative pathway of complement (11). However, progress is being made in understanding how removal and/or neutralization of these antibodies and the limitation of complement activation may be achieved (12).

Another promising approach is the use of organs from genetically engineered pigs, which do not stimulate the usual hyperacute rejection in the human recipient. Several routes are being explored to successfully breed such pigs (13), with the hope that doing so will provide an adequate supply of donor organs for clinical use.

People who observe the Jewish dietary laws (14–15) are forbidden to raise pigs or eat their meat. It might thus be argued that transplanting pig organs into observant Jews would be prohibited. This is not the case, however. Although Judaism prohibits the consumption of pork, it does not forbid deriving benefit from pork. Thus, for decades, the use by diabetics of insulin made from pork has been permissible in Jewish law, as is the use of porcine heart valves.

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Furthermore, Judaism is guided by the axioms of the supreme sanctity of human life and the dignity of man created in the image of God. The preservation of human life in Judaism is a divine commandment. To save a life, all religious laws are automatically suspended, the only exceptions being those forbidding idolatry, murder, and certain sexual relations such as incest or adultery (16). Thus, Judaism would certainly condone the transplantation of pig organs into Jewish recipients in order to save their lives.

There are other reasons why pig organ transplantation into humans is an important issue to address at this time. For a variety of medical, practical, ethical and financial reasons, most attention is being focused on the pig rather than on primates as the best donor of vascularized organs for human patients (17). It is available in large numbers; it is easy to breed and maintain; it is similar in anatomy and physiology to man; it is able to breed under pathogen-free conditions; and it is more likely to receive public acceptance than primates (13). With such a seemingly ideal source of organs, the prospects for the future of xenotransplantation are indeed promising and encouraging (18). This essay discusses some of the moral issues involved in xenotransplantation and presents a detailed exposition of the Jewish view on the use of animals, including the pig, in the service of mankind.

Ethical Issues in Xenotransplantation

The shortage of human cadaveric organs for transplantation is well recognized. In an effort to alleviate this shortage, better artificial organs are being more effectively and efficiently employed, along with the more frequent use of organs obtained from willing and suitable related and even unrelated living donors. However, each of these “solutions” is associated with a variety of practical, medical, and moral issues beyond the scope of this essay.

The use of animal organs as xenotransplants also raises a number of ethical issues. Is it moral to breed, raise and kill animals to provide organs for humans? Animals are already bred and killed for food, clothing and many other products, including a variety of medical materials. The use of porcine insulin or pig heart valves has been socially and morally acceptable for decades (19). Yet some people argue that animals have rights too and deserve equal consideration with human beings (20). They further argue that we should not raise animals for food or other products, or test new cosmetics on them. Animal rights

activists also oppose the use of animals for medical experimentation (21). Nonetheless, most people seem to believe that a human being is quite distinct from and far more valuable than any animal. And the reality is that several billion animals are killed annually for food, so that the death of a few thousand animals yearly, so that their organs can be used to save people’s lives, does not seem highly objectionable.

One can, of course, argue that xenotransplantation in humans is not ethically justifiable given the limitations of our current knowledge. Hastillo et al. (22) conclude that, because of these limitations, “this is a route not yet to trod.” However, progress in medical research has already provided insights into how immunological barriers to xenotransplantation might be overcome. In time, such research may well provide the knowledge needed for successful clinical trials.

Guidelines for the conduct of animal research and its oversight by institutional committees and regulatory agencies are already in place in most of the Western world. These include assurances that the research proposal is sound, that the need for animal subjects is minimized, and that the animals are maintained in humane conditions and killed without pain.

Informed consent must, of course, be obtained from the human patient being offered xenotransplantation, who must be told of its experimental nature and its chances for success and potential side effects. Some patients might reject the whole idea of cross-species transplantation as inhumane and degrading (23). These and other issues raised by the basic and clinical research aspects of xenotransplantation are discussed by Caplan (24), who concludes as follows:

The scarcity of organs and tissues from human sources is real, growing, and unlikely to be solved by any other alternative policies or approaches in the foreseeable future. If xenografting must be explored as an option, then the moral justification for doing basic and clinical research involving animals is that it would not be possible to learn about the feasibility of overcoming immunologic and physiologic problems without using animals, and that animals are to be used instead of human subjects whenever possible, since human beings have more moral worth than do animals. If xenografting evolves into a therapy, then provisions must be made for ensuring the welfare and health of the animals that would be bred, raised, and killed to supply organs and tissues to human beings.

