

Korean Perspectives on Stem Cell Research: A Nation-wide Survey

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Abstract

The scandal of Dr. Woo-Suk Hwang's fabricated research paper in 2005 increased the Korean general public's awareness of the importance of bioethics and research ethics in the stem cell research. In 2008, the Bioethics Policy Research Center(BPRC) conducted a survey to find out public opinions regarding this issue. The result of the survey provides the overview of the general public's current understanding and perspectives toward the stem cell research and other researches using SCNT stem cell or the technique of nuclear transfer between different species. Most respondents indicated that they agreed with carrying out the "Somatic Cell Nuclear Transfer(SCNT)" stem cell research, although they showed the opinion of somewhat disappointed with the performance of the SCNT stem cell research. However, more than half of the respondents "strongly disagreed" or "disagreed" with the nuclear transfer between different species regardless of the religion, age or gender. Concerning human egg donation, many respondents indicated that the human egg donation could be allowed for some

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specific purposes such as the treatment for infertility, but sharply divided opinions were captured in this survey on the issue of giving monetary compensation to egg donors.

Keywords

stem cell research, bioethical issues, human embryo

I. Introduction

The development of stem cell technologies may provide a promising treatment for current incurable illnesses such as Parkinson's disease, while it also raises ethical concerns such as the destruction of embryos and the possibility of human cloning. However, most Korean people were actually indifferent to the issues for the technology had seemed to promise the future wealth and prosperity of the nation.

The scandal over Dr. Woo-Suk Hwang's fabricated 2005 research paper in *Science* was a significant epoch for the biomedical research in South Korea. After then, the public as well as the government recognized the importance of bioethics and research ethics in the sensitive scientific field of stem cell research.¹ Accordingly numbers of efforts have been made to promote the ethical level of the scientists and bioethics literacy of the general public by the government and professional societies.

The Bioethics Policy Research Center (BPRC),² which was designated by the Korean Ministry of Health, Welfare, and Family Affairs, is located at the center of these efforts. One of the BPRC's missions is following up the general public's perspectives on the advanced biotechnology to help the government and bioethics researchers understand the current Korean situation for biotechnology and bioethics. This survey, which was

conducted by the BPRC for the purpose of providing basic data for establishing the bioethics policy regarding stem cell research in Korea, shows well the current understandings and perspectives of the Korean public toward stem cell research including “therapeutic cloning.”

II. Material and Methods

The target population of the survey (1,000 Korean men and women in their 20~70 years old) were finally selected based on the resident registration statistics of Korea in May 2008, and they were distributed equally according to their gender, age, and the location of residence. The questionnaire was prepared by selecting ethical issues regarding stem cell research which were to be tailored for telephone survey. The actual survey was conducted by the BPRC with the help of a professional survey institute (the Hyundai Research Institute) from Oct. 21st until Oct. 24 2008 using a computer assisted telephone interviewing (CATI) method.

In detailed questions, the respondents were asked if they agree or disagree with the stem cell research related issues such as the research using spare human embryos, cloning human embryo by somatic cell nuclear transfer technique and nuclear transfer between human and different animal species. The questionnaire also included the items about the acceptance of the human egg donation and its permissible purposes, the monetary incentive for the egg donation, and willingness to donate their own germ cells. The number of total items was 6. For statistical purposes, we added additional questions about the respondents' education level and religion.

Collected data were processed through Editing-Coding-Punching-Programming and analyzed by using SPSS for windows (v.10.0).

III. Results

1. Demographic Features of the Respondents

1,000 male and female adult respondents were selected on the statistics derived from the resident registration using a sampling method. Gender, age, and the area of residence were considered to match with the distribution of the population. Demographic features of the respondents are as follows. (Table 1)

(Table 1) Demographic Features of the Survey Respondents

	Variables	Frequency	%
Gender	Male	506	50.6
	Female	494	49.4
Age	20-30	196	19.6
	30-40	250	25.0
	40-50	259	25.9
	50-60	182	18.2
	60-70	113	11.3
Education level	High school graduate or lower	498	49.8
	College graduate or higher	502	50.2
Religion	Protestant	283	28.3
	Buddhist	195	19.5
	Roman Catholic	86	8.6
	Others(Confucianism)	15	1.5
	No religion	421	42.1

