Running head: BIOTECHNOLOGY: IS IT MORAL TO USE FOR HUMAN ENHANCEMENT?

Biotechnology: Is it moral to use for human enhancements?

Scott McBride, Sara Covington, Jennifer Appel, Ia Falo, Katie Griffis

Boise State University

Abstract

Biotechnology and its consequences (e.g., manipulating DNA, curing illnesses, and human therapeutic cloning) are becoming increasingly scrutinized by the American public. The purpose of the present study was to find out if Boise State students support the use of biotechnology and whether their attitudes differ based on their degree of religiosity. A survey was given to 56 psychology and math students to gather information on their knowledge of and their opinions about biotechnology and its uses. We hypothesized that students who are religious would be more opposed to biotechnology than individuals who identified as non-religious. In opposition to our hypothesis, religion did not have direct effect on how biotechnology was viewed.

Biotechnology: Is it moral to use for human enhancement?

The argument for whether or not biotechnology should be used for human enhancement has been going on for many years. With new technology and more recent discoveries in the science world, this issue has become an increasing problem. As the new discoveries being made motivate scientists to further explore and manipulate human DNA, questions surrounding this issue begin to rise: Is it humane for humans to be enhanced? Is it going against God to alter humans? Who are we to do God's work, or who are we to play God? In the literature review that follows, we will discuss arguments for and against biotechnology to better understand the controversy behind these important questions.

Arguments in Favor of Biotechnology

There are two main arguments in favor of using biotechnology for human enhancement. First, biotechnology can be used to cure disease or prevent diseases (Rollin, 2005). It can help make humans' bodies stronger and more durable to the world around us. In fact, researchers argue that human nature itself is improved through science and other various methods which in the end can have the possibility of increasing the human life-span, expanding our intelligence and physical capabilities, and giving us more control over our emotions by increasing mental stability (Bostrom, 2005). Furthermore, biotechnology used for these purposes has proven so far to be medically safe and effective (Bostrom & Ord, 2006).

The second argument in favor of biotechnology centers on medical enhancements. In other words, we could be genetically altering our children so that they will have no birth defects or any complications during labor. Just as sculptors create beautiful pieces of art by manipulating and molding clay, a baby could be altered and changed with the chiseling away of imperfections into a beautiful master piece (Rollin, 2005). Even the child's beauty could be established

depending upon the parent's desires (George, 2006). The enhancement of the child's capabilities and strengths could potentially create more opportunities and pathways, embedding a more prosperous future for the individual (Bostrom, 2005). These positive traits of the genetic alteration would then be passed on genetically, thereby improving the human race. Thus, our children would have superior traits to our own. The strength of the child or its intelligence could be controlled. Although opponents argue that we do not have the right to play God (Hefner, 2007), it is not necessarily a bad thing to better the human race. It is more along the lines of survival of the fittest, a different version of natural selection. The only difference is that humans are giving nature a hand in that selection (Rollin, 2005).

Arguments Against Biotechnology

There are three main arguments against biotechnology. The first argument centers around the moral issues involved: who are we to decide what nature does and does not alter? Nature was created by God, and who are we to play God or do God's work? What God has set forth and what he has created should be lived by what he made of it and not altered in any way (Hefner, 2007). What if the human race was not meant to be enhanced to be better? What if the whole purpose of having frail bodies was due to the fact of natural selection? Maybe the purpose of famine and disease is so that we would have a short life span so the world would not be over-populated and more controlled. Playing with genetics or altering them so that the human race can better itself may be a mistake in itself, leading to unforeseen consequences. For example, humans attempted to improve cows' milk using a genetically engineered growth hormone called BST. Unfortunately, this 'improvement' has been linked to prostate and breast cancer (Al-Hayani, 2007).