Judaism's Prohibition of Cruelty to Animals

The Jewish attitude toward animals has always been governed by the consideration that they too are God's creatures and that *His tender mercies are over all His works* (Psalms 145:9). Not only is cruelty to animals prohibited, but humaneness, compassion and mercy to animals are demanded of man by God. God gives to the beast its food (Psalms 147:9) . . . causes the grass to spring up for the cattle (ibid. 104:14) . . . satisfies every living thing (ibid. 145:16), and preserves man and beast (ibid. 36:7). God's concern extends from the lion, king of the beasts, to the raven, one of the most despised of birds (Job 38: 39–41). When Moses obtained water from the rock by divine intervention, the water was to give drink to the congregation and their cattle (Numbers 20:8). One reason for the commandment to let the fields lie fallow in the Sabbatical year is that the food which grows naturally there during that year shall be for thy cattle and for the beasts that are in thy land . . . (Leviticus 25:7).

Animals must have their Sabbath rest the same as man (Exodus 20:10). In the repetition of the Decalogue in Deuteronomy, this teaching is reiterated (Deuteronomy 5:14), so that one of Britain's former chief rabbis (25) asserted that care and kindness to animals are of such profound importance for the humanizing of man that this duty has its place in the Decalogue. Thoughtfulness for animals as a religious duty is demonstrated in numerous biblical narratives. Rebekah proved that she was the proper wife for Isaac, son of Abraham the Patriarch, by the fact that she brought water not only for Abraham's servant Eliezer, but also for his camels (Genesis 24:14). The parable with which the prophet Nathan rebuked King David took for granted that a lamb can be a household pet to be treated kindly (2 Samuel 12:3). A righteous man is merciful and pays attention to the needs of his beast (Proverbs 12:10).

Numerous biblical commandments have as one possible explanation or allusion the prohibition of cruelty to animals. These include the prohibitions against muzzling an ox as it threshes, to deprive it of food while it is working (Deuteronomy 25:4), the slaughtering of an animal and its young on the same day (Leviticus 22:28), the eating of a limb cut off from a living animal (Genesis 9:4, Deuteronomy 12:23), as well as the command to release the mother bird from the nest before taking its young (Deuteronomy 22:6–7). The prohibition against muzzling the ox when he treads grain applies to

all animals employed in labor. In his biblical commentary on Deuteronomy 22:10, Rabbi Abraham Ibn Ezra suggests that the reason for not plowing with an ox and a donkey together is that the ox, being the stronger, would pull harder and thus cause pain to the donkey. Moses Maimonides explains some of these laws as follows (26):

It is likewise forbidden to slaughter [an animal] and its young on the same day (Leviticus 22:28), this being a precautionary measure in order to avoid slaughtering the young animal in front of its mother. For in these cases animals feel very great pain, there being no difference regarding this pain between man and the other animals. For the love and the tenderness of a mother for her child is not consequent upon reason, but upon the activity of the imaginative faculty, which is found in most animals just as it is found in man. This law applies in particular to ox and lamb, because these are the domestic animals that we are allowed to eat and that in most cases it is usual to eat . . .

Ancient biblical commentary suggests that Moses and David were chosen as leaders because God noted their gentle and understanding treatment of their flocks. For example, it is told how Moses, while still his father-in-law Jethro's shepherd, sought out a stray lamb and tenderly carried the tired creature in his arms back to the fold. A voice from Heaven cried out: "Thou art worthy to be My people's pastor" (Exodus Rabbah 2:2). When Balaam struck his donkey, an angel rebuked him, saying: *Wherefore hast thou smitten thine ass these three times?* (Numbers 22:32) This verse is a classical text for the preaching of humane treatment of animals. Castration or emasculation of animals is also prohibited (Leviticus 22:34).

