

THE ROMANIAN STUDENT PERCEPTION ABOUT EXPERIMENTATION ON ANIMALS

MIHAELA CLAUDIA SPATARU¹, CRISTIN COMAN^{2*}, VERONICA BILD³, GABRIELA-DUMITRIȚA STANCIU⁴, BRUNO STEFAN VELESCU⁵, SORIN-IOAN BEȘCHEA CHIRIAC¹, CONSTANTIN SPATARU¹

¹“Ion Ionescu de la Brad” University of Life Sciences, Faculty of Veterinary Medicine, Iași, Romania

²“Cantacuzino” National Medico Military Institute for Research and Development, Bucharest

³Department of Pharmacodynamics and Clinical Pharmacy, “Grigore T. Popa” University of Medicine and Pharmacy, 700115 Iași, Romania

⁴Advanced Research and Development Center for Experimental Medicine (CEMEX), “Grigore T. Popa” University of Medicine and Pharmacy, 16 Universității Street, 700115 Iași, Romania

⁵“Carol Davila” University of Medicine and Pharmacy, Faculty of Pharmacy, Bucharest, Romania

*corresponding author: comancristin@yahoo.com

Manuscript received: September 2021

Abstract

Since the experimentation on animals is a sensitive subject throughout the world, we have been interested in the young people's perception concerning the use of animals in experimentation, especially considering the fact that such surveys have not been made in Romania so far. The survey was addressed to pupils in the last high school classes, with various educational profiles, and to young students, generally from the biomedical faculties. The purpose of the survey is to find out the projection in future of the general trend on perception, knowledge and attitude regarding experimentation on animals. Thus, we were able to find out what the level of knowledge was and what the sources of information were, when it comes to the use of animals in experimentation, but above all, the current and future perception or attitude concerning animal experimentation. The students in high schools are less interested in the subject and less informed than students from universities, and their general attitude is to disagree with experimentation on animals. On the other hand, we have noticed the increasing in receptivity among young students from universities, where, the acquired information from the curriculum raises the level of knowledge concerning the role of experimentation and more than that, it increases the tolerance regarding the use of animals in experimentation. The results of our survey are generally similar to the others in the European Union countries and show a general tendency to reject the experimentation on animals.

Rezumat

Întrucât experimentarea pe animale este un subiect sensibil în întreaga lume, ne-a interesat percepția tinerilor cu privire la utilizarea animalelor în experimente, mai ales având în vedere faptul că, astfel de studii nu au fost făcute până acum în România. Sondajul a fost adresat elevilor din ultimele clase de liceu, cu diverse profiluri educaționale, precum și studenților de la facultățile biomedicale. Scopul sondajului este de a evalua tendințele generale de percepție, cunoaștere și atitudine față de experimentarea pe animale. Astfel, am putut afla care a fost nivelul de cunoștințe și care au fost sursele de informare, în legătură cu utilizarea animalelor în experimentare, dar mai ales, percepția sau atitudinea actuală și viitoare. Elevii din licee sunt mai puțin interesați de subiect și mai puțin informați decât studenții de la universități, iar atitudinea lor generală este de a nu fi de acord cu experimentarea pe animale. Pe de altă parte, am observat creșterea receptivității în rândul studenți din universități, unde, informațiile dobândite din curriculum ridică nivelul de cunoștințe privind rolul experimentului și, mai mult decât atât, crește toleranța față de utilizarea animalelor în experimentare. Rezultatele sondajului nostru sunt în general similare cu celelalte din țările Uniunii Europene și arată o tendință generală de respingere a experimentelor pe animale.

Keywords: animal experimentation, perception, students, survey

Introduction

Throughout the world, the relationship between humans and animals is different, in some cultures the animals are considered sacred, in others they are being hunted and killed [1, 2]. In many countries, including Romania, the animals are still used for agricultural or heavy labour. In this sense, Phillips and McCulloch [3] showed that differences were

noticed in the perception and attitude of students coming from different cultures - regarding animal life and their suffering during life, this being related to a combination of religion and other traditions, in the matter of using animals within society [2, 4]. In the same line of thought, Phillips and McCulloch [3] consider that the multicultural education tends to dim the specific cultural relations concerning human-animal boundaries suggested by Mullin [2]. Furnhan