The second point of contention against biotechnology argues that nature has a way of

doing things on its own, and does not need human intervention. If something is not working or is unfit, nature has a way of getting rid of it by altering its nature or evolving it into something better. That is the essence of natural selection (Al-Hayani, 2007). The unnatural human enhancement eliminates natural selection, potentially "dehumanizing" the population, taking away the natural components that are valuable about being human (Bostrom, 2005).

The final argument against biotechnology involves the issue of genetically altering embryos. The human race is beginning to find technology that enables them to alter a baby in the embryonic stage and even go as far as tampering with the embryo's genetics. Opponents of biotechnology argue that parents should let children make their own decisions about who they want to be and how they grow up. Parents should not be allowed to 'design' their babies. From the first moment of creation, the embryo is as equal as any other human being alive. It holds the same moral status and therefore is and must be protected by virtue of the principle of dignity (Nippert, 2002). Furthermore, if we allowed such technology to be used to develop superior babies (e.g., into the 'perfect athlete'), this would raise the bar in the world of athletics (or whatever the realm in question was). How is that fair to all those who spend their entire life time trying to be the best? This would almost certainly be the creation to an entirely new race of athletes/scientists/artists/etc. and furthermore create a new race (Jones, 2006).

The Present Study

In sum, this is a hotly debated topic and there are likely many factors that influence which side a person favors. The present study will examine how one factor, religiosity, affects peoples' overall opinions on biological technology. Religious stance is an important element to an individual's moral, ethical, and social status. Religiosity potentially formulates the core belief system, creating a social structure in which you live and work by. Furthermore, if the belief of

God is instilled in our values and our cultural beliefs toward life, then biotechnology ignores our traditional religious guidelines on how humanity should be lived. God's will is to use only what he has given to us and not to alter or change what he has created (Hopkins, 2002). Thus, with religion and science in a constant battle, it is important to examine the relation between the two to better understand how individuals formulate their opinions on biotechnology.

The purpose of this study was to examine how religiosity affects a person's opinion about biotechnology and subjects within the field of biotechnology. It was hypothesized that individuals who self-identified as religious would be more opposed to biotechnology than would individuals who self-identified as non-religious.

Method

Participants

Participants in this study were 60 Boise State University students. Four participants had to be excluded from analyses due to improper survey completion or missing information. The 56 remaining participants were both males (N = 13) and females (N = 43); 85.7% were Caucasian, 7.1% were Hispanic, and 7.1% were Asian/Pacific Islander. Participant age ranged from 18 to 55, with a mean of 28.41 (*SD = 8.9*). Five participants did not report their age. Of the 56 participants, 66.1% (73.0% females, 27.0% males) self-identified as religious whereas 33.9% (84.2% females, 15.8% males) did not.

Measures

A survey was designed to assess eight basic demographic characteristics (e.g., age, major in school, ethnicity, religiosity/spirituality), as well as 36 items concerning how the participant felt about biotechnology and subjects within the field of biotechnology (see Appendix). Biotechnology questions were divided into two types: generalized questions that focused on how

much the participant knew about biotechnology and its elements (e.g., “If you had to rate your own basic understanding of science and technology, how would you rate it?;” “Are you aware of any consequences from using stem cells to enhance humans?”), and defined questions that emphasized specific biotechnologies (e.g., “Do you know what biotechnology is?;” “Do you feel that biotechnology is good or bad?”; see Appendix).

Procedure

The survey was given out to participants in two different Boise State University classes: Learning (Psyc 441) and Introduction to Mathematical Thought (Math 124). The participants were given instructions on how to fill out the survey and the answer sheet. The survey and answer sheets were linked together using an identification number. Participants were not linked to their survey or answer sheet. After the completion of the survey the data was analyzed using SPSS.

Results

Respondents were asked “Do you feel that biotechnology is good or bad?” Of the 37 respondents that self-identified as religious, 64.9% were unsure whether biotechnology was good or bad, 29.7% felt that biotechnology was good, and 5.4% felt that biotechnology was bad. Of the 19 respondents that self-identified non-religious, 68.4% were unsure whether biotechnology was good or bad, 26.3% felt that biotechnology was good, and 5.3% felt that biotechnology was bad.