2. Perspectives on the Researches using Spare Embryos

Among the numbers of ethical issues regarding human embryonic and

stem cell research, the question about the perspective on the researches using spare embryos was asked first. In Korea, many infertile couples tried to have a child by surgical treatment, and accordingly the numbers of infertility clinics and couples giving birth via in vitro fertilization (IVF) are increasing. As a result, embryo producing medical institutions and embryo research centers of Korea keep over hundred thousand spare embryos from IVF procedures in their facilities.³ Many scientists are interested in embryonic stem cell research because they believe that it has a potential to overcome current incurable diseases. Yet this kind of research poses ethical questions concerning the destruction of embryos that might be born as human if transplanted to human uterus.⁴ Therefore, we asked the respondents whether they agreed or disagreed to the use of the spare embryos from IVF procedures for stem cell research purposes.

The distribution of the responses is shown in <Table 2>. About half (49.2%) of the respondents agreed with the research while 27.1% disagreed. 16.0% said that they were “neutral.” There was a significant difference in responses between genders ($p=0.00$), with male respondents being more permissive toward researches using the spare embryos. 41.3% of female respondents agreed to the use of residual embryos, whereas 57.0% of male respondents agreed. Furthermore, women leaned more to ‘generally agree (34.0%)’ than to ‘highly agree (7.3%),’ but men responded in relatively high proportion to both ‘highly agree (20.8%)’ and ‘generally disagree (36.2%).’

There were also significant differences in responses between religions ($p=0.003$). The responses of Protestants and Catholics were similar in proportion, with 12.4% and 12.8%, respectively, responding to “highly agree,” 32.9% and 32.6% to “generally agree,” 17.0% and 16.3% to “generally disagree,” and 15.5% and 22.1% to “highly disagree.” On the other hand, Buddhists and the respondents with no religion had slightly

〈Table 2〉 Research using Spare Human Embryos

		Highly agree	Generally agree	Neutral	Generally disagree	Highly disagree	No response	P-Value
Total (%)		141 (14.1)	351 (35.1)	160 (16.0)	158 (15.8)	113 (11.3)	77 (7.7)	
Gender (%)	Male	105 (20.8)	183 (36.2)	49 (9.7)	75 (14.8)	60 (11.9)	34 (6.7)	.000***
	Female	36 (7.3)	168 (34.0)	111 (22.5)	83 (16.8)	53 (10.7)	43 (8.7)	
Age (%)	Below 40s	44 (9.9)	178 (39.9)	75 (16.8)	80 (17.9)	52 (11.7)	17 (3.8)	.000***
	40s~60s	77 (17.5)	134 (30.4)	71 (16.1)	64 (14.5)	46 (10.4)	49 (11.1)	
	Over 60s	20 (17.7)	39 (34.5)	14 (12.4)	14 (12.4)	15 (13.3)	11 (9.7)	
Education Level(%)	High School and Below	64 (12.9)	149 (29.9)	93 (18.7)	80 (16.1)	56 (11.2)	56 (11.2)	.000***
	Over College	77 (15.3)	202 (40.2)	67 (13.3)	78 (15.5)	57 (11.4)	21 (4.2)	
Religion (%)	Protestants	35 (12.4)	93 (32.9)	46 (16.3)	48 (17.0)	44 (15.5)	17 (6.0)	.003
	Buddhists	30 (15.4)	74 (37.9)	31 (15.9)	37 (19.0)	8 (4.1)	15 (7.7)	
	Catholics	11 (12.8)	28 (32.6)	10 (11.6)	14 (16.3)	19 (22.1)	4 (4.7)	
	Others	5 (33.3)	2 (13.3)	2 (13.3)	1 (6.7)	3 (20.0)	2 (13.3)	
	No religion	60 (14.3)	154 (36.6)	71 (16.9)	58 (13.8)	39 (9.3)	39 (9.3)	

different views toward this question. Among Buddhists, 15.4% highly agreed, 37.9% generally agreed, 19.0% generally disagreed, and 4.1% highly disagreed. Among the respondents with no religion, 14.3% “highly agreed,” 36.6% “generally agreed,” 13.8% “generally disagreed” and 9.3% “highly disagreed.” Buddhists and the respondents without religion tended to agree to the researches using spare human embryos, and relatively small portion of them responded to “highly disagreed.” In different age groups, older respondents shows more positive attitude to the research compared with the younger group ($p=0.00$). The positive attitude also appeared in better educated group of respondents ($p=0.00$).