and Pinder [5], and Machado *et al.* [4] defended the hypothesis that a lower level of education is correlated with a more negative attitude towards the use of animals in research. Thomson [6] showed that in Oxford University, in the 1960s, a group of students had become vegetarians after reading the book *Animal machine* by Harrison (1964). The interest in animal ethics related to the empathy towards the suffering animals [7] and the welfare of livestock was firstly claimed in 1959 when Russel and Burch (1959) recommended the use of the 3Rs: replacement (the use of alternative methods if possible), reduction (minimizing the requested number of animals) and refinement (the improving and developing of cutting-age techniques). Until now, the topic about the use of animals in research has rested controversial, both in the case of the general public and the scientific community [8]. It is fully understood and accepted among the researchers that animal experimentation has massively contributed to the development of human and animal medicine, technology and environmental protection [9]. According to Marque *et al.* [10] “virtually every advance in human and veterinary medicine has been obtained through animal research”. Even if the use of animals in experiments is really controlled and restricted by internal and international regulations (Directive 2010/63/EU of the European Parliament and of the Council on the protection of animals used for scientific purposes), the negative reactions are still occurring throughout the world [11]. This aspect mainly originates in not knowing or ignoring the real impact of animal researching on our everyday life [12] or it can be emotionally founded [13]. Romania, a country that has been part of the European Union since 2007, regulated its internal legislation on the use of animals in experimentation by issuing a normative act, Law No. 43/2014 on the Protection of animals used for scientific purposes, which in fact represents the internal implementation of the EU legislation. The latest statistics (2016) published by the Romanian National Veterinary Authority (www.ansvsa.ro, 2016) indicates a number of 14168 animals used for scientific purposes, most of them (50.77%) being involved in basic and translational research. We believe that the number of animals used in Romania for scientific purposes is even higher than expected because there are still unauthorized units conducting experiments on animals and not participating in the reporting, as in other countries [14]. Using statistics from the European Union on the number of animals used for scientific purposes, reports including Romania, and statistics (Eurobarometers) related to several aspects of science in an analysis of the public perception of animal experiments in Europe, von Roten [15] it also refers to Romania. While students’ opinions on educational aspects such as readiness for inter-professional

learning or attitudes towards adverse drug reactions have been assessed in studies [16, 17], their views on animal experimentation remain unclear since no such survey exists in Romania. However, an attitude against the experimentation on animals can be suspected because 1645 Romanians signed the European “Stop Vivisection” initiative. Although their number represents only 0.14% of the total number of signatories, we can believe that this attitude may increase in future if the issue of animal experimentation is not properly and completely explained and understood. Also in Romania, unlike other European Union member states [18], apart from the information required for the European Union to be published, there is a lack of transparency in government and institutional communication on animal experiments, which made necessary our survey.

Materials and Methods

The purpose of our survey was to find and analyse the perception regarding animal experimentation of young people studying in high schools and universities in Romania. In this sense, a number of students in high-schools (grades XI and XII) and university faculties which cover most of the curricular area, namely from humanities (philological, arts) and science (technical) to the specialized profile (biological), were questioned. The study was applied individually in 23 high schools across Romania, by distributing and completing a questionnaire containing 20 questions with one (17 questions) or more variants of response (3 questions). Also, for this purpose, a platform for completing online questionnaires was created on the site of the Romanian Association for Laboratory Animals Science (ARSAL), which was active for 2 months in 2018. The needed time for completing the questionnaire was estimated at 5 minutes. The printed questionnaires were distributed throughout the country, having respondents from all the historical provinces of Romania, mainly from the representative university centres. The questionnaire was created by members of ARSAL, being based on their pedagogical experience and their current activity on animal experimentation. The questions of the survey were created by researching the literature in the field and/or relying on other models of the same topic [4]. The final form of the survey was accepted by all authors. The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of the “Cantacuzino” Institute in Bucharest, Romania. The questionnaires have complied with the rules in force concerning the processing of the personal data. The questionnaires are divided into three parts. The first part contains general information about the respondent, who was anonymous, the only personal information requested being about the age, sex, occupation (student in high school or in university faculties), the class

degree (the year of study in faculties), affiliation (the name of the educational institution) and the locality where the educational institution functions. In order to complete the questionnaires, a young adult population was selected, therefore, most students in high school (98%) are aged 18 - 24 years, 1.5% of whom are over 17 years of age (11th class) and 0.5% are between 14 and 17 years of age. The second part represents a cover letter where we included the information about the questionnaire: the number of questions, the authors, the purpose of it and the agreement to complete it. Thus, it was stipulated that "by completing the questionnaire you agree that the data will be statistically processed and that it may become public". A total of 4803 questionnaires were completed, 3466 from high schools (57.19% girls, 42.81% boys) and 1337 from university faculties (73.74% women, 26.26% men). The data were centralized, analysed and interpreted considering the type of education unit where respondents came from. They represented two groups. High school students were assigned to group A (named AG) and students of university faculties to group B (noted BG), the results obtained referring to both the two groups and to the total number of respondents, which was marked with TR.

For a proper interpretation of results, the questionnaire tried to cover three categories of questions: about the level of knowledge, about perception and about the people attitude concerning experimentation, in a balanced distribution. Questions which check the general level of knowledge (8 questions) aim to highlight the quantity and quality of information gathered by the respondent regarding the purpose of the experiments, the categories of animals most frequently used or their source of information in the field. The second category of questions (5 questions) quantifies the perception of young people about the use of animals in experimentation, the outcome of the personal evaluation and deduction process that substantiates the next category of questions. Attitudinal questions (7 questions) reveal the respondent's tendencies, attitudes and reactions in terms of interest, involvement and consolidation of a general trend regarding the importance of animals in experimentation and the importance of experimentation for the mankind evolution. The data were processed using the latest version of Microsoft Excel.

Results and Discussion

It is important to indicate that the surveyed undergraduate students from high schools or university faculties meant a noticeably higher number of young women, about 62%, who came predominantly from the biological field of study, in Romania. This is in accord with the general tendency to increase the number of women enrolled in these fields, in general

in veterinary and animal science courses [19]. In addition to that, Balcombe [20] considers there is a tendency of boys in the United States of America to impress girls with acts of bravado in relation to ethical attitudes about animal suffering, pain and distress.