When asked, “Do you feel that genetic engineering is good or bad?”, 62.2% of self-identified religious respondents had no opinion, 24.3% felt that genetic engineering was good, and 13.5% felt that genetic engineering was bad. Of the 19 respondents that self-identified non-religious, 47.4% were unsure whether genetic engineering was good or bad, 31.6% felt that

genetic engineering was good, and 21.1% felt that genetic engineering was bad.

Respondents were asked their feeling about human gene therapy. 64.9% of religious respondents had no opinion, 29.7% felt that human gene therapy was good, and 5.4% felt that human gene therapy was bad. Of the 19 respondents that self-identified non-religious, 78.9% were unsure whether human gene therapy was good or bad, 15.8% felt that human gene therapy was good, and 5.3% felt that human gene therapy was bad.

When asked about cloning, 37.8% of religious respondents were unsure if cloning was good or bad, 16.2% felt that cloning was good, and 45.9% felt that cloning was bad. Of the 19 respondents that self-identified non-religious, 47.4% were unsure whether cloning was good or bad, 21.1% felt that cloning was good, and 31.6% felt that cloning was bad.

Respondents were asked, “Do you feel that stem cell research is good or bad?” 56.8% of religious respondents had no opinion, 37.8% felt that stem cell research was good, and 5.4% felt that stem cell research was bad. Of the 19 respondents that self-identified non-religious, 31.6% were unsure whether stem cell research was good or bad, 68.4% felt that stem cell research was good, and none felt that stem cell research was bad.

When asked, “How much risk do you think developments in science and technology will have in the next 20 years?,” 40.5% of those the self-identified as religious responded that they felt that there is a high risk to the development of science and technology, and 37.8% felt that there is some risk to the development of science and technology. 47.4% of those the self-identified as non-religious responded that they felt that there is a high risk to the development of science and technology, and 31.6% felt that there is some risk to the development of science and technology. Table 1 shows a full break out of how respondents answered this question.

Respondents were asked “I think it is acceptable to use biotechnology for self

enhancement." Of the 37 respondents that self-identified as religious, 40.5% were neutral and 35.1% moderately disagree. Of the 19 respondents that self-identified as non-religious, 42.1% were neutral and 31.6% moderately disagree (see Table 2 for a full break out of how respondents answer this question).

When asked if they supported stem cell research, 18.9% of respondents that self-identified as religious moderately disagreed, 32.4% were neutral, and 18.9% moderately agreed. Of the 19 respondents that self-identified as non-religious 21.1% were neural, 42.1% moderately agreed, and 36.8% strongly agreed (see Table 3).

When asked if they think stem cell research should be used to help cure or treat genetic diseases, 21.6% of respondents that self-identified as religious were neutral, 40.5% moderately agreed, and 27.0% strongly agreed. Of the 19 respondents that self-identified as non-religious 26.3% were neural, 52.6% moderately agreed, and 15.8% strongly agreed (see Table 4).

Finally, when asked to respond to the statement, "It is immoral to use biotechnology to enhance human life," 24.3% of respondents that self-identified as religious moderately disagreed, 43.2% were neutral, and 16.2% moderately agreed. Of the 19 respondents that self-identified as non-religious 21.1% strongly disagreed, 31.6% moderately disagreed, and 36.8% were neutral (see Table 5).

Discussion

The purpose of this study was to observe how religiosity could affect a person's opinion concerning biotechnology. Biotechnology is an ongoing ethical debate which could have the potential to produce many ethical and moral questions (Scheitle, 2005). It was hypothesized that individuals who self-identified as religious would be more opposed to biotechnology than would individuals who self-identified as non-religious.

