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## INTRODUCTION

Applications of ionizing radiations (IRs) are increasing in world. Too many benefits are obtained to society by using radiations in different areas as engineering, industry, research, security, construction and mainly in medicine. But, these applications seem to be unknown by the population which generally associate the radiation with bomb, mutation or cancer. It is observed that people construct their own concepts, influenced by military applications, accidents or even superhero movies or cartoons, where radioactivity is regarded as something extremely dangerous that causes damage to the people and to the environment. Consequently, there is a cultural aversion over the peaceful use of ionizing radiation and their applications in various sectors of society.

Although Brazilian educational legislation requires issues as nuclear energy and radiation applications should be taught in high school, it is easy to find many points that hinder such law requirements.

A research in Brazilian publications shows many difficult pointed by teachers to present radiations issues in high school: small numbers of scholar books presenting this issue; students have previous misconceptions about this issue; teachers themselves have previous misconceptions about the issue that prevent them to talk about it without own opinion [1].

The lack of knowledge how to handle safely the radiation usually cause panic to the people about the possibility of any accident with radioactivity. Therefore, it is necessary to demystify what is radioactivity. This can be done in schools, in different levels, through the dissemination the concepts about this subject including several demonstrations of the peaceful applications of the ionizing radiation associated radiological protection.

## METHODOLOGY

As the objective was to evaluate the level of knowledge regarding IRs of students in the last year of high school, a quiz with 10 questions related to various applications of ionizing radiation, namely, nuclear medicine, food irradiation, computed tomography, industrial radiography, radioactive tracers, irradiation sterilization, radiotherapy and nuclear meters. The questions consisted of statements with the following options: right, wrong or I do not know.

Fifty students, selected in this study, did not have before any special class on ionizing applications neither quiz statements. The objective was to evaluate their knowledge with the regular classes from the school without any additional improvement of their knowledge. The students were encouraged to be extremely sincere; they had not the obligation to get a good score in the quiz. It was empathized to the students that the most import was to show what they actually known about ionizing radiation applications.

## OBJECTIVES

The objectives of his work are:

- To evaluate the level of knowledge of students in the last year of high school regarding ionizing radiation,
- To clarify the misunderstanding concepts,
- To present the practices related to a response for radiation emergency, and
- To show the several peaceful applications of ionizing radiation.
- To submit the students to a quiz with 10 questions about various applications of ionizing radiations.

## RESULTS AND CONCLUSION

Some answers percentages are presented in Table 1. The gray cells are the percentages of right answers. Answers of the quizzes are presented in the Figure 1.

Tab 1. Percentage (%) results from quiz answered by last year high school students.

Statements	True	False	I do not know
a) Radioactive material can be injected in patient body to do an image exams or clinical treatment.	37	41	22
b) Foods as meals and fruits exposed to ionizing radiation increase the shelf life. These foods can be consumed without damage to health.	6	78	16
c) Computed Tomography is an exam with high resolution image which allows evaluating the health conditions and, the advantage is that patient does not receive radiation dose.	31	36	33
d) Some radioactive elements, in small amounts, are added to beverages to alter the colouring. As the amount of radioactive material is low, these drinks can be consumed freely.	24	37	39
e) In medicine, radiography is used to evaluate a broken arm. In industry, the radiography is used to evaluate manufacturing defects of an aircraft turbine or in a steering column of a car.	53	12	35
f) Mammography is a test recommended for women in order to diagnose early possible breast cancer cases and it reduces the mortality rates in certain age group; however, women who undergo this exam receive a dose of ionizing radiation in the breasts.	51	22	27
g) An airline has refused to carry medical equipment because it carries a radiation sterilization certificate. The airline had a correct attitude because this material could cause damage to the health of passengers during the flight.	31	22	47
h) Paper documents can be longer lasting if irradiated. One technique for conserving books, pictures, maps, photographs is to disinfect such documents by applying a significant dose of ionizing radiation.	16	23	61
i) Radiation therapy is a method capable of destroying tumour cells using bundles of ionizing radiation. A dose of radiation is applied at a given time to a volume of tissue encompassing the tumour, seeking to eradicate all tumour cells.	51	14	35
j) One of the applications of ionizing radiations in the industry are nuclear meters. An example is the density meter in a paper mill, which consists of positioning the source of radioactivity on one side of the paper and the radiation detector on the opposite side. When the radiation passes through the paper it is possible to evaluate the density of the paper.	27	10	63

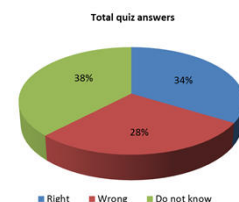


Fig 1. Percentage of total quiz answers of third year high school students: 34% right, 28% wrong and 38% do not know.

The conclusions of this work are:

- The number of correct answers was small, confirming that most students are unaware of the applications of ionizing radiation, which could explain the phobia observed when addressing the topic.
- Disclosure of ionizing radiation applications can be the way to demystify radioactivity through the knowledge of many uses of it in the society. Some concepts as justification, risk-benefit and cost-benefit relationship should be addressed in the lectures.
- Partnerships are being signed with the schools so that this disclosure occurs annually in order to arouse young people's interest in the nuclear area.
- Most data are being generated by the quiz application in other schools. That will allow a comparison among schools and grade schools. Quiz and a blank space to students make questions or give their opinion has help us to improve our lectures to this specific public.

### Reference:

1. LUCENA E. A., REIS, R. G., SORES, A. P., et al, Radiação ionizante, energia nuclear e proteção radiológica para a escola, *Braz J Rad Sciences*, DOI: [10.15392/bjrs.v5i1.215](https://doi.org/10.15392/bjrs.v5i1.215), 2017.