The level of knowledge in the matter of animals use in experimentation

Taking into account the fact that the respondents follow a form of teaching (high school or university), the first category of questions is focused on the knowledge gained about the role of experimentation (questions 1, 3, 5), the level of knowledge in the matter of legislation in the field (questions 15, 16), the frequently used animals in experimentation (question 6), the most well-known experimental areas (question 7) and the source of information (question 4). The results can be seen in Table I, being expressed as a percentage.

Clemence and Leaman [7] noticed that in the UK, 34% of the public consider themselves either very informed or fairly well informed about the use of animals in scientific research, 24% feel "not at all informed" and 28% report having no interest in finding out more. On the other hand, Singer [7] argued that "among the tens of millions of experiments performed, only a few can possibly be regarded as contributing to important medical research". In Romania, among TRs, 82% hold information about the importance of the animal research in the progress of humanity. Considerable differences are noticed between the AG (78%) and the BG (94%). This is because the school curriculum in high education does not contain enough and concrete information about experimentation or about its importance for the development of all sciences, this subject being considered "sensitive" from a psycho-emotional point of view, although it is very important in building a real image about the importance of experimentation. The results are negative if correlated with the level of the general interest of the population surveyed to be informed about the use of animal research and its role. Thus, a rather low level of interest is noted, with 51% of the TRs not interested in this area at all. This is also reinforced by the rather low number (1337 respondents) of students who participated in the online questionnaire completion, the vast majority of them coming from the biological or medical universities. By comparing the two groups, only 41% of the AG were interested in the field, while the percentage of interested persons increased to 75% in the BG. These results are in line with the global tendency to refuse (50% in most European Community) accepting animal experimentation due to the stress, pain or discomfort of animals [21]. In 2014 Mervis [22] showed that for diminishing the effects of the phrase "animal experimentation" this was replaced by "animal research" because the latter is "less inflammatory". The opponents of animal

testing often claim that humans do not have the moral authority to use animals in such activities [23]. In the same line of thought, [22] noticed that while the U.S.A the public is largely uninformed about the federal requirements designed to protect research

animals from abuse and neglect, people may form their own assumptions about such regulations (or their believed lack of such regulations), perhaps based on information supplied by animal rights or animal welfare groups.

Table I

The level of knowledge in the matter of animals use in experimentation

1/1. Did you know that the greatest progress for improving human life has been achieved by experimenting on animals?						
Answer option	Yes			No		
AG	77.77%			22.23%		
BG	93.56			6.44%		
TR	82.06%			17.94%		
1/3. Have you ever been interested in learning about the use of animals in experimentation?						
Answer option	Yes			No		
AG	41.70%			58.30%		
BG	74.79%			25.21%		
TR	50,69%			49,31%		
1/4. Specify the main source which provided you with information on animal experimentation (multiple responses accepted)						
Answer option	Mass media	School	Internet	Other sources		
AG	16.99%	14.22%	55.85%	12.94%		
BG	14.08%	31.05%	39.35%	15.52%		
TR	15.70%	21.67%	48.55%	14.08%		
1/ 5. Given the fact that the main purpose of experimenting on animals is to improve the human, animal and environmental life, how do you think the information is presented to you?						
Answer option	The negative aspect is exaggerated	The positive aspect is exaggerated	Impartially	Do not know/ Not sure		
AG	20.70%	26.92%	33.48%	18.90%		
BG	37.39%	23.18%	30.51%	8.92%		
TR	25.23%	25.90%	32.67%	16.20%		
1/6. Which of the species listed below do you recognize as being used in experimentation? (multiple answers accepted)						
Answer option	Fish, amphibians	Mice, rats	Monkeys	Insects	Dogs, cats	
AG	5.91%	56.53%	19.08%	5.31%	13.17%	
BG	8.65%	42.96%	24.37%	6.22%	17.80%	
TR	6.89%	51.66%	20.98%	5.64%	14.83%	
1/7 In which field, excepting the biological and medical sciences, do you think that animals are used more often in experiments? (multiple responses accepted)						
Answer option	Food industry	Chemical Industry	Education and training	The armament industry	Aerospatiale industry	Cosmetics industry
AG	15.27%	39.62%	8.66%	2.60%	4.36%	29.49%
BG	16.43%	29.57%	9.21%	2.68%	6.72%	35.36%
TR	15.69%	35.95%	8.86%	2.63%	5.22%	31.65%
1/15 Do you know that there are laws governing the use of animals in experiments?						
Answer option	Yes			No		
AG	33.98%			66.02%		
BG	67.71%			32.29%		
TR	43.14%			56.86%		
1/16 Do you know that in the countries of the European Union the testing of cosmetics on animals, as well as the import of cosmetics tested on animals from other countries is banned?						
Answer option	Yes			No		
AG	32.74%			67.26%		
BG	39.41%			60.59%		
TR	34.55%			65.44%		

AG, high school students; BG, students of university faculties; TR, the results obtained referring to both the two groups and to the total number of respondents