3. Perspectives on Human Embryonic Stem Cell Research by Somatic Cell Nuclear Transfer Technique. (SCNT stem cell research)

Before asking questions to the respondents on SCNT stem cell research, the interviewer briefly explained about the research as research on human embryo made by eliminating the nucleus in a human egg cell and transplanting the nucleus of another cell. The potential benefit as medical treatment for incurable disease was explained and so was the potential risk as the birth of human clone if the embryo is transplanted into a uterus. After explaining the benefit/risk, the question was asked to the respondents if they were for or against somatic cell cloning embryo research.

9.9% of respondents “highly agreed,” 27% “generally agreed,” 13.2% “neutral,” 26% “generally disagreed,” and 20.2% “highly disagreed.” Overall, the results showed 36.9% agreement and 46.2% disagreement. As in the responses about the research using spare embryos, there was a significant difference according to the gender ($p=0.00$); male respondents were more permissive about the SCNT stem cell research than females.

For education level, the better educated respondents (over college) agreed more with the research than the less educated group (42.7% vs. 31.1%). Buddhist group and no-religion group showed more preference for the research (37.5% and 41.8% agree respectively) rather than Protestant and Catholic groups (30.4% and 30.3% agree respectively). But all the religious groups showed a negative attitude toward the SCNT stem cell research, while no-religion group slightly more agreed with the research. There was no significant difference between the age groups (p=0.36). (Table 3)

Table 3) SCNT Stem Cell Research

		Highly agree	Generally agree	Neutral	Generally disagree	Highly disagree	No response	P-Value
Total (%)		99 (9.9)	270 (27.0)	132 (13.2)	260 (26.0)	202 (20.2)	37 (3.7)	
Gender (%)	Male	74 (14.6)	157 (31.0)	48 (9.5)	121 (23.9)	90 (17.8)	16 (3.2)	.000***
	Female	25 (5.1)	113 (22.9)	84 (17)	139 (28.1)	112 (22.7)	21 (4.3)	
Age (%)	Below 40s	31 (7.0)	124 (27.8)	60 (13.5)	138 (30.9)	81 (18.2)	12 (2.7)	0.36
	Over 40s below 60s	54 (12.2)	115 (26.1)	59 (13.4)	98 (22.2)	96 (21.8)	19 (4.3)	
	Over 60s	14 (12.4)	31 (27.4)	13 (11.5)	24 (21.2)	25 (22.1)	6 (5.3)	
Education Level(%)	High School and Below	40 (8.0)	115 (23.1)	60 (12.0)	131 (26.3)	123 (24.7)	29 (5.8)	.000***
	Over College	59 (11.8)	155 (30.9)	72 (14.3)	129 (25.7)	79 (15.7)	8 (1.6)	
Religion (%)	Protestants	20 (7.1)	66 (23.3)	35 (12.4)	73 (25.8)	82 (29.0)	7 (2.5)	

Buddhists	20 (10.3)	53 (27.2)	30 (15.4)	56 (28.7)	32 (16.4)	4 (2.1)	.000***
Catholics	7 (8.1)	19 (22.1)	6 (7.0)	23 (26.7)	27 (31.4)	4 (4.7)	
Others	4 (26.7)	4 (26.7)	0 (0)	2 (13.3)	5 (33.3)	0 (0)	
No religion	48 (11.4)	128 (30.4)	61 (14.5)	106 (25.2)	56 (13.3)	22 (5.2)	

4. Perspectives on the Research of Nuclear Transfer between Different Species

Some ethical concerns arise regarding the research of nuclear transfer between different species. The research requires living human egg from female donors and it may be harmful do the donor’s health. In addition, the status of the embryo which is to be produced by the technique is ambiguous because its genetic substance is from other non human species. Such ambiguity may infringe the human dignity seriously in a specific moral and religious context.

For the question about the research of nuclear transfer from other nonhuman animals, 74.4% of the respondents answered negatively (25.3% “generally disagree,” 49.1% “highly disagree”).