The results did not support our hypothesis. Religion, in fact, does not have a direct negative effect on how one would view biotechnology. It is interesting to note the majority of the religious population did not have an opinion, for or against biotechnology. It was actually found that overall, disregarding the neutral respondents; religious participants thought different biotechnology techniques were "good." In addition, most respondents were either neutral or agreed that different methods of biotechnology should be used in order to help cure or treat diseases. Interesting enough, not only were respondents neutral and agreeing with treating diseases with biotechnology, they were also neutral or agreeing to using biotechnology for "self-enhancement," as 40.5% moderately agreed it was acceptable. In reality, this shows that religious individuals agree, more than disagree, with biotechnology practices. Again, this goes against our hypothesis that religious individuals would oppose to biotechnology.

When it comes to religion, there is often an argument that biotechnology steps in God's territory or is going against God (Hopkins, 2002). However, research on this topic is limited (Scheitle, 2005). Our results indicated that, for the most part, participants were neutral about biotechnology practices. For example, when participants were asked, "Do you feel that biotechnology is good or bad?", the majority of the participants responded neutral, regardless of self-identified religiosity. When asked a more method-specific question, "Do you feel that stem cell research is good or bad?", again, the religious respondents reported a neutral opinion. Thus, there is little indication that self-identified religiosity was affecting a person's opinion on biotechnology.

Limitations

There are several limitations to this study. First, the small sample size may have limited the generalizability of the study. In addition, the majority an overwhelming number of participants were females and Caucasian, which may have further limited generalizability. Second, the survey itself was very short and only focused on a few types of biotechnology. In addition, some of the items in the survey should be re-written. For example, the first item in the survey could be modified to examine other factors that could influence a person's opinion about biotechnology (e.g., "what has played the greatest role in your opinion about biotechnology?" or "where have you learned about biotechnology?"). In addition, future research may wish to examine how levels of knowledge of different areas of biotechnology influence individuals' opinions about biotechnology. Third, the survey asked participants to disclose their religious or spiritual background. Many people find it hard to talk about this topic even when they know that the information is confidential. Thus people many opt not to answer this question, thus causing their data to be unusable.

Conclusion

Biotechnology is a controversial topic that affects the world as a whole. Supporters of biotechnology argue that being able to prevent or cure diseases and genetically alter our children by eliminating birth defects would bring great advances to our society (Rollin, 2005). However, on the other hand, opponents argue that humans do not have the right to play God, destroy the process of natural selection, or genetically alter embryos (Hefner, 2007). Based on the results of this study, participants responded overwhelmingly neutral to the questions regarding biotechnology within the survey. However, when disregarding the neutral responses, the results indicate that the participants that self-identified as religious were in favor of biotechnology and

subjects within biotechnology. Thus, contrary to our hypothesis, in general religious participants did not see a negative effect of biotechnology, but rather a positive acknowledgement of biotechnology in human enhancement. It is unclear whether religiosity is simply no longer a factor influencing individuals' opinions about biotechnology or whether the education level of the participants might have confounded our results. Although these results are encouraging, more research needs to be conducted outside of a college setting to see if religiosity or other variables (e.g., religious affiliation, education level, age, socioeconomic status, and region of the country) affect individuals' views on biotechnology in a non-collegiate environment. Regardless of the factors affecting views on biotechnology, as we learn more about this issue, it is likely that additional information about this topic could help shape individuals' opinions.

References

Al-Hayani, F. A. (2007). Biomedical ethics: Muslim perspectives on genetic modification. *Zygon: Journal of Religion & Science, 42,* 153-162.

Bostrom, N. (2005). In defense of posthuman dignity. *Bioethics, 19* (3) 202-214.

Bostrom, N., & Ord, T. (2006). The reversal test: Eliminating status quo bias in applied ethics. *Ethics, 116,* 656 - 679.

George, R. P. (2006, fall). Ethics, politics, and genetic knowledge. *Social Research, 73* (3), 1029-1032. *(George, 2006, pp. 1029-1032)* - what is this?