In UK, Clemence and Leaman, [7] reported that among the population aged between 15 and 24 years, 52% prefer television, 15% the newspapers, 15 - 24% websites, actually 40% of them preferring social media as a source of information. Many people from generally questioned people who did recall a story about animal

research said they had heard about it online - hence the frequent references to Facebook, the internet and online articles or advertisements. The same trend is noticed in Romania, when referring to sources of information. Thus, 48% of the TR use the Internet and for only 22% of them it comes from school. What is

worrying is the fact that within the AG, 56% of them reported that information came from the internet, and only 14% reported that it came from school and 17% reported that it came from the mass media. In the case of the BG, the strictly controlled and upgraded university curriculum makes the number of respondents reporting from the internet drop to 39% and increases the number of those who are informed in school to 31%. It is noticed, however, that a constant percentage of respondents, 14 - 16% takes information from other sources or from the media. After Clemence and Leaman, [7] in the UK, men are more likely than women (aged 15 - 34) to trust universities to provide balanced information, namely 47% compared to 32%. Animal protection organisations are more trusted by women than by men, namely 43% compared to 30%. A percentage of 50% of those who would like to receive more information about animal research over social media would trust these organisations to give them balanced information [19, 32].

Finsen and Finsen [24] launched the idea that the rapid expanding of the farming and experimentation industry are happening in "conditions largely unknown to the general public". Moreover, animal research organisations are widely viewed as secretive, 42% of the respondents selected this attribute from a list of positive and negative options. The overall public view of these organisations is mixed, with 34% selecting only negative traits to describe them, and 34% selecting only positive traits [7]. Bergmeister and Podesser [25] reported that the need for updated information about animal research for the public was rated high by 75% of the participants, students and medical staff members from the Medical University of Vienna. In Romania, with a constancy of over 30% (33% of the TR, 33% of the AG and 31% of the BG), respondents do not know or are undecided about how the information about the goals of experimentation is presented. On the other hand, 25% of the respondents consider that the negative aspect of the experiments is exaggerated, while an approximately equal number, 26%, considers that the positive appearance is exaggerated. By comparison, we can say that there is a decreasing in the number of the undecided respondents from 19% in the AG to 9% in the BG.

The study of the techniques and methods of experimentation in universities, but especially the study of their limits, lead us to an increased number of respondents (from 27% to the AG to 37% to the BG) who considered the negative aspects of experiments were exaggerated. Metzger [21] suggested that researchers who use animal subjects in biomedical and behavioural experiments should strive to disseminate the information to the public. Such information may be provided by animal rights or animal welfare groups. Educating the

public about the rules and regulations in place for the protection of animal subjects may be an effective means to improve attitudes toward animal research [21].

The selection of species used as models in research depends on many considerations, such as fidelity, predictive value, discriminative abilities, financial costs and tradition [26]. In 2000, Hagelin *et al.* [26] noticed that the use of dogs, cats or nonhuman primates had lower levels of support, between 32 - 55%, than those including the use of small rodents, about 55 - 70% of people from different countries or continents [27].

Regarding the category of animals used as research animals in Romania, 52% of the TR admit that most experiments are done on rodents, namely 57% of the AG and 43% of the BG, followed by monkeys and carnivores at a low score. Even though most of the experiments in schools are done on frogs [28], only 6% of the AG and 9% of the BG mention this, which means that experimentation on animals in schools and universities in Romania is low. Hagelin *et al.* [29] reported that the medical and veterinary students in Kenya (78%) and Sweden (75%) approved the use of nonhuman primates in research. O'Rourke and Callery [30] mentioned that the amphibians were used as animal models, environmental indicators, or primary research subjects, amphibians remaining critically important to scientific investigation and the advancement of knowledge, but current statistics on their use are unavailable, although in the latest reports of the EU Member States this category of animals is also introduced among the species reported as being used for scientific purposes.

In Romania, with the exception of biological and medical sciences, 36% of the TRs believe that animal research is most commonly used in testing chemical substances, 32% in the cosmetics industry, 15% in the food industry and only 9% in education and training. In the UK, 38% of the people agree that they can accept the use of animals in scientific research to test chemicals that could harm people, 36% say the same for chemicals that could harm pets, farm animals or wildlife and 25% agree that they could accept the use of animals in research to test chemicals that could harm plants or the environment [7].

The first national law to regulate the animal experimentation was passed in Great Britain in 1876 - the Cruelty to Animals Act of 1876, being continuously improved. After Clemence and Leaman [7], 52% of the people agree that the UK has strict rules on the use of animals in scientific research, 41% trust regulators to uncover any misconduct in animal research facilities, 34% agree that the rules are well-enforced and 36% say they neither agree nor disagree that the rules governing scientific research are well-enforced. Of the Romanian TR, only 43% say they

have knowledge of the laws governing the use of animals in experimentation. A significant difference is noticed between the results from the AG and those from the BG. Thus, almost a double number (68%) of the respondents from the BG claim that they hold information about the regulations in the field, compared to 34% from the AG. In fact, few, if any people read legal regulations pertaining to animal research, and thus responses are not based on knowledge, but on something else [26]. That is directly related to the next answer, in the context in which the international legislation forbids the animal testing for cosmetics but also the cosmetics import if they are tested on animals. From the Romanian TR, 65% do not know this, the ratio remaining almost constant in both groups. In the UK, testing

cosmetics on animals remains the area with the greatest conflict of interest between those who believe and those who do not believe that it is allowed and that it should be permitted, 28% of the 15 - 24 years old believing that cosmetics testing is legal [7]. In their report, Phillips and McCulloch [31] showed the students from most European countries, but not Spain or Italy, were more likely to disagree with animal use for testing cosmetics and shampoos than those from China, Korea and Taiwan, while those from the United States were middle of the road.