The major biblical source for the prohibition of cruelty to animals is the law that if one sees an animal staggering under a burden too heavy for it, one must stop and help unload it, even if the animal belongs to one's enemy (Exodus 23:5). This law shows a humanitarian motive toward the animal and a charitable motive toward the enemy. The law is codified by Maimonides, who rules that a person is enjoined to unload the burden from an animal that is crouching under the weight of the burden even if the owner is not present with the animal and even if the animal belongs to a heathen (27). Maimonides explains the prohibition of cruelty to animals as follows:

As for the dictum of the sages: [To avoid causing] suffering to animals is [an injunction to be found] in the Torah — in which they refer to its dictum, *wherefore hast thou smitten thine ass?* (Numbers 22:32) — it is set down with a view to perfecting us so that we should not acquire moral habits of cruelty and should not inflict pain gratuitously without any utility, but that we should intend to be kind and merciful even with a chance animal . . . except in case of need — *Because thy soul desireth to eat flesh* (Deuteronomy 12:20), for we must not kill out of cruelty or for sport . . . (28).

Maimonides here clearly prohibits hunting for sport, accepting it only to satisfy hunger. In ancient times, however, some Jewish sects were strictly vegetarian. In fact, meat consumption is not sanctioned in Genesis until after the Flood. Man and animals were originally vegetarians according to the Talmud (Tractate Sanhedrin 59b), although the sacrificing of animals to God had been previously allowed (Genesis 1:29, 9:3). After Noah and his family saved the animals from extinction, God made a concession to man by giving him the right to consume meat (Genesis 9:3), provided the animals are humanely slaughtered. The Jewish method of ritual slaughter, particularly the laws that the knife be exceedingly sharp and without the slightest notch, is motivated by consideration for the animal, because this method is the most painless.

The Talmud, both in its legal (halachic) and homiletical (aggadic) portions, refers frequently to the mandate to be kind to animals and the prohibition of cruelty to animals. The Talmud states that wagonettes were made for rams so that their tails would not knock against rocks (Shabbat 54b). Furthermore, straps were placed on the legs of fowl to prevent the legs from knocking each other. A jaw bar was placed around the neck of a donkey with a bruise to prevent it from chafing it afresh and to allow it to heal (ibid.). After a ewe was sheared, a compress saturated in oil was placed on its forehead so that it should not catch cold. When a ewe kneeled for lambing, two oily compresses were made for her: one was placed on her forehead and the other on her womb so that she should be warmed. (ibid).

The Talmud also asserts that one helps fledglings ascend into or descend from a hen coop by overturning a basket for them in front of the coop (Shabbat 128b). One may assist an animal in giving birth on the Sabbath, and the newborn calf or

lamb or other baby animal is held so that it will not fall on the ground. One also blows into the baby animal's nostrils to clear them of mucus and puts the teat into its mouth so that it can suck (ibid.).

One may desecrate the Sabbath and Jewish holidays to relieve the suffering of an animal, since the prohibition of cruelty to animals is biblical and takes precedence over rabbinically enacted Sabbath laws. To save animals from suffering is regarded as a stronger reason for desecrating the Sabbath than to save oneself from personal loss (Shabbat 117b). A person should not buy an animal or a bird unless he can properly provide for it (Jerusalem Talmud, Ketubot 4:8). A man is forbidden to eat before he gives food to his beast (Berachot 40a and Gittin 62a). A man who confined his neighbor's animal in a place exposed to the sun so that it died of sunstroke was held liable (Sanhedrin 76a).

The story is told of a calf, taken to be slaughtered, that broke away and hid its head under the skirts of Rabbi Judah the Prince. He said to it: "Go, for this wast thou created." Thereupon they said in Heaven: "Since he has no pity, let us bring suffering upon him." So Rabbi Judah suffered from a toothache for thirteen years; he was cured when he saved the lives of a litter of kittens (Baba Metzia 85a).

Animal Experimentation in Jewish Law

Despite the central importance placed on kindness to animals in Jewish tradition, the forward-looking Rabbi Moses Isserles (1510–1572), known as Rama, ruled that any activity necessary for medical or other useful purposes is excluded from the prohibition of cruelty to animals (29). He made this ruling in the context of another central tradition in Jewish thought: that the world and everything in it was created by God to serve humanity and human needs. Jakobovits (30) noted that none of the 15th century sources upon which Isserles based his ruling actually specify any medical use to which living animals can be put. Nevertheless, all subsequent permissive rabbinic rulings on animal experimentation for medical research are based on this statement by Isserles that, for medical or other useful purposes, the prohibition of cruelty to animals does not apply.

