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Original Research Article

Knowledge of stem cells among Dentistry undergraduates

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Abstract

Introduction: Stem cells (SCs) enabled great advances in different health fields, including Dentistry. **Objective:** To investigate the knowledge of last year Dentistry undergraduate students regarding SCs and its applications. **Material and methods:** A questionnaire with open-ended questions was applied to the students, followed by qualitative-quantitative analysis involving the clustering of the answers. **Results:** The majority of students (70%) defined SCs adequately, only half of the interviewees (48.8%) were unable to classify SCs and just 26.2% classified it correctly. On the question about SCs from dental tissues, 77.5% reported it was possible and 70.9% knew which tissues could be used. The main source of knowledge was the media (36.4%), followed by the University (26.6%); 88.5% stated that the topic was only addressed in the first year of the course. Consequently, only 7.5% reported being capable of answering questions about it. **Conclusion:** The students are not receiving enough information about the topic.

Introduction

Stem cells (SCs) are an important weapon to combat diseases, especially those that defy science long ago, such as cancer, neuronal degeneration, quadriplegia, paraplegia and also diseases and disorders that affect the field of dentistry [4], including caries, periodontitis, root canal filling, wound healing, dental implants, and repair of the cartilage of temporomandibular joints [8].

SCs are defined as undifferentiated cells with great capacity of self-renewal and production of at least a highly specialized cell type [11]. Adult stem cells (ASCs) are present in organs and tissues, where it remains in a not proliferative state [12]. These cells may be derived from bone marrow, blood, cornea, retina, liver, skin, gastrointestinal tract, pancreas, and dental tissue [4].

The knowledge obtained by means of the SC biology study and molecular regulation in tooth morphogenesis contributes to future strategies in tissue engineering, such as the development of new therapies aimed at restoring the structural integrity of dental tissues [4] and tissue neoformation such as, for example, pulp tissue engineering [1]. Thus, undergraduates, graduates, post-graduates, and the dentists themselves need more knowledge on the subject to prepare for future practice. To this purpose, there is need for the integration of the subject in the curriculum of dental schools [5].

Although the use of SC is a current topic and with great prospects, few studies in the literature evaluate the degree of academic information about the knowledge on SC. Discussions on the great impact generated by biotechnology revolution has been little instigated in higher education [10, 15]. SC applicability is increasingly present in everyday of the general population. Health professionals, especially dentists, are more likely to apply this knowledge in their activities. Therefore, it is necessary to identify whether students are or are not following this science evolution, as the main source of production and dissemination of scientific information is the university.

This study aimed to investigate the level of knowledge of last year dental undergraduates from a federal university stem cells and their applications, especially in Dentistry.

Material and methods

The research project was approved by the Ethics Committee in Research under protocol no. #755/2010. All undergraduates regularly enrolled in the Dentistry disciplines of the last year in at a Federal University were invited to participate in the study, comprising a total of 87 students. Those who agreed to participate in the study read and signed the consent form.

For general information on the knowledge and attitude of the students on the benefits and implications of the SC use a questionnaire was applied as an interview with the following open questions:

1) How do you define stem cells?
2) What are the types of stem cells?
3) From which tissues stem cells are possibly obtained?
4) Which are two advantages and two disadvantages of adult and embryonic stem cells?
5) Is it possible to obtain stem cells from dental tissues? If yes, which dental tissues?
6) Do you know any clinical application perspective of stem cells related to dentistry? Which one (s)?
7) How did you get knowledge about stem cells?
8) Have you had any discipline at graduation on stem cells? Which one (s)? How do you rate the content taught (satisfactory / unsatisfactory)?
9) If any patient asks you about the use of stem cells, do you know how to answer?
10) Stem cells can cure some diseases hitherto classified as "incurable". Would you donate stem cells for conducting research or for treatment of patients?
11) What was your degree of difficulty to answer this questionnaire (low / medium / high)?

Students were interviewed by a single calibrated researcher. Then, all the information was tabulated and digitally recorded. The data were subjected to qualitative and quantitative analysis, initially grouping same or similar answers and then trying to detect the sets of reorganized responses, the categories that allowed the differentiation.

Results

Of the 87 students, 80 agreed to participate in the survey, corresponding to 92% of undergraduates from the last year of course. Approximately 70% of these were female and the average age was approximately 23 years.

Of the 80 respondents, 56 (70%) mentioned properly what SCs are. Partially suitable concepts accounted for 16.3% (n = 13) improper concepts accounted for 13.7% (n = 13) Table I presents the undergraduates' responses regarding SC classification.