Beliefs and perceptions about the use of animals in experimentation

Statistical analysis of respondents' answers to the second type of questions, perception questions, can be found in Table II.

Table II

Beliefs and perceptions about the use of animals in experimentation

2/2. How do you consider the experimentation on animals is?				
Answer option	Ethical	Non-ethical	Do not know/Not sure	
AG	17.28%	43.46%	39.26%	
BG	35.11%	41.07%	23.82%	
TR	22.13%	42.81%	35.06%	
2/ 8. Do you think you are a user of any animal-tested product?				
Answer option	Yes	No	Do not know/Not sure	
AG	54.74%	14.30%	30.96%	
BG	78.01%	4.18%	17.81%	
TR	61.21%	11.49%	27.30%	
2/11. Do you consider that the experiments are causing physical and psychological, temporary or permanent damage to animals?				
Answer option	Yes	No	Do not know/Not sure	
AG	77.67%	6.11%	16.22%	
BG	83.91%	8.75%	7.34%	
TR	79.40%	6.84%	14.76%	
2/12. Do you consider the experimentation on animals infringes their right to life?				
Answer option	Yes	No	Do not know/Not sure	
AG	75.69%	12.87%	11.44%	
BG	66.69%	22.74%	10.57%	
TR	73.21%	15.59%	11.20%	
2/17. What effect do you think the abandon of testing on animals over the humans, animals and the environment would have?				
Answer option	Positive effect	Negative effect	No effect	Do not know/Not sure
AG	33.83%	25.72%	14.99%	25.44%
BG	32.74%	34.65%	10.03%	22.56%
TR	33.53%	28.18%	13.62%	24.67%

AG, high school students; BG, students of university faculties; TR, the results obtained referring to both the two groups and to the total number of respondents

According to many authors, the use the animals in research is non-ethical issue because animals are harmed in experimentation from such things as confinement, fear, pain and early death [31]. Questioning the adults with biomedical science training and animal researchers from North America we found out that “in order to achieve human benefits, research that results in harm to animals should be supported”, the public (44%) and the medical students (80%) are supportive of animal research [15, 27]. Phillips and McCulloch [31] noticed that students from Korea, USA, Britain and Spain were most supportive of using animals for scientific research, whereas those from

Turkey were most opposed. Most students also thought that trapping wild animals was unacceptable, but less so the students from America, Japan, China and Turkey. Support for euthanasia of unwanted dogs was stronger in France, Thailand, Turkey and Poland and was weaker in Italy, Taiwan, Korea and Japan. In the UK, a smaller proportion, of 39% agrees that it is acceptable to use animals in all types of research where there is no alternative, with a very similar proportion (40%) disagreeing and with 20% of them being unsure [7].

Given the lack of information or avoidance to inform the population, as the results of the experiments are

reported to a relatively small group, mainly represented by researchers [24], 43% of the TR responds that animal research is non-ethical, but a percentage relatively high, 35% are still undecided. Concerning the AG and the BG, there is a considerable variation with respect to the undecided group, which is reduced from 39% in the AG to 24% in the BG.

In United States, the medications are generally unavailable for public use until they have gone through a series of clinical trials and received approval from the FDA. When approved treatments fail to remedy patients' conditions, some patients with serious or terminal illness seek to try investigational treatments [33]. The opponents of right-to-try laws raise concerns that the authorities minimize the potential serious risks that come with taking investigational medications, which means that patients may seek and obtain medications that have not been tested for efficacy [33]. Without being warned in any way by labels or instructions that the products are tested on animals (except for drug prospectuses), 78% of the Romanian BG think to be the users of an animal-tested product. Overall, however, 27% of the respondents do not know or are unsure about that. This highlights once again the general lack of knowledge about the use of animals in experiments.

There is currently no external labelling indicating that a given drug was tested on animals and no further information in the product information sheet [34]. Winston [35] proposed labelling medicines in the UK as tested on animals to inform the public of the role of preclinical animal work. The animal activists opposed the labelling initiative, citing concerns that patients may not accept the medication because it had been tested on animals and arguing that animal research made no meaningful contribution to drug development anyway [11], if data on the rate at which patients refuse treatments on ethical grounds is collected, they can discourage researchers and biomedical companies from developing treatments that the public finds ethically unacceptable [33]. It has generally been reported that moral acceptance of the use of animals in research is positively correlated with age [26]. In their study Kellert and Berry [36] suggest that younger people are more opposed to animal use than older people.

In 2001, Dryden [18] defined cruelty as having or showing an indifference to, or pleasure in, another's pain or suffering. Socially unacceptable behaviour that intentionally causes unnecessary pain, suffering, or distress to and/or death of an animal can be considered animal cruelty. Kitchell and Guinan [37] to surmise that animal pain might be even worse than human pain, too. In this sense, Rollin [38] argued for elevating the moral status of animals and codifying that status into law for laboratory animals. In North America, the people questioned responded that "in

the case of human benefits, research that results in harm to animals should be supported". The people questioned affirmatively responded, 80% from medical schools and 44% in the case of public people [4, 27]. Some survey questions require experience that many people do not possess, such as issues related to legislation about controlling the pain [38]. Due to the intense mediatisation of animal suffering during experimentation, their discomfort and stress, through various advertising materials or more or less imaginative films or personal experience [4], 79% of the TR respond that during experiments the physical and psychological harm to laboratory animals are produced and 73% of the respondents consider it a violation of their right to life. However, from those 84% of the BG who respond that the physical and psychological harm are produced, only 67% believe that this is violating the animals right to life. This can be correlated with the fact that the rural students have a larger acceptance of animal exploitation by humans than urban people [26]. 34% of the AG consider that the effect of abandoning experimentation on animals has a positive effect, while about 35% of the BG group consider the effect to be negative. However, about 25% of the TGs still have no opinion. These results are due to insufficient knowledge on animal experimentation and its role.