But the strength of the negativity is different according to the variables of gender, education level, and religion. Although negative responses were dominant, but male respondents and more educated group showed more positive attitude toward the research than females and less educated group (23.7% vs. 10.5%, 20.5% vs. 13.8%). Strong negative responses were more apparent in the Protestant group (60.8%) than the Buddhists (46.2%), Catholics (47.7%), and no-religion group

(43.2%). There was no significant difference between age groups. (Table 4)

(Table 4) Nuclear Transfer between different species

		Highly agree	Generally agree	Neutral	Generally disagree	Highly disagree	No response	P-Value
Total (%)		44 (4.3)	129 (12.9)	62 (6.2)	253 (25.3)	491 (49.1)	22 (2.2)	
Gender (%)	Male	34 (6.7)	86 (17.0)	30 (5.9)	122 (24.1)	227 (44.9)	7 (1.4)	.000***
	Female	9 (1.8)	43 (8.7)	32 (6.5)	131 (26.5)	264 (53.4)	15 (3.0)	
Age (%)	Below 30s	17 (3.8)	60 (13.5)	30 (6.7)	127 (28.5)	205 (46.0)	7 (1.6)	.113
	Over 40s below 60s	22 (5.0)	58 (13.2)	30 (6.8)	103 (23.4)	217 (49.2)	11 (2.5)	
	Over 60s	4 (3.5)	11 (9.7)	2 (1.8)	23 (20.4)	69 (61.1)	4 (3.5)	
Education Level(%)	Below High school	20 (4.0)	49 (9.8)	28 (5.6)	121 (24.3)	264 (53.0)	16 (3.2)	.007
	Over College	23 (4.6)	80 (15.9)	34 (6.8)	132 (26.3)	227 (45.2)	6 (1.2)	
Religion (%)	Protestants	8 (2.8)	22 (7.8)	9 (3.2)	68 (24.0)	172 (60.8)	4 (1.4)	.000***
	Buddhists	5 (2.6)	22 (11.3)	16 (8.2)	55 (28.2)	90 (46.2)	7 (3.6)	
	Catholics	3 (3.5)	13 (15.1)	8 (9.3)	17 (19.8)	41 (47.7)	4 (4.7)	
	Others	4 (26.7)	3 (20.0)	0 (0)	2 (13.3)	6 (40.0)	0 (0)	
	No religion	43 (5.5)	129 (16.4)	62 (6.9)	253 (26.4)	182 (43.2)	22 (1.7)	

5. Allowance of Human Egg (Oocyte) Donation

The revised Bioethics and Safety Act of Korea includes provisions allowing oocyte donation for infertility treatment and research purpose.⁵ But the provisions are still in harsh debates and criticized by many groups. For the question about the allowance of human egg, 22.6% of the respondents agreed with the donation for infertility treatment and research purpose, 40.8% only for the infertility treatment, and 15.6% only for the research purpose. 17.7% of the respondents were opposed to the donation of oocytes for any purpose.

The majority of the female respondents (49.6%) answered that human egg should be donated only for infertility treatment, while the male respondents showed a different view; the rate of the respondents who thought that it is possible to donate human eggs for both research and treatment purpose was higher in males than females (28.5% vs. 16.6%).

The differences of opinions were witnessed in different age, education level, and religion groups. The older age groups were opposed to human egg donation compared with the younger group (25.7%, 19.0%, and 14.3% respectively). The Less educated group was opposed to the donation compared with the better educated group (20.1% vs. 15.3%). Protestant group was opposed to the donation compared with other religion groups. <Table 5>

〈Table 5〉 Allowance of Human Egg Donation

		Allowed to donate eggs for infertility treatment & research purposes	Allowed to donate eggs for infertility treatment	Allowed to donate eggs for research purposes	Opposed to any donations of oocytes	No response	P-Value
Total (%)		226 (22.6)	408 (40.8)	156 (15.6)	177 (17.7)	33 (3.3)	
Gender (%)	Male	144 (28.5)	163 (32.3)	94 (18.6)	92 (18.2)	13 (2.6)	.000
	Female	82 (16.6)	245 (49.6)	62 (12.6)	85 (17.2)	20 (4)	
Age (%)	Below 40s	121 (27.1)	209 (46.9)	44 (9.9)	64 (14.3)	8 (1.8)	.000
	Over 40s below 60s	97 (22.0)	165 (37.4)	82 (18.6)	84 (19.0)	13 (2.9)	
	Over 60s	8 (7.1)	34 (30.1)	30 (26.5)	29 (25.7)	12 (10.6)	
Education Level(%)	Below High school	78 (15.7)	206 (41.4)	92 (18.5)	100 (20.1)	22 (4.4)	.000
	Over College	148 (29.5)	202 (40.2)	64 (12.7)	77 (15.3)	11 (2.2)	
Religion (%)	Protestants	65 (23.0)	101 (35.7)	37 (13.1)	72 (25.4)	8 (2.8)	.009
	Buddhists	33 (16.9)	93 (47.7)	28 (14.4)	31 (15.9)	10 (5.1)	
	Catholics	17 (19.8)	34 (39.5)	15 (17.4)	15 (17.4)	5 (5.8)	
	Others	5 (33.3)	5 (33.3)	2 (13.3)	2 (13.3)	1 (6.7)	
	No religion	106 (25.2)	175 (41.6)	74 (17.6)	57 (13.5)	9 (2.1)	