Table I – Undergraduates' responses on the classification of stem cells

Classification of stem cells	n	%
I do not know	39	48.8
Adult and embryonic	21	26.2
Totipotent and pluripotent	7	8.8
Primary and secondary	1	1.2
Others	12	15
Total	**80**	**100**

Concerning to the advantages and disadvantages of adult stem cells (ASCs) and embryonic stem cells (ESCs), 43.8% (n = 35) reported not knowing about it and 56.2% (n = 45) incompletely responded to the question. In this context, among the incomplete answers, ESCs were mentioned more than adult, citing, in most cases, as disadvantage the ethics issue and as advantage their great capacity for differentiation.

When asked about possible tissue for obtaining SCs, 71 students (89.2%) cited routine sources such as embryos, cord blood, bone marrow, and dental pulp, among others. Only two respondents (2%) could not answer the question; and seven (8.8%) said non-routine sources as the fetus, spinal cord, and the female gamete. Although the question was not linked to dental tissues, 13 students (16.3%) spontaneously recalled sources related to dentistry.

More than half of students (52.5%, n = 42) said they would not know to answer the possible doubts on SCs, thereby demonstrating insecurity regarding the subject. Only six students (7.5%) said that they knew how to answer the patients and 32 (40%) reported not knowing how they would act in the situation.

The question about obtaining SCs through dental tissues, 20% (n = 16) reported that they did not know this possibility; 77.5% (n = 62) stated that the possibility exists; of these latter, 70.9% (n = 44) were capable of citing the dental tissues. Although ten students (12.9%) claimed that it is possible to obtain SCs through dental tissues, they did not know what would be the donor tissue. Just over half of respondents, approximately 66% (n = 53), reported knowing any clinical application perspective of SCs related to dentistry. Of these, 98.1% (n = 52) correctly answered which would these perspective, and the "making of teeth" and the "new formation of tissues" the most cited responses (table II).

Table II – Responses of 53 undergraduates who reported knowing the clinical application of stem cells

Clinical perspectives of stem cells	n	%
Making natural teeth	24	45.3
Tissue neoformation	20	37.7
To obtain tooth germ	3	5.7
Implants and grafts	1	1.9
Prevent tooth loss	1	1.9
Others	4	7.5
Total	**53**	**100**

The figure 1 shows the sources of information reported by students to acquire the knowledge they had on SCs. In general, respondents remembered for more than a source of acquisition of knowledge, and the media was reported 52 times (65%) by respondents. The university was also considered important for students to acquire knowledge (n = 38 times, 47.5%). However, of 40 (50%) undergraduates who reported having a discipline responsible for the issue, 31 (77.5%) said the issue was generally presented by basic disciplines and without a dental. Of the 35 students who remembered which discipline

that addressed the matter, 74.3% (n = 26) considered the disciplines unsatisfactory. The most described disciplines were Genetics applied to Dentistry, Oral Histology and Embryology, and only once Bioethics and Biosafety were cited.

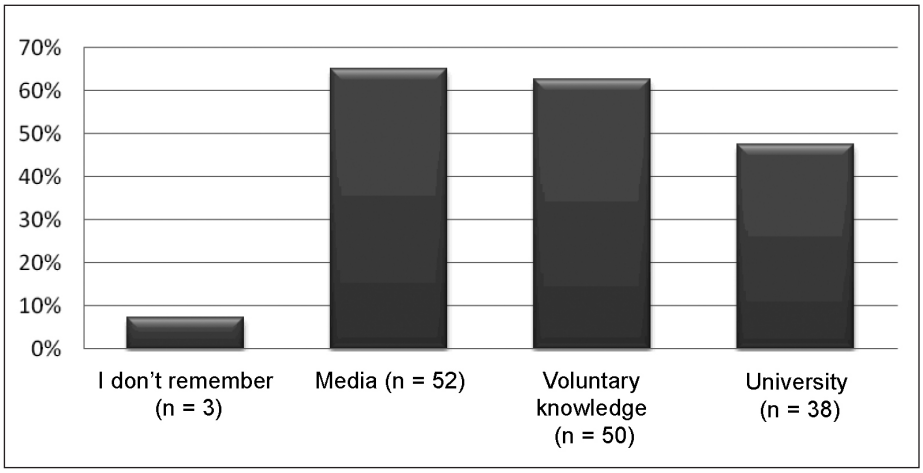

Figure 1 – Sources of knowledge about the stem cell issue reported by interviewed undergraduates

Almost 90% (n = 72) of the undergraduates ensured that they would donate SCs for conducting research or for the treatment of patients. The others reported the fear of the procedures required for donation, such as pain or other negative consequences for the donor.

Concerning to the level of difficulty of the questionnaire, 58.2% (n = 46) reported medium difficult degree and only three students (3.7%) mentioned the low level; of these three, two failed to answer basic questions about it, such as the concept of CT and its classification.

