

## Original Research Article

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## Animal Scientists and Students Perception toward Stem Cell Research

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### ABSTRACT

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Stem cell research has been extensively explored worldwide to enhance human health. Nevertheless, there is currently no full understanding of the perception toward stem cell research among veterinarians in India. This study aimed to assess the perception toward stem cell research, and associated factors with, among at Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar students as well as scientists. Perception in this study was conceptualized as positive or negative inclination towards acceptance of stem cell research. A schedule containing 27 statements was used to assess the perception of respondents about xenotransplantation. Mean score of all the respondents was 62.47 indicating a strongly favourable perception about stem cell research. Further, more than half of respondents were having favourable perception. The remaining respondents exhibited strongly favourable perception about stem cell research. Age, gender educational qualification, belief in animal mind, agreeableness conscientiousness was found significantly associated with the perception about stem cell research.

### Introduction

Stem cells are undifferentiated cells with the ability to divide and give rise to identical and undifferentiated cells (Acharya, 2013). As central utility and repair units of the human body, stem cells maintain and regenerate the organs and tissues in the body. Human embryonic stem cells can be programmed to treat a great variety of health problems, such as AIDS, diabetes, and Parkinson's disease (Johnson, 2004). Stem cell research has great

promise. However, heated debate regarding the ethical boundaries of scientific research (Brock, 2011) threaten to limit its possible benefits. However, their use is not without ethical dilemmas. The first set of critical issues involves - defining when the life begins and determining the rights and privileges of an early embryo (sometimes called a pre-embryo). Noonan *et al.*, (1970) consider that an embryo is a living entity whether or not it is endowed with human qualities. Therefore, its destruction for the purpose of retrieving stem

cells is absolutely unacceptable to some (ibid). However, the idea is acceptable and even mandatory to others though within certain boundaries (for example Balint, 2001). Although there is general agreement that an embryo, because it is a living entity and a potential human, deserves respect, but some have questioned how this can be achieved if the embryo is in fact destroyed (Meyer *et al.*, 2001). Shirley *et al.*, (2008) conducted a study to examine public attitudes toward stem cell research, they found that older Americans and those with higher household income were likely to indicate support for human embryonic stem cell research. Notably, education levels were strongly positively related to support for embryonic stem cell research. On the contrary Anekwe (2002) conducted a study and they found that most respondents from all groups surveyed opposed stem cell research. Neither education nor religion was a major determinant in the opposition to stem cell research. The aim of this study was to explore the perception, and factors affecting these perception, of veterinary student as well as scientists concerning stem cell research.

### **Materials and Methods**

The study was conducted at Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar. All the animal scientists at LUVAS, Hisar were taken as universe for the sample. A sample of 50 members was drawn randomly by simple lottery method. Similarly, a sample of 120 students (100 undergraduates and 20 postgraduate) was drawn. The list of undergraduate students in each class was obtained and 20 students were randomly chosen using simple lottery method. Similarly, a list of all Post-graduate students was prepared. Then 20 students were randomly selected for the study. Thus, the total number of respondents were 170. The antecedent variables likely to affect students' and

scientists' perception about stem cell research were selected after thorough review of available literature and consultation with the faculty members. These were age, gender, educational qualification, history of pets, belief in animal mind, religiousness, extraversion, conscientiousness, agreeableness, neuroticism, openness. They were operationalized as presented in Table 1.

The perception in this study was conceptualized as positive or negative inclination towards acceptance of stem cell research. A schedule was developed to assess the perception of respondents towards stem cell research. The following procedure was adopted to develop the schedule. A list of 81 statements reflecting opinion about stem cell research was prepared initially. These statements were obtained from different sources like popular literature, scientific works, general discussion, etc. In the next stage, the statements which were ambiguous, irrelevant and not conforming to the criteria as suggested by (Edwards *et al.*, 1948) were deleted and a list of 52 statements was obtained. These statements were listed randomly and sent to 20 judges with well-defined instructions to carefully and critically evaluate the statements. They were requested to give their responses as to whether the particular statement is favourable, unfavourable or ambiguous. They were requested to add/delete or modify any statement which they deemed fit for inclusion or deletion. The performa was returned by 11 judges. In the next step, the statements with more than 70 percent agreement scores of judges were retained. In this way 27 statements were retained. The respondent were requested to give responses on three-point continuum scale, i.e. agree, neutral and disagree and the scores 3, 2, and 1 and 1, 2 and 3 were assigned for positive and negative statements, respectively. Thus, the minimum and maximum possible obtainable overall

scores were 27 and 81, respectively. The total score of each respondent was worked out by adding the scores of individual statements. The respondents were categorized in three groups of equal range based on their scores. (i.e. less favourable (27-45), favourable (43-63) and strongly favourable (64-81).