The present and future attitude of people in the matter of animals' experimentation

The present and future attitude of people in the matter of animals' experimentation is presented in Table III. Considering the age range at which we refer, if products were labelled as "animal tested", 51% of the Romanian TR considered they would not use them, in approximately equal proportions of the two groups. Only 11 - 12% of them would use the products with more confidence.

Moreover, by launching the need for testing the products used by humans on animals, a large majority, namely 57% of the TR considers that it is not necessary for the animals to be tested and only 18% would agree with the testing. It has been noticed that the number of respondents considering the animal testing unnecessary reaches a higher level in the BG (60%) than in the AG where it is about 56%. On the other hand, 27% of the AG are unsure in comparison with the 21% of the GB, the percentage of this response highlighting the lack of specific information and the fact that such issues are not discussed in school.

In Romania, there is no greater confidence in the use of an animal-tested drug either. 41% of the TRs believe they would use a drug untested on animals, and within the groups, the percentage is only 39% of the AG and 46% of the BG. The undecided respondents represent about one third (35%) of the TR. Bergmeister and Podesser [25] investigating the positions of students and medical staff members of

the Medical University of Vienna, came to the conclusion that a majority of participants (62%)

would not accept a treatment that has not been previously tested on animal models.

Table III

The present and future attitude of people in the matter of animals' experimentation

3/9. What do you think would be the people's reaction if the products were labelled as "animal-tested"?			
Answer option	They would use it with more confidence	They wouldn't buy it	Do not know/Not sure
AG	11.91%	51.7%	37.01%
BG	10.62%	49.58%	39.80%
TR	11.56%	50.67%	37.77%
3/10. Do you think the products that people use have to be tested on animals?			
Answer option	Yes	No	Do not know/Not sure
AG	16.92%	56.17%	26.91%
BG	19.28%	59.49%	21.23%
TR	17.56%	57.07%	25.37%
3/13. Do you think you wouldn't use a medicine if it weren't tested on animals?			
Answer option	I wouldn't use it	I would use it	Do not know/Not sure
AG	23.66%	38.75%	37.59%
BG	24.53%	46.14%	29.33%
TR	23.91%	40.76%	35.33%
3/14. Do you think the scientific and technological development have reached the level at which animal testing would be stopped?			
Answer option	Yes	No	Do not know/Not sure
AG	45.70%	32.71%	21.58%
BG	38.21%	46.89%	14.90%
TR	43.67%	36.56%	19.77%
3/18. What is your opinion on the following statements? "Animals are not as important as humans. If they can be used to make people's lives better, this should be done."			
Answer option	I agree with it	I don't agree with it	Do not know/Not sure
AG	15.28%	71.38%	13.34%
BG	16.00%	73.07%	10.93%
TG	15.48%	71.85%	12.67%
3/19. How do you think your future attitude concerning animal experimentation will be?			
Answer option	I will accept it	I will be against it	Do not know/Not sure
AG	17.84%	51.33%	30.33%
BG	35.71%	39.26%	25.03%
TG	22.67%	48.07%	29.26%
3/20. Do you think this questionnaire has made you more interested in using animals in experimentation?			
Answer option	Yes	No	Do not know/Not sure
AG	54.58%	32.13%	13.27%
BG	61.18%	26.40%	12.42%
TG	56.38%	30.57%	13.05%

AG, high school students; BG, students of university faculties; TR, the results obtained referring to both the two groups and to the total number of respondents

Being asked whether the scientific and technological developments have reached the level at which the animal experiments can cease, 44% of the TRs agree, most of them being from the AG (46% vs. 38% from the BG). However, it has been noticed that within the BG, 47% of them admit that animal experimentation cannot be dispensed with. A reduction in the number of undecided respondents or of those who don't know can also be remarked, from 22% recorded at the AG to 15% at the BG.

At the question of whether "Animals are not as important as humans. If they can be used to make people's lives better, this should be done" 72% of the TR respond that they disagree with the statement. It is worrying that 15% of them agree with it and 13%

are undecided, so, we can conclude that about 1/3 of the interviewed people admit the superiority of humans over animals.

The acceptance of animal research on these measures varies to a certain extent depending on gender factors. Men are typically more accepting of the use of animals in research than women (a familiar pattern from many other studies); 71% of men can accept the use of animals in research for medical purposes where there is no alternative (compared to 60% of women overall, and just 49% of women aged 15 - 34). Close to half of men (47%) agree that it is acceptable to use animals for all types of research where there is no alternative, against 32% of women [21, 26]. By weighing the benefits and harmful effects

of science, in general. Roten [15] noticed in 2013 that a much lower effect was produced in Malta, Denmark, Belgium and Sweden, whereas in Romania and Austria it was a stronger positive effect.