Hefner, P. (2007). Genetic frontiers: Challenges for humanity and our religious traditions. *Zygon: Journal of Religion & Science, 42,* 183-192.

Hopkins, P. D. (2002). Protecting god from science and technology: How religious criticisms of biotechnologies backfire. *Zygon: Journal of Religion & Science, 37,* 317-344.

Jones, D. G. (2006). Enhancement: Are ethicists excessively influenced by baseless speculations? *Medical Humanities, 32,* 77-81.

Nippert, I. (2002). The pros and cons of human therapeutic cloning in the. *Journal of Biotechnology, 98,* 53-60.

Rollin, B. E. (2005). Genetic engineering and the sacred. *Zygon: Journal of Religion & Science, 40,* 939-952.

Scheitle, C. P. (2005). In god we trust: Religion and optimism toward biotechnology. *Social Science Quarterly, 86,* 846-856.

Appendix

This survey will take approximately 10 – 20 minutes to complete. Your participation is voluntary. If you should come to any question that you do not wish to answer, just go on to the next question. To keep your responses anonymous, please do not put your name anywhere on the survey or answer sheet. Please complete all pages of the survey. If you come across a question you do not understand, please ask the Researcher for assistance. Participants need to be 18 years of age or older.

For the following questions please follow the instructions given to you by the Research Assistant. If you have any questions about those instructions please ask for assistance before marking your answer key. When filling in the answer sheet please use the indicated field for the answer. Some of your answers will be marked on the survey booklet. Make sure to fill in your Identification number found at the top of the survey booklet in the field marked "Identification number" on the answer sheet.

Age: _____

Gender

Male Female

Major: _____

Year in School

1st 2nd 3rd 4th 5 & more

Is this your first college degree?

Yes | No

(If no please indicate your other degrees in the space provided.)

_____

Race

Caucasian Hispanic Black Asian / Pacific Islander American Indian

Other

(If other please indicate here)

_____

Are you religious?

Yes | No

(If yes please indicate what denomination below)

Denomination

Other Christian | Catholic | Mormon/LDS | Jewish | Muslim/Islamic

Non-denominational | Buddhist | Other

(If other please indicate here)

_____

For the following section there will be three parts to the question. The first part will be whether you know about the given topic. The second part will be how much you feel you know about the given topic. The third part is your feelings about the given topic. Please answer all question to the best of you ability.

1. Do you know what biotechnology is?

Yes | No

2. Please rank on a scale of 0 to 9 how much you feel you know about the above topic, where 0 is nothing at all and 9 is a lot.

3. Do you feel that biotechnology is good or bad?

Good | Neutral | Bad

4. Do you know what genetic engineering is?

Yes | No

5. Please rank on a scale of 0 to 9 how much you feel you know about the above topic, where 0 is nothing at all and 9 is a lot.

6. Do you feel that genetic engineering is good or bad?

Good | Neutral | Bad

7. Do you think you understand the meaning of human gene therapy?

Yes | No

8. Please rank on a scale of 0 to 9 how much you feel you know about the above topic, where 0 is nothing at all and 9 is a lot.

9. Do you feel that human gene therapy is good or bad?

Good | Neutral | Bad

10. Do you know what cloning is?

Yes | No

11 Please rank on a scale of 0 to 9 how much you feel you know about the above topic, where 0 is nothing at all and 9 is a lot.

12. Do you feel that cloning is good or bad?

Good | Neutral | Bad

13. Do you know what stem cell research is?

Yes | No

14. Please rank on a scale of 0 to 9 how much you feel you know about the above topic, where 0 is nothing at all and 9 is a lot.

15. Do you feel that stem cell research is good or bad?

Good | Neutral | Bad

For the following questions please pay close attention to the scales as they do change from question to question. Please answer all of the following questions to the best of your ability.