In the 18th century, Rabbi Jacob Reischer (1670–1733) was asked whether or not a Jewish physician is permitted to test the effects of a new drug on an animal, such as a dog or cat, in order to discover whether it might prove injurious or

even fatal before applying it to human beings. His answer was strongly affirmative and was based on several earlier responsa (as was that of Isserles) that anything required for a useful purpose for mankind, including medical uses, is excluded from the biblical prohibitions of wanton destruction (based on Deuteronomy 20:19) and cruelty to animals (31). Reischer asserted that if the Sabbath must be desecrated to save a human life, the prohibition of cruelty to animals must also be set aside for the same reason.

In the 19th century, Rabbi Jacob Ettlinger (1798–1871) expressed the view, in accord with the permissive ruling of Isserles, that the prohibition of cruelty to animals is waived for any medical or useful purpose is limited to medical needs and is not valid for financial gain (32).

In the 20th century, rabbinic opinions have generally permitted animal experimentation for medical research, and the use of animals to save human lives. These opinions are cited and discussed in detail by Bleich (33), Friedman (34), Chaphutta (35), Steinberg (36), Metzger (37) and Cohen (38). These new rulings maintain the Jewish religious tradition that forbids any act which causes pain or discomfort to an animal unless that act satisfies a legitimate human need. Specifically, animal pain is “sanctioned only for medical purposes, including direct therapeutic benefit, medical experimentation of potential therapeutic value and the training of medical personnel” (33). Clearly, the use of animal organs, including those from pigs, to save human lives would be included in this list. One rabbinic responsum permits the raising of pigs for medical research (39). Otherwise there are no specific responsa on this issue yet. However, the principles of Jewish medical ethics discussed here make it highly probable that such responsa, if and when they are published, will rule permissively, in view of the life-saving nature of xenotransplants.

Summary and Conclusion

Judaism espouses the concept that everything that was created in this world by God was created to serve mankind. Thus, for example, certain animals, in accord with Jewish dietary laws, may be used for food, provided that they are humanely treated and slaughtered. Pigs are a noted exception with respect to their use as food by observant Jews. But the use of any animal as a source of hormones (e.g., insulin and growth hormone) or tissues for implantation (e.g., heart valves), or organs for transplantation to save human lives

would be sanctioned in Judaism. Ethical scientific experiments upon laboratory animals, in medical research that might lead to a cure for a disease, are also sanctioned in Jewish law as a legitimate utilization of all animals for the benefit of mankind. However, animal experimentation and related usage of animals is permissible in Jewish law only if its purpose is to obtain practical benefits for mankind and not simply the satisfaction of intellectual curiosity. And every effort must be made to eliminate or minimize the pain that might be experienced by these animals.

References

1. Hammer C. Xenotransplantation: State of the art. *Transplant Proc* 1993; 25(Suppl 3):35–37.
2. Starzl TE, Tzakis A, Fung JJ, et al. Prospects of clinical xenotransplantation. *Transplant Proc* 1994; 26:1082–1088.
3. Cooper DKC, Koren E, Oriol R. Clinical potential of xenotransplantation. *Transplant Proc* 1994; 26:1331–1332.
4. Millan MT, Ferran C, Winkler H, et al. Xenotransplantation: Problems and approaches. *Transplant Proc* 1994; 26:3593–3596.
5. Steele DJ, Auchincloss H Jr. Xenotransplantation. *Annu Rev Med* 1995; 46:345–360.
6. Michler RE, Chen JM, Rose EA. Cardiac xenotransplantation: Insurmountable barrier or clinical reality? *Adv Card Surg* 1994; 5:231–244.
7. Somerville CA, D'Apice AJF. Future directions in transplantation: Xenotransplantation. *Kidney Int* 1993; 44(Suppl 42): S-112–S-121.
8. Kaufman CL, Gaines BA, Ildstad S. Xenotransplantation. *Annu Rev Immunol* 1995; 13:339–367.
9. Chapman LE, Folks TM, Salomon DR, et al. Xenotransplantation and xenogeneic infections. *N Engl J Med* 1995; 333:1498–1501.
10. Paradis K, Langford G, Long Z, et al. Search for cross-species transmission of porcine endogenous retrovirus in patients treated with living pig tissue. *Science* 1999; 285:1236–1241.
11. Lu CY, Khair-El-Din TA, Davidson IA. Xenotransplantation. *FASEB J* 1994; 8:1122–1130.
12. Bach FH. Xenotransplantation: A view to the future. *Transplant Proc* 1993; 25:25–29.
13. Cooper DKC. Is xenotransplantation a realistic clinical option? *Transplant Proc* 1992; 24:2393–2396.
14. Roth C, editor. *Encyclopedia Judaica*, Vol. 6, Jerusalem: Keter; 1972. pp. 26–45.
15. Rosner F, translator. *Julius Preuss' biblical and talmudic medicine*. Northvale, NJ: Jason Aronson; 1993. pp. 501–506.
16. Rosner F. *Modern medicine and Jewish ethics*. 2nd ed. Hoboken, NJ and New York, NY: Ktav and Yeshiva University Press; 1991.
17. Doring A, Lechler RI. Prospects for xenografting. *Curr Opin Immunol* 1994; 6:765–769.
18. Najarian JD. Overview of *in vivo* xenotransplantation studies: Prospects for the future. *Transplant Proc* 1992; 24:733–738.
19. Dunning JJ, White DJG, Wallwork J. The rationale for xenotransplantation as a solution to the donor organ shortage. *Pathol Biol* 1994; 42:231–235.
20. Singer P. Xenotransplantation and speciesism. *Transplant Proc* 1992; 24:728–732.