## **Results and Discussion**

### **Background profile of the respondents**

The observed age of the total respondents were 18-58 years indicating that respondents of all age groups were represented in the study (Table 2). A majority of the respondents were male with nearly one third being females. This is perhaps because of the fact that the veterinary profession is perceived in the society as masculine. Further, a large percentage of the respondents were having experience of keeping pets. They were having varying degrees of extraversion, conscientiousness, agreeableness, neuroticism, and openness. Further, the respondents were having moderate belief in animal mind (BAM). This BAM is the term used for how we attribute to animals mental capacities such as intellect, the ability to reason, and feelings of emotion (Hills, 1995). Similarly, the respondents were having varying degree of religiousness.

### **Perception of respondents about stem cell research**

A schedule was developed for assessment of perception about xenotransplantation. There were 27 statements in the schedule and scoring was done on a three point continuum. The minimum and maximum possible scores were 27 and 81 respectively. The minimum score obtained by the respondents was 48 while the maximum was 79. The frequency distribution is depicted in the (Figure 1). The average score of all the respondents was

62.47±6.82 (mean ±SD). The respondents were categorized in three groups i.e. less favourable (27-45), favourable (46-63) and strongly favourable (64-81) based on the score obtained (Table 3).

Further, more than half of respondents were having favourable perception about stem cell research. The remaining respondents exhibited strongly favourable perception about stem cell research.

### **Effect of Respondents Antecedents on Attitude toward Xenotransplantation**

The ethical debate in stem cell research is mainly associated with the sources of stem cells (Longstaff *et al.*, 2009). Among the primary sources of stem cells, i.e. the embryo, umbilical cord, placenta, amniotic fluid, adult tissues and organs, the extraction of stem cells from the embryo involves the on-going controversy about the moral status of embryos and challenges to other fundamental values and beliefs (Hayes *et al.*, 2006). In the stem cell debate, one of the major controversies is whether the early embryos should be treated as a person. In order to derive embryonic stem cells, embryos must be destroyed around 5-7 days after fertilization (i.e. at blastocyst stage).

This raises question of whether it is right to do so (Corrigan *et al.*, 2006). The controversy surrounds around the concept of respect for persons and it is argued that, a foetus should also be treated as a person similar to babies, children and adults (Corrigan *et al.*, 2006). However, others believe that embryos have either no particular moral status or they have an intermediate status: "they are not the moral equivalents of infants, nor are they simply clumps of cells like any other tissue sample that can be used and discarded at will" (Fukuyama, 2005). The other matter of ethical concern is whether to use 'spare embryos' for research.

**Table.1** Operationalisation of independent variables

Variables	Operationalisation
Gender	Dichotomous
Age	Chronological age of respondents
Experience of pet animals	Schedule was developed
Belief in animal mind	Scale developed by Hills (1995)
Religiousness	Scale developed by Hernandez (2011)
Level of education	Schedule was developed
Extraversion	Scale developed by John and Srivastava (1999)
Conscientiousness	Scale developed by John and Srivastava (1999)
Agreeableness	Scale developed by John and Srivastava (1999)
Neuroticism	Scale developed by John and Srivastava (1999)
Openness	Scale developed by John and Srivastava (1999)

**Table.2** Background profile of respondents

Variable	Possible Range	Scientists		Students		Overall	
		Observed Range	Mean± SD	Observed Range	Mean± SD	Observed Range	Mean± SD
Age (years)	-	26-58	40.10±10.62	18-34	22.06±2.32	18-58	27.36±10.22
Gender	0-1	0-1	0.32±0.47	0-1	0.40±0.49	0-1	0.38±0.49
Educational qualification	1-7	6-7	6.80±0.40	1-6	3.50±1.71	1-7	4.76±2.45
History of pets	1-4	1-4	1.72±0.88	1-4	2.34±1.29	1-4	2.16±1.22
Belief in animal mind	4-28	15-28	22.80±3.58	15-28	21.36±3.58	15-28	21.78±3.63
Religiousness	0-111	0-85	52.18±19.26	0-86	47.78±20.92	0-86	49.07±20.49
Extraversion	8-40	19-38	27.38±4.38	19-39	26.84±3.89	19-39	27.00±4.03
Agreeableness	9-45	29-44	35.64±3.72	20-44	32.49±4.47	20-44	33.42±4.49
Conscientiousness	9-45	24-42	34.46±4.45	21-43	31.12±4.21	21-43	32.10±4.53
Neuroticism	8-40	13-33	22.16±4.91	11-38	22.11±4.83	11-38	22.12±4.84
Openness	10-50	28-43	36.12±3.75	27-45	35.27±3.81	27-45	35.52±3.80
Stem cell research	27-81	51-79	64.98±6.54	48-76	61.42±6.69	48-79	62.47±6.82

