

# THE NEED OF EDUCATION OF BIOTECHNICAL SPECIALISTS IN THE FIELD OF RADIATION PROTECTION

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## ABSTRACT

Education is the base for a successful carrying out of radiation protection measures. Starting from this fact, in the field of biotechnology protection measures should be carried out by biotechnical specialists (veterinarians, agronomists, technologists). In FR Yugoslavia, at the Faculty of Veterinary Medicine a separate course "Radiobiology and radiation hygiene" was introduced in undergraduate and postgraduate studies in 1976. However, other biotechnological specialists do not study the field of radiation protection separately at their faculties. Because of this, the Expert Group for Radiation Protection in Biotechnology formed at the Federal Ministry of Economy initiated the introducing of a course for this field in undergraduate and postgraduate studies at the faculties of agriculture and technology in FR Yugoslavia.

This paper presents the basic elements of the educational plan and program of the course "Radiobiology and radiation hygiene" for students of biotechnical faculties in FR Yugoslavia and discusses the results obtained until now.

## INTRODUCTION

Radiation protection is a wide and a complex field with a range of specific problems. To solve these problems, a multidisciplinary approach and team work, with participation of specialists of different profiles (physicists, chemists, veterinarians, agronomists, doctors, food technologists, lawyers, sociologists etc.) is necessary. Taking into consideration that for an effective undertaking of radiation protection the knowledge of main characteristics and effects of ionizing radiation is necessary, as well as of the characteristics of the milieu where radioactive substances are located and which they affect, the protection can only be successfully fulfilled by reciprocal connection of these knowledge (1,2).

In addition, the basis of each protection, and so of radiation protection, is the prevention, i.e. undertaking of measures that prevent the intake of radioactive substances into human organism. Since the main way of the intake of radioactive substances is the ingestion (intake through food - it makes 70% of the total intake), the most effective way from the aspect of prevention and protection is to break the chain, i.e. to prevent the food contamination in the process of production, processing and turnover. This task can most successfully be fulfilled by biotechnical specialists (agronomists, veterinarians and technologists), whose main task is the production of "healthy" food and indirectly also the protection of human health (3-5).

## THE BASIS FOR INTRODUCING OF TEACHING

Taking into consideration that the danger of radioactive contamination of greater proportions considerably increased in the last period, not only because of the possible use of nuclear weapons but also because of a real danger of accidents on nuclear power plants in peaceful times, the education of biotechnical specialists from the field of radiation protection deserves much bigger attention.

In order to include biotechnical specialists equally and competently in solving complex problems of radiation protection, it is necessary to introduce a separate course from this field in undergraduate studies and to organize postgraduate studies at all biotechnical faculties (Faculty of Veterinary Medicine, Faculty of Agriculture, Faculty of Food Technology).

## SITUATION IN FR YUGOSLAVIA

In the previous period, the education from the field of radiation protection in undergraduate and postgraduate studies of biotechnical specialists had only an informative character. An exception is the Faculty of Veterinary Medicine in Belgrade, where since 1976 the field of radiation protection has been separately studied in undergraduate and postgraduate studies.

At the end of 1992 a meeting of representatives of biochemical faculties in FR Yugoslavia, of the Federal and Republic Ministries of Agriculture as well as of the permanent Expert Group for Radiation Protection in Biotechnology was held, that was devoted to measures that should be carried out in the field of biochemistry to reduce the radiation risk. On the basis of adopted conclusions, the Expert Group for Radiation Protection worked out The Bases for Elaboration of Educational Plan and Programme for teaching in the field of radiation protection in biotechnology at biotechnical faculties (Faculty of Agriculture, Faculty of Veterinary Medicine and Faculty of Food Technology) in FR Yugoslavia.

## BASES OF THE EDUCATIONAL PLAN AND PROGRAMME

1. *Title of the course:* "RADIATION HYGIENE AND PROTECTION IN BIOTECHNOLOGY"

2. *Aim:* Education and training of biotechnical specialist to become able to carry out production and population protection, to reduce the radiation risk and to provide the production of healthy food and fed by complete perceiving of the production cycle and food processing as well as by applying measures of radiation-hygienic prevention, control and protection.

3. *General teaching plan:* Teaching would be carried out during one semester at the end of the third or at the beginning of the fourth year of studying (semester VI or VII) with 3 + 2 classes per week, i.e. 45 + 30 classes per semester.

4. *General teaching programme:* The teaching programme is conceived and standardized for all biotechnical faculties, but in certain chapters the focus and the content of the subject are adapted to particularities of individual faculties and majors (Faculty of Agriculture - Husbandry, Cattle-Raising, Fruit and Wine Growing, Plant and Food Protection, Melioration, Food Technology of Plant Products, Food Technology of Animal Products, Agroecology, Faculty of Veterinary Medicine, Faculty of Food Technology).

a) *Theoretical teaching - lectures:* The lectures include the following topics:

1. Introduction with theoretical base and elements of radioecology, radiobiology and radiation hygiene and protection;
2. Sources of ionizing radiation in the biosphere;
3. Ways of spreading, migration and transfer of radionuclides;
4. Characteristics and effects of ionizing radiation;
5. Detection and dosimetry of ionizing radiation, radiation values and units;
6. Radiation load and radiation risk;
7. Endangering of biotechnical production by radioactive contamination in normal occasions as well as in case of emergency;
8. Preventive protection measures from radioactive contamination;
9. Radiation protection in biotechnology;

10. Rehabilitation measures and radiation decontamination in biotechnical production;
11. Radiation-hygienic control of biotechnical production;
12. Radiation-hygienic expert opinion on soil, plants, animals, food, water and feed;
13. Organization of the biotechnical monitoring system in normal situations and in case of emergency;
14. Carrying out of measures of radiation-hygienic control and protection from the field of biotechnology during export, import and transport on the territory of Yugoslavia;
15. International and domestic standards, conventions and legislation from the field of radiation protection.

b) *Practical teaching - practice:* The practice includes the following topics:

1. Introduction and work in radiological laboratory;
2. Measuring instruments for the detection and dosimetry of ionizing radiation - introducing with characteristics and principles of work;
3. Measuring of the radiation phon and determination of KonZ;
4. Estimation of the semilethal and the lethal radiation dose;
5. Instruments for measuring of radioactivity level - their characteristics and principles of work;
6. Ways of sampling and sample preparing for measuring of radioactivity level;
7. Measuring of the total beta activity by using the anticoincidental beta counter - LARS-5;
8. Measuring of the total beta activity by using the method of thick-layer-sample in normal conditions - LARA-86;
9. Measuring of the total beta activity by using the method of thick-layer-sample in case of emergency - LARA-10;
10. Estimation of the consuming value of food;
11. Gamma and alpha spectrometry - demonstrative;
12. Decontamination of space and equipment - estimation of the decontamination effect.

The Expert Group took care that the plan and the programme are uniform, consistent and compatible for all biotechnical faculties and that they correspond to modern scientific knowledge from this field.

c) *Literature:* For carrying out the teaching and preparing exams there is a contemporary domestic literature, which is cited as references.

## CONCLUSION

Introducing of irradiation protection in education of biotechnical experts would provide reducing of radiation risk for the population, more effective protection and control during import as well as the possibility of an equal and recognized participation in the international turnover and exchange.

The proposed bases of the teaching plan and programme can be very useful during introducing the radiation hygiene in the educational system for biotechnical specialists.

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