21. Rosner F. Is animal experimentation being threatened by animal rights groups? *JAMA* 1985; 254:1942–1943.
22. Hastillo A, Hess ML. Heart xenografting: A route not yet to trod. *J Heart Lung Transplant* 1993; 12:3–4.
23. Hamma C, Molloy B. Ethical aspects in xenotransplantation. *Transplant Proc* 1993; 25(Suppl 3):38–40.
24. Caplan AL. Is xenografting morally wrong? *Transplant Proc* 1992; 24:722–727.
25. Hertz JH. *The Pentateuch and Haftorahs*. 2nd ed. London: Soncino Press; 1962. p. 767.
26. Maimonides M. *The guide of the perplexed*. Pines S, translator. Chicago: University of Chicago Press; 1963. Section 3:48.
27. Maimonides M. *The code of Maimonides: The book of torts*. Klein H., translator. New Haven (CT): Yale University Press; 1954. pp. 233–236.
28. Reference 26, Section 3:17.
29. Isserles M. In: *J Karo's Shulchan Aruch, Section Even Haezer 5:14*. New York: Grossman; 1954. p. 15.
30. Jakobovits I. The medical treatment of animals in Jewish law. *J Jewish Studies* 1956; 7:207–220.
31. Reischer J. *Responsa Shevut Yaakov, Part 3 No. 71*, Lemberg; 1860.
32. Ettinger J. *Responsa Binyan Zion, No. 108*, Altona; 1868.
33. Bleich JD. Animal experimentation. In: *Contemporary halakhic problems*. Vol. III. New York: Ktav and Yeshiva University Press; 1989. pp. 194–236.
34. Friedman NZ. *Nisuyim mada'eyem al gufoth ba'ale chayim [Scientific experiments on living creatures]*. Noam (Jerusalem) 1962; 5:188–194.
35. Chaphutta A. *Bedin tzar ba'ale chayim letzorchei refuah [On the law of cruelty to animals for medical needs]*. Noam (Jerusalem) 1961; 4:218–225.
36. Steinberg A. *Tzar ba'ale chayim le'ohr hahalachah [Cruelty to animals in Jewish law]*. In: *Assia*. Vol.1. Shaare-Zedek Hospital (Jerusalem) 1976; 1:263–269.
37. Metzger Z. *Nisuyim refuyim beba'ale chayim [Medical experiments on living animals]*. In: *Harefuah le'ohr hahalachah*. Jerusalem: Machon Lachakor Harefuah Behalachah [Institute for the Investigation of Medical Matters in Jewish Law]; 1983. pp. 1–50.
38. Cohen A. Animal experimentation. *J Halacha Contemp Soc*. New York: Jacob Joseph School; 1986. No. 11, pp. 19–32.
39. Aronson YM. *Responsa Yeshuat Moshe*. Self-Publication, 1983, vol. 3 #117, pp. 254–256.