6. Monetary Compensation for Oocyte Donation

Human egg donation is a difficult and sometimes risky procedure. So unless some monetary compensation beyond the real cost for the procedure, very few women will donate their eggs for the purpose of research or infertility treatment. But such compensation could pose an ethical risk of exploiting women in economically hard situation.⁶ The Bioethics and Safety Act of Korea permits the infertility clinics or research institutions provide only the actual cost for the egg procurement.⁷

Overall, 45.2% of respondents agreed with the monetary compensation for the human egg donation, while 37.3% disagreed. Male respondents more advocated the compensation(51.2% vs. 34.8%) while female respondents were roughly split in their responses(39.0% vs. 39.8%). Buddhists were most positive to the compensation(53.8%) than Protestants(42.0%) and Catholics(33.7%). Among Catholic group, the negative responses were more prevalent than positive. There are no significant difference between different age and education level groups. <Table 6>

<Table 6> Monetary Compensation for Oocyte Donation

		Agree	Neutral	Disagree	No response	P-Value
Total (%)		452 (45.2)	140 (14.0)	373 (37.3)	35 (3.5)	
Gender (%)	Male	259 (51.2)	52 (10.3)	176 (34.8)	19 (3.8)	.000
	Female	193 (39.1)	88 (17.8)	197 (39.9)	16 (3.2)	

Age (%)	Below 30s (27.1)	206 (46.9)	63 (9.9)	166 (14.3)	11 (1.8)	.639
	Over 40s below 60s	196 (44.4)	63 (14.3)	165 (37.4)	17 (3.9)	
	Over 60s	50 (44.2)	14 (12.4)	42 (37.2)	7 (6.2)	
Education Level(%)	Below High school	218 (43.8)	80 (16.1)	175 (35.1)	25 (5.0)	.010
	Over College	234 (46.6)	60 (12.0)	198 (39.4)	10 (2.0)	
Religion (%)	Protestants	119 (42.0)	40 (14.1)	113 (39.9)	11 (3.9)	.005
	Buddhists	105 (53.8)	32 (16.4)	54 (27.7)	4 (2.1)	
	Catholics	29 (33.7)	6 (7.0)	49 (57.0)	2 (2.3)	
	Others	6 (40.0)	2 (13.3)	7 (46.7)	0 (0)	
	No religion	193 (45.8)	60 (14.3)	150 (35.6)	18 (4.3)	

IV. Conclusion

After the stem cell research scandal in 2005, most Korean people still persist on the belief of the possible benefits of stem cell research and seem to be affirmative in the research using spare human embryos in spite of its related ethical concerns. The belief is much stronger in male, older, better educated, and Buddhist/no-religion group. However, for the research using somatic cell nuclear transfer technique (SCNT stem cell research),

the rate of negative response was higher than that of the positive. It may reflect the “disappointment” of Korean people on the research after the stem cell research scandal. When Dr. Hwang enjoyed his great popularity as a national scientist before 2005, most Korean people agreed with the research (so called “therapeutic cloning”).⁸ But many people(36.9% of the respondents) still agree with the research and the gap between the positive and the negative group is not so large. As current Korean regulation permits the research, the result suggests that there still exist a possibility of conflict of public opinion about the issue now. For this issue, male, older, better educated, Buddhist/no-religion group were much affirmative. However, for the issue of “nuclear transfer between different species(so called “production of chimera”),” most respondents showed a negative response. Most people seem to think it a morally repugnant idea because in Korea, strongly influenced by Neo-Confucianism over 600 years, the borderline between human and animal is naturally apparent. In the mind of Korean people, the human is the unique spiritual being rather than one of the creatures.⁹ For human egg donation, most respondents thought it could be feasible for some reasons. The commonest reason is the purpose of infertility treatment and the next one is for “infertility treatment and research.” In Korea, infertility is granted as a serious problem affecting the whole family life not to mention of the individual couple. One of the backgrounds of permissibility of the human egg donation for infertility treatment is the low estimation of the genetic contribution from the mother’s side(egg) to bear a child. Traditionally the metaphor of seed(man) and soil(woman) dominates the Korean mind, and the contribution of women for reproduction is from the womb, not the egg. Therefore a new born baby has been generally granted to follow the paternal lineage regardless of the maternal origin. This attitude suggests that it could be possible to bear a child with the eggs from the other