Tuvel [40] showed that while there was considerable protest against the use of animals in experimentation, less protest is voiced against the use of knowledge gained from animal experimentation. Two thirds (65%) of the public in the UK say they can accept the use of animals in research so long as it is for medical research purposes and there is no alternative, and a slightly higher proportion (71%) say they can accept the use of animals in scientific research so long as there is no unnecessary suffering and there is no alternative [7].

Asking about the future attitudes of Romanian respondents regarding animal experimentation, 48% of the TRs disagree with it. Within the AG, 52% disagree with it and so are 39% of the BG. It should be noted that the proportion of those who will accept the animal experimentation varies significantly from 17% in the AG to 36% in the BG. The percentage of those who are undecided is about 30%. In Roten's opinion [15] the acceptance of animal experimentation has significantly dropped between 2005 and 2010 in Germany, Finland, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia and Bulgaria. In order to change the future attitude about animal experimentation, scientists who believe that animal research is an important means of improving the lives of both humans and animals should strive to increase public awareness regarding the benefits that animal research provide and the legislation that protects animal subjects from abuse and neglect. Increased knowledge about animal experimentation was associated with attitudes more favourable to animal research [21, 26, 41].

After a survey applied in the U.S.A. in 1994, Pifer [39] concluded that the majority of youths have not yet formed a solid attitude about animal research. The same author noticed that the undecided youths might be thought of as ready targets for either animal rights groups or the scientific community. Asking the Romanian respondents whether the present questionnaire made them more interested in experimenting on animals, we found a fairly high receptivity, with 56% of them agreeing. However, we registered an increasing interest in the topic in the BG, where only 26% of them considered that the questionnaire had not increased their interest in experimentation on animals comparable to 32% of the AG. This aspect is slightly similar to what Clemence and Leaman [7] noticed when about 28% of the British public expressly "do not want to receive more information" about the use of animals in research, 32% men and 25% women. A majority (65%) say they can accept the use of animals in research as long as it is for medical purposes and there is no

alternative. While medical and scientific research both attract majority acceptance, the public is less accepting the use of animals in "all types" of research, and there is a less than majority acceptance of all forms of non-medical chemical testing [7].

Conclusions

The surveyed undergraduate students from the high schools or universities were predominantly young women, about 66%, who came mostly from the biological field. That is in line with the general tendency to increase the number of women enrolled in these fields, especially in veterinary and animal science courses [19]. On the same note, Balcombe [20] considers that the tendency of boys, in the United States, to impress girls with acts of bravado is in relation to an ethical attitude towards animal suffering, pain and distress.

For the first time in Romania, a questionnaire has been elaborated and disseminated, aiming to find out the young people's opinion about animal experimentation, their information and their ethical perception of the use of animals for scientific purposes. The respondents, of both sexes, came from all regions of the country. The high schools where the respondents came from were of different profiles (biology, informatics, sports, technology, etc.), while the university faculties were predominantly of bio-medical profiles (biology, human medicine, veterinary medicine, pharmacy, dentistry). The questions were aimed at finding out the level of information, the source of information, the perception about animal experimentation and the degree of acceptability of experiments on animals.

Most of the answers are slightly similar within the two groups assessed, although in different percentages, but we should consider here that a large percentage represented the undecided, namely between 15% and 25%, depending on the question.

Generally, the attitude of young people is to reject the use of animals in experimentation, even if they admit in majority that they use the tested products on animals. The results also highlighted a lack of information in general and a low level of information in schools and society regarding this area.

Conflict of interest

The authors declare no conflict of interest.

References

1. Hagelin J, Hau J, Carlsson HE, Attitude of Swedish veterinary and medical students to animal experimentation. *Vet Rec.*, 2000; 146(26): 757-760.
2. Mullin MH, Mirrors and windows: sociocultural studies of human-animal relationships. *Ann Rev Anthropol.*, 1999; 28: 201-224.
3. Harrington A, Science, animal rights, and the polemics of 'clear thinking'. *Pub Underst Sci.*, 1992; 1(4): 395-401.