16. If you had to rate your own basic understanding of science and technology, how would you rate it?

Poor | Fair | Average | Good | Excellent

19. Do you think that you understand the different types of biotechnology?

Yes | Somewhat | No

18. Are you aware of any benefits from using stem cells to enhance humans?

Yes | Somewhat | No

19. How much risk do you think developments in science and technology will have in the next 20 years?

None | Very little | Some | A little | A Lot

20. Do you feel that you are familiar with human enhancement using stem cells?

Yes | Somewhat | No

21. Are you aware of any consequences from using stem cells to enhance humans?

Yes | Somewhat | No

For the following indicate if you agree or disagree to the statement given. Please answer all questions.

22. It poses a danger to the environment to use genetic manipulation.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

23. As a student, I feel biotechnology directly concerns me.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

24. I think it is acceptable to use biotechnology for self enhancement.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

25. Genetic manipulation can improve the environment.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

26. I support stem cell research.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

27. Genetically engineered products pose a serious danger to the people and the environment.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

28. I think that stem cell research should be used to help cure or treat genetic diseases.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

29. I am opposed to certain aspects of stem cell research.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

30. I think that it is against human nature to apply biotechnology on humans.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

31. It is wrong to use biotechnology to prolong life.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

32. It is immoral to use biotechnology to enhance human life.

Strongly Disagree | Moderately Disagree | Neutral | Moderately Agree | Strongly Agree

For the following questions please rank on a scale of 0 to 9 your feelings about each topic given below, the question, where 0 is totally unacceptable and 9 is totally acceptable.

33. Where would you rank genetic manipulation of human cells in a laboratory?

34. Where would you rank genetic manipulation of animal cells in a laboratory?

35. Where would you rank genetic manipulation of plant cells in a laboratory?

36. Where would you rank genetic manipulation of bacteria in a laboratory?

Table 1

Count (and % within religious category) of responses to the question "How much risk do you think developments in science and technology will have in the next 20 years?"

Response	Religious	Non-Religious
None	1 (2.7%)	0 (0.0%)
Very little	1 (2.7%)	1 (5.3%)
Some	14 (37.8%)	6 (31.6%)
A little	6 (16.2%)	3 (15.8%)
A lot	15 (40.5%)	9 (47.4%)

Table 2

Count (and % within religious category) of responses to the question "I think it is acceptable to use biotechnology for self enhancement."

Response	Religious	Non-Religious
Strongly Disagree	5 (13.5%)	1 (5.3%)
Moderately Disagree	13 (35.1%)	6 (31.6%)
Neutral	15 (40.5%)	8 (42.1%)
Moderately Agree	3 (8.1%)	3 (15.8%)
Strongly Agree	1 (2.7%)	1 (5.3%)

Table 3

Count (and % within religious category) of responses to the question "I support stem cell research."

Response	Religious	Non-Religious
Strongly Disagree	3 (8.1%)	0 (0%)
Moderately Disagree	7 (18.9%)	0 (0%)
Neutral	12 (32.4%)	4 (21.1%)
Moderately Agree	7 (18.9%)	8 (42.1%)
Strongly Agree	8 (21.6%)	7 (36.8%)

Table 4

Count (and % within religious category) of responses to the question "I think that stem cell research should be used to help cure or treat genetic diseases."

Response	Religious	Non-Religious
Strongly Disagree	1 (2.7%)	0 (0%)
Moderately Disagree	3 (8.1%)	1 (5.3%)
Neutral	8 (21.6%)	5 (26.3%)
Moderately Agree	15 (40.5%)	10 (52.6%)
Strongly Agree	10 (27.0%)	3 (15.8%)

Table 5

Count (and % within religious category) of responses to the question "It is immoral to use biotechnology to enhance human life."

Response	Religious	Non-Religious
Strongly Disagree	4 (10.8%)	4 (21.1%)
Moderately Disagree	9 (24.3%)	6 (31.6%)
Neutral	16 (43.2%)	7 (36.8%)
Moderately Agree	6 (16.2%)	1 (5.3%)
Strongly Agree	2 (5.4%)	1 (5.3%)