Discussion

The SCs are "cells capable of self-replication and differentiate into at least two distinct cell types" [5]. Taking into account this concept, most students defined SCs properly. We observed that the answers were very similar to each other, using terms usually conveyed by the media. In some answers, the terms "totipotent" and "pluripotent" were used improperly, demonstrating that there is a lack of true learning. According to some authors [7] , this kind of response shows the influence of the media, because of the similarity of the responses, i.e., predetermined answers and terms vigorously cited, leading to the belief that students simply repeat what they "learn", not knowing sure its meaning. Other researchers [2] also demonstrated the difficulty of students to recognize the real concept of SCs. Thus, the question arises whether the students know what it really means "undifferentiated cell", as commonly cited in the responses.

SCs can be classified as "adult and embryonic" [11], based on the tissue source by which the cells are obtained and the students have shown a little more difficult to respond appropriately. Almost half of respondents did not know this classification, proving that when it comes to depth, students have a greater difficulty in this regard.

When asked about the advantages and disadvantages of ASCs and ESCs, slightly less than half of the students reported not knowing speak about it, and those who tried to formulate an answer made it incompletely. The undergraduates more consistently mentioned the characteristics of ESCs than those of ASCs. This corroborates other findings [7], which also showed the most cited response by undergraduates, ESCs advantages (the fact that they are more specialized and less differentiated) and the disadvantage (the ethical question involved the use of embryos). Among the incomplete answers, the advantages and disadvantages cited were, mostly, those presented by the media, again proving that the source of students' knowledge is based on this information medium.

Bone marrow and umbilical cord were the sources for obtaining SC most cited in the interview. In this question, a large part of the students said routine obtaining sources; however they pointed out sources constantly displayed on the TV and magazines. According to some authors [4], ASCs may be derived from bone marrow, blood, cornea, retina, liver, skin, gastrointestinal tract, pancreas,

and dental tissue. It was noted, however, that most students do not spontaneously associated the dental tissues as a source of obtaining. As dental undergraduates, this source should be the first cited. However, when mentioned about obtaining SCs from dental tissues, most stated that the possibility existed and knew what would be the tissues. According to the literature, four types of ASCs derived from dental tissue have already been isolated: SC from dental pulp [3] , stem cell from pulp of human exfoliated deciduous teeth [6], SC from apical papilla [13, 14], and SC periodontal ligament [9]. Therefore, it can be proved that the students have some knowledge on dental sources. However, the memory of this tissues was not spontaneous.

Just over half of respondents reported knowing any clinical application perspective of SCs related to dentistry. The perspective most mentioned by students was "making teeth", expressing thus the existence of a superficial knowledge of the subject, since science has not yet absolute success in this type of procedure and many studies still need to be deepened. Therefore, it is noted that students have an “false” idea, which is usually conveyed by non-academic information resources.

Respondents reported that the main source of acquiring knowledge was the media. Thus, one can confirm that the students' knowledge comes mostly from non-academic sources. Although the university has also been reported as a source of knowledge acquisition, students said that the issue was superficially addressed only in basic subjects of the course and considered as allegedly unsatisfactory. Such discontent was found also by other researchers [7] evaluating other courses, except to the Pharmacy, who unanimously said that the discipline of Bioethics (responsible for the issue in university) was not satisfactory during the undergraduation years. The results obtained in this study, the mention to Bioethics discipline as a promoter of knowledge was minimal, unlikely other authors, who pointed out Bioethics as the great responsible for the diffusion of this content. It is noteworthy, with the findings of our study, the irrelevance given by Dentistry course to the issue, although it is something innovative, with large future therapeutic perspectives and of paramount importance.

Also, we emphasize the lack of undergraduates' interest, because they do not search for studies beyond what is within the university. Other research [7] contemplates with dissatisfaction the incipient discussion among undergraduates on the scope of this study and its future consequences. The authors argued that such reflection can be attributed, perhaps, to the systematic approach taken by the media. They also dispute the lack of interest of students to pursue more scientific knowledge.

As a result of the issues discussed earlier, many students pointed not know how to answer the possible questions from their patients on SCs. We emphasized their insecurity on the subject. This research was conducted with the students of the last year. Thus, the ideal would be that they leave the university with satisfactory knowledge, capable to answer the questions and difficulties that their patients may have. With these data, we can say that this is not yet a reality for future professionals.

When asked if they would or would not donate SCs, almost all ensured that would be willing to donate. Similar results were found with students of Biological Sciences, Medicine, and Law courses (EMU) [10] and students of Dentistry (UFSC) [15] in relation to the Human Genome Project, in which the majority of respondents also donate material for genomic research.

Overall, the questionnaire was considered to have a medium to high degree of difficulty; only the extreme minority reported low degree of difficulty. Other authors [7] also reported the difficulty of students to answer the interview, mainly conceptual questions. It is noteworthy that the questionnaire proposed to the students was formulated with basic questions and a low degree of complexity.

Conclusion

Although the undergraduates interviews had some knowledge about stem cells, that was not considered sufficient for a health professional and the subject is still not widely discussed in the Dentistry course.

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