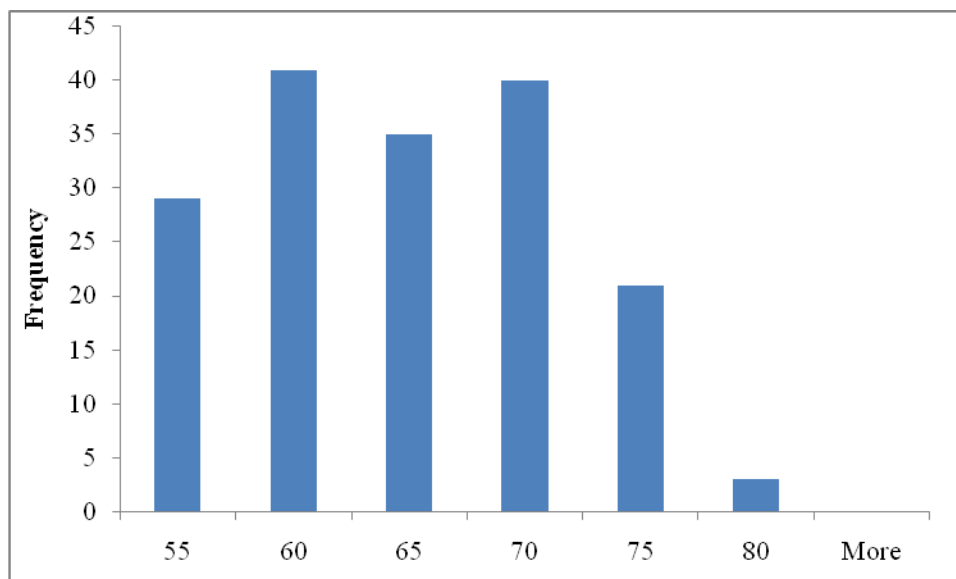
**Table.3** Classification of respondents on the basis of perception about stem cell research

S No.	Stem cell research level	Students(n=120)		Scientists (n=50)		Total (n=170)	
		Frequency (%)	Mean Score	Frequency (%)	Mean Score	Frequency (%)	Mean Score
1	Less favourable (27-45)	-	-	-	-	-	-
2	Favourable (46-63)	72 (60)	56.88	24 (48)	59.25	96 (56.47)	57.47
3	Strongly favourable (64-81)	48 (40)	68.25	26 (52)	70.27	74 (43.53)	68.96
4	Mean Stem cell research score	61.42		64.98		62.47	