4. Machado FG, Melo GD, Perri SHV, Fernandes FV, Moraes OC, Souza MS, Grano F, Silva J, Nunes C, Perceptions of animal experimentation: A longitudinal survey with veterinary students in Araçatuba, São Paulo, Brazil. *Journal of Biological Education*, 2016; 51(4): 391-398.
5. Furnhan A, Pinder A, Young People's Attitudes to Experimentation on Animals. *Psychologist*, 1990; 10: 444-448.
6. Thompson PB, Animal Ethics and Public Expectations: The North American Outlook. *JVME*, 2010; 37(1): 13-21.
7. Clemence M, Leaman J, Public attitudes to animal research. Ipsos MORI: London, UK, 2016.
8. Newkirk L, Free the Animals: the Story of the Animal Liberation Front. Lantern Books: Los Angeles, CA, USA, 2000.
9. Petroianu A, Aspectos éticos na pesquisa em animais. *Acta Cir Bras.*, 1996; 11(3): 157-164.
10. Marque SRG, Morales MM, Petroianu A, Brazilian law for scientific use of animals. *Acta Cir Bras.*, 2009; 24(1): 69-74.
11. Balls M, The European Citizens' Stop Vivisection Initiative. *Altern Lab Anim.*, 2015; 43(3): 147-150.
12. Bass R, Lives in the balance: utilitarianism and AR. In *The ethics of animal research: exploring the controversy*, Garrett JR Eds.; MIT Press Scholarship Online: Cambridge, MA, USA, 2012; 81-105.
13. Funk C, Rainie L, Page D, Public and Scientists Views on Science and Society. 2015.
14. Ferdowsian HR, Beck N, Ethical and Scientific Considerations Regarding Animal Testing and Research. *PLoS ONE*, 2011; 6(9): e24059: 1-4.
15. von Roten FC, Public perception of animal experimentation across Europe. *Public Underst Sci.*, 2013; 22(6): 691-703.
16. Cerbin-Koczorowska M, Przymuszala P, Michalak M, Piotrowska-Brudnicka SE, Kant P, Skowron A, Comparison of medical and Pharmacy Students' Readiness for Interprofessional learning – A Cross-Sectional Study. *Farmacia*, 2020; 68(6): 1166-1172.
17. Farcas A, Bucsa C, Crisan A, Cazacu I, Leucuta D, Mogosan C, Knowledge, Opinion and Attitudes towards Adverse Drug Reactions Reporting among Pharmacy Students in Romania. *Farmacia*, 2021; 69(3): 602-608.
18. Dryden AJ, Overcoming the inadequacies of animal cruelty statutes and the property-based view of animals. *Idaho Law Review*, 2001; 38(1): 177-212.
19. Britt JH, Aberle ED, Esbenshade KL, Males JR, Animal Science Departments of the Future. *J Anim Sci.*, 2008; 86(11): 3235-3244.
20. Balcombe J, *The Use of Animals in Higher Education*. Humane Society Press: Washington DC, USA, 2000.
21. Metzger MM, Knowledge of the Animal Welfare Act and Animal Welfare Regulations Influences Attitudes toward Animal Research. *J Am Assoc Lab Anim Sci.*, 2015; 54(1): 70-75.
22. Mervis J, How much does the public support animal research? Depends on the question, Plants & Animals. *Animal Research*, 2016; 23: 45-56.
23. Festing S, The animal research debate. *Polit Q*, 2005; 76(4): 568-572.
24. Finsen L, Finsen S, *The Animal Rights Movements in America: From Compassion to Respect*. Twayne Pub: New York, USA, 1994.
25. Bergmeister K, Podesser B, Acceptance of animal research in our science community. *F1000Research*, 2016; 5: 282.
26. Hagelin J, Johansson B, Hau J, Carlsson HE, Influence of pet ownership on opinions towards the use of animals in biomedical research. *Anthro*, 2002; 15(3): 251-257.
27. Joffe AR, Bara M, Anton N, Nobis N, The ethics of animal research: a survey of the public and scientists in North America. *BMC Med Ethics*, 2016; 17: 17: 1-12.
28. Callery EM, There's more than one frog in the pond: A survey of the amphibia and their contributions to developmental biology. *Semin Cell Dev Biol.*, 2006; 17(1): 80-92.
29. Hagelin J, Carlsson HE, Hau J, An overview of surveys on how people view animal experimentation: some factors that may influence the outcome. *Public Understanding of Science.*, 2003; 12(1): 67-81.
30. O'Rourke DP, Amphibians Used in Research and Teaching. *ILAR J*, 2007; 48(3): 183-187.
31. Phillips CJC, McCulloch S, Student attitudes on animal sentience and use of animals in society. *Journal of Biological Education.*, 2005; 40(1): 17-24.
32. Garrett JR, The ethics of animal research: an overview of the debate. In *The ethics of animal research: exploring the controversy*, Garrett JR Eds.; MIT Press: USA, 2012; 1-16.
33. Piel J, Informed consent in right-to-try cases. *J. Am. Acad. Psychiatry*, 2016; 44: 290-296.
34. Khoo SY, Justifiability and Animal Research in Health: Can Democratisation Help Resolve Difficulties?. *Animals*, 2018; 8(2): 28: 1-12.
35. Winston R, Animal experiments deserve a place on drug labels. *Nat Med.*, 2013; 19(10): 1204.
36. Kellert SR, Berry JK, Knowledge, Affection and Basic Attitudes toward Animals in American Society. National Technical Information Services: Springfield, VA, USA, 1981.
37. Kitchell R, Guinan M. The nature of pain in animals. In *The Experimental Animal in Biomedical Research*, BE Rollin, ML Kesel, Eds.; CRC Press: USA, 1990; Volume I; 185-205.
38. Rollin BE, Animal research: a moral science. *EMBO Rep.*, 2007; 8(6): 521-525.
39. Pifer LK, Adolescents and animal research: stable attitudes or ephemeral opinions?. *Public Understand. Sci.*, 1994; 3(3): 291-307.
40. Tuvel R, Against the Use of Knowledge Gained from Animal Experimentation. *Societies*, 2015; 5(1): 220-244.
41. Daradics Z, Crecan CM, Rus MA, Morar IA, Mircean MV, Cătoi AF, Cecan AD, Cătoi C, Obesity-Related Metabolic Dysfunction in Dairy Cows and Horses: Comparison to Human Metabolic Syndrome. *Life*, 2021; 11(12): 1406: 1-19.