woman in case of infertility.

However, for the monetary compensation for the donation of eggs, the opinions of the respondents were shapely separated. It is not so easy to determine whether the monetary compensation is a kind of exploitation of vulnerable donors or not. It needs further interpretation and evaluation in Korean context in the future.

Among the 4 variables-gender, age, education level, and religion, the most consistent factor influencing the result is “gender.” Women showed more “reserved” response to all questions in the survey rather than men. It may be due to the fact that stem cell research using human eggs or embryos is more direct relationship to women’s body; they tend to feel the issues of hers, not an abstract scientific one. Different responses according to different religion are also apparent. But for certain issue, the difference is not as big as expected. Among the Catholics, who are expected to be strongly against human embryonic stem cell research, the rate of positive response to stem cell research using spare embryo was 45.4%. The result requires further investigation.

In conclusion, Korean people think it is ethically possible to conduct human embryonic stem cell research using spare embryos. But for the other issues such as “therapeutic cloning”, “nuclear transfer between different species”, and monetary compensation for human egg donation they maintain a very prudent position. More discussions, public education, and civil consensus should be made to prepare an appropriate regulatory system for such issues in Korea.

NOTES

1. The National Bioethics Committee. The National Bioethics Committee’s report on

- bioethical problems in Hwang Woo-Suk research. Bioethics Policy Research Center. 2008.
2. The Bioethics Policy Research Center (BPRC) in Korea was established in July, 2006 as an information and communication center playing a role in research on ethical and legal issues of biomedicine, public health and medicine. The BPRC has served as a facilitator which promotes discourse among the government, civilians, bioethicists, and researchers of biomedicine, which will eventually contribute to social consensus on bioethics policies among domestic and international societies.
 3. The number of the embryo producing institutions was 145 at Feb. 2009 in Korea. <http://www.nih.go.kr/nihhome/jsp/home/introduction/sciencect/Science.jsp>
 4. According to the conception view in which a human organism comes into existence at its conception or fertilization, a fertilized human egg, or human zygote is a human being with holding the same moral status as of any other human being. Many ethics problems and controversial issues have been raised from this point. Bonnie Steinbock, Moral Status, Moral Value, and human Embryos, *The Oxford Handbook of Bioethics*, Oxford University Press, 2007, pp. 420-422.
 5. Bioethics and Safety Act. Article 13 and Article 21.
 6. In Denmark, the monetary compensation is paid to egg donors according to the following provision of the law. § 268 stk 2. It is not allowed to give payment or other kind of economic compensation in relation to donation of oocytes. However, in the guidance from the National Board of Health stk 7.1.4 it emerges that donors are allowed to receive 500 Dkk (64 eur) to compensate for inconvenience related to the donation.(Law no.535 § 268 stk 2.)
 7. Bioethics and Safety Act. Article 5-3. Article 5.3 : Compensation for Oocyte Donors ① Pursuant to article 15.4 of the Act, the Embryo Producing Medical Institution may compensate oocyte donors for the following expenses to cover the actual costs:
 1. Transportation; 2. Meals; 3. Accommodation; and 4. Compensation for the time spent for treatment and recovery
 8. According to a survey by Gallop Korea, 67.4% of Korean people agreed with Dr.Hwang's stem cell research in spite of critics in 2005. Gallup Report : National Survey on Embryonic Stem Cell Research. July 2005.
 - 9 Jansen B, Simon W eds. *Xenotransplantation: Ethical, Legal, Economic, Social,*

Cultural and Scientific Background, Vol. 5, Meidenabuer Martin, 2010.; Ivo Kwon.
“Korean Perspective on Xenotransplantation: Ethical and Cultural View.”