**Table.4** Relationship of dependent and independent variables

Variable	Category (No. of respondent)	Perception about xenotransplantation				F/Z value
		Less favorable (27-45) Mean ± SD (No. of respondent)	Favorable (46-63) Mean ± SD (No. of respondent)	Strongly favorable (64-81) Mean±SD (No. of respondent)	Mean±SD	
Age (years)	Young (upto 30) 132	-	57.06±4.07(77)	68.27±2.92(55)	61.73±6.62	<b>3.54*</b>
	Middle (31-45) 22	-	58.36±3.44(11)	71.73±3.23(11)	65.05±7.57	
	Old (Above 45) 16	-	60.13±3.48(8)	69.87±4.29(8)	65±6.29	
Gender	Male 106	-	56.74±4.13(57)	69.49±3.40(49)	62.63±7.43	0.4221
	Female 64	-	58.54±3.66(39)	67.92±3(25)	62.20±5.73	
Educational qualification	B.V.Sc 1 yr (20)	-	55.33±4.54(12)	68.87±3.18(8)	60.75±7.87	<b>9.75**</b>
	B.V.Sc 2 yr(20)	-	56.65±3.22(20)	-	56.65±3.22	
	B.V.Sc 3 yr(20)	-	58.60±4.01(10)	68.30±2.67(10)	63.45±5.98	
	B.V.Sc 4 yr(20)	-	56.69±4.13(13)	69.29±3.20(7)	61.10±7.21	
	B.V.Sc 5 yr(20)	-	56.60±4.60(15)	65.20±1.64(5)	58.75±5.54	
	M.V.Sc(30)	-	62±1.73(3)	68.56±2.76(27)	67.90±3.33	
	Ph.D(40)	-	59.22±3.25(23)	71±3.98(17)	64.95±6.87	
History of pets	No pets 73	57.80±4.49(4)	85.69±8.83(59)	108±4.40(10)	87.16±13.40	0.14
	In childhood 38	61.67±2.08(3)	83.65±9.50(26)	107.33±4.47(9)	87.53±15.02	
	In recent past 18	-	84.44±9.71(16)	118.50±2.12(2)	88.22±14.31	
	At present 41	64.33±0.58(4)	86.49±9.31(35)	110±1.41(2)	85.41±12.33	
Belief in animal mind	Low (≤20) 64	-	56.33±4.24(46)	67.72±2.63(18)	67.72±2.63(18)	<b>4.6241**</b>
	High (>20) 106	-	58.22±3.54(50)	69.36±3.46(56)	69.36±3.46(56)	
Religiousness	Low (0-37) 45	-	57.05±4.25(22)	69.17±3.21(23)	63.24±7.17	0.42
	Medium (38-74) 109	-	57.62±4.04(65)	68.82±3.29(44)	62.14±6.67	
	High (75-111) 16	35.67±3.06(3)	56.57±3.21(7)	71.33±3.08(6)	58.19±13.43	
Extraversion	Low (8-24) 47	-	56.60±4.26(25)	69.82±3.97(22)	62.79±7.82	0.3421
	High (25-40) 123	-	57.77±3.92(71)	68.60±2.99(52)	62.35±6.43	
Agreeableness	Low (9-27) 21	-	55.19±3.67(16)	68.80±2.17(5)	58.43±6.81	<b>2.9141**</b>
	High(28-45) 149	-	57.92±3.95(80)	68.97±3.41(69)	63.04±6.65	
Conscientiousness	Low (9-27) 24	39±0(1)	57.89±4.07(18)	71.80±3.27(5)	60±8.19	<b>4.3221**</b>
	High(28-45) 146	38.41±5.05(17)	59.43±4.73(76)	71.81±3.08(53)	61.48±11.02	
Neuroticism	Low (8-24) 119	-	57.82±3.83(65)	68.91±3.33(54)	62.85±6.61	1.0623
	High(25-40) 51	-	56.74±4.38(31)	69.10±3.42(20)	61.59±7.29	
Openness	Low (10-30) 18	-	57.83±3.27(12)	68.50±1.76(6)	61.39±5.88	0.8086
	High(31-50) 152	-	57.42±4.13(84)	69±3.44(68)	62.60±6.93	

**Fig.1** Histogram depicting frequency distribution of stem cell research score of all respondents



The proponents of using embryos in stem cells argue that 'spare embryos' could be used in research. They believe that there is nothing wrong with using those embryos which are not going to be implanted (Dutka, 2002). Opponents use the Kantian argument that persons must be treated as ends rather than as means (Darr *et al.*, 2004). This suggests that a person's life cannot be sacrificed to accomplish some greater good. Apart from philosophical debates about using embryos in research, there are apprehensions that embryos will be also used as a commodity similar to human organs and other tissues. This new source is different from the living donors as it is procured from the early life, i.e. the embryo, and results in a new form of 'tissue economy' (Waldby and Mitchell, 2006). It shifts the source of tissue from a whole organ to a tiny collection of cells, and from an unarguably human person to an entity whose status regarding the human community is the subject of bitter contestation" (Waldby, 2002). Further, the 'spare' embryos are viewed as a good source of stem cell technologies. However, it is also facing the same problem as organ donors, as availability of eggs is a matter of concern and in this direction a

country like the UK has started an incentive to donate eggs for stem cell research. This step is viewed as a departure from the previous policy and a practice of altruistic donation (Roberts and Throsby, 2008). Drawing from Foucault's notion of 'bio-politics' it can be argued that this 'incentive' scheme is a new way of managing life in the name of well-being of the population (Rose, 2001), which further leads to commodification and commercialization of body parts.

In the present study, the respondents' score indicated moderate to high inclination towards acceptance of stem cell research. Further, the respondents were categorized in three groups of equal range - less favourable, favourable and strongly favourable (Table 4). As can be seen, more of respondents were having strongly favourable perception about stem cell research. However, the scientists' opinions were more favourable compared to students. Thus it can be hypothesized that utility and potential application of such stem cell research is the driving force for such a favourable perception. However, this should not rule out the role of other factors like

hardening of attitude, realization of health difficulties with advancing age, lack of appreciation of ethical difficulties, etc.

The results indicate that the veterinary education contribute in shaping of perception about bioethical issues. Moreover, the respondents' opinions do not vary greatly indicating the influence of cultural and traditional values. It requires further research to understand the factors underlying their perception about emerging bioethical issues.

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