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MANAGEMENT OF MICROBIOLOGICAL WASTE-CASE STUDY

Abstract : *This work* presents a case study of microbiological waste management *at the Institute of Food Technology in Novi Sad (FINS) in accordance with FINS Waste Management Plan that is harmonized with regulation. The development and implementation of FINS Waste Management Plan is focused on environmental protection. It is created to support reduction and recycling of some types of waste. For each component of microbiological waste there is a Material Safety Data Sheet (MSDS) to facilitate waste management. Risk assessment is determined for all values of risk regarding the microbiological waste generated in the Department of Microbiology of Laboratory for Technology, Quality and Safety using data from MSDS.*

Key words: *management, microbiological waste, case stady, environmental protection*,

1. INTRODUCTION

The waste management in the Institute of Food Technology in Novi Sad (FINS) is in accordance with Zakon o upravljanju otpadom [1] that requires the FINS Waste Management Plan to be made and the responsible person for waste management to be appointed. One of the most important locations where the major quantities of waste have been generated is the Department of Microbiology of Laboratory for Technology, Quality and Safety. Treatment and neutralization of hazardous waste in the Department of Microbiology is conducted in accordance with good laboratory practice. It is necessary to obtain the permission for the treatment of microbiological waste which has to be in accordance with legislation [1] and with Pravilnik o načinu skladištenja, pakovanja i obeležavanja opasnog otpada [2].

Classification and characterization of all types of waste at the Institute of Food Technology in Novi Sad is conducted in accordance with Waste Catalogue which is a part of Pravilnik o kategorijama, ispitivanju i klasifikaciji otpada [3].

The classification of waste is done on the basis of index numbers for all types of generated waste, as well as on the basis of test results of waste obtained from authorized laboratories for waste testing.

The list of all types and categories of waste (chemical, microbiological, ambalage and municipal waste) that is generated at FINS, with classifications, estimated quantities and safety characteristics, is included in FINS Waste Catalogue.

Updating the FINS Waste Catalogue has been practicing quarterly by the responsible person for waste management who is required to make a record of updating in a free form. The updating is carried out by following the data from *Daily Waste Record* **(*Dnevne evidencije o otpadu proizvođača otpada*)** and *Annual Report on Waste Collection* (***Godišnji izveštaj o sakupljanju otpada***).

2. PROCEDURE WITH MICROBIOLOGICAL WASTE

Identification and classification of microbiological waste

Location where microbiological waste has been generated is the Department of Microbiology of Laboratory for Technology, Quality and Safety. The estimated amount of microbiological waste on the annual level is approximately 10 t.
The classification of microbiological waste in the Department of Microbiology of Laboratory for Technology, Quality and Safety is carried out on some following basic rules:

- classification is responsibility of waste producer (**the principle of duty of care**);
- classification is carried out as close to the source (**the proximity principle**);
- if there is any doubt in the initial classification the waste will be classified in a category with a higher level of risk (**precautionary principle**);
- mixing of hazardous and nonhazardous waste **is forbiden** and
- dilution of hazardous waste **is forbiden**.

The classification of microbiological waste in the Department of Microbiology of Laboratory for Technology, Quality and Safety is conducted in accordance with the types of waste presented in Table 1 at places marked with a label *Classification of Microbiological Waste* (***Klasifikacija mikrobiološkog otpada***) which have to be equipped with appropriate bags and containers to ensure the succesful classification of waste and the safety of persons who participate in it.
The classification of microbiological waste is carried out as follows:

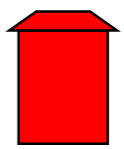
1. All material obtained in the process of sample inoculation (initial dilution, decimal dilutions, pipette tips) are classified according to the **precautionary principle** in potentially infectious waste;
2. Inoculated microbiological medium (solid/liquid) with the presence of bacterial growth are classified into infectious waste and
3. If the analysis confirms the presence of pathogens in the analyzed sample it has to be decontaminated by autoclaving according to the *Order for Decontamination of the Sample* (***Nalog za dekontaminaciju uzorka***). It is generated by the person who is responsible for sample storage in Laboratory for Technology, Quality and Safety.

Buckets with pedal equipped with biohazard bags are used for the classification of microbiological waste to avoid touching the lid.

Buckets for microbiological and municipal waste are located at the same place in order to reduce the risk of mixing waste.

The identification and classification of waste is the responsibility of the person who generated tha waste.

Table 1. Classification of waste

Type of waste	Examples	Container	Type of treatment/disposal of waste
Municipal waste	General waste, foods and noncontaminated packaging	 **Black bag**	Municipal landfill
Microbiological waste (infectious and potentially infectious waste)	Initial dilution, decimal dilutions, inoculated microbiological medium	 **Biohazard bag**	Steam sterilization (autoclave) and disposal in municipal landfill
Chemical waste	Dangerous chemicals such as acids, alkalis, solvents, reagents etc.	 **Red container**	Secure long-term storage and final disposal by incineration or chemical treatment
Waste materials for recycling	Cardboard, paper, glass, plastic and metal packaging	 **Green container**	Collection and waste disposal

3. PACKAGING AND LABELING OF MICROBIOLOGICAL WASTE

The packaging of microbiological waste is carried out following the basic rules:

- the defined packaging from Table 1 must be used for appropriate waste;
- bags and containers for hazardous waste are filled to ¾ capacity only to allow proper clousure of the packaging;
- waste which requres autoclaving must be packaged in bags specified for that purpose.

Packaged microbiological waste should be clearly and visibly marked using a label *Microbiological Waste* (***Mikrobiološki otpad***).

Packaging and labeling of generated microbiological waste in the Department of Microbiology is performed by a lab assistant.

4. EVIDENTION OF MICROBIOLOGICAL WASTE

All types of microbiological waste is evidented daily, i.e. in the moment when it is generated. A person who has closed the bag is required to mark, weight and record

the waste. The data are recorded on a form DEO1 in accordance with Pravilnik o obrascu dnevne evidencije i godišnjeg izveštaja o otpadu sa uputstvom za njegovo popunjavanje [4].

Since the Department of Microbiology of Laboratory for Technology, Quality and Safety uses the thermal treatment (autoclaving) of infectious waste to convert it into municipal waste, the inplemented activities are recorded on the forms Registry of Microbiological Waste Treatment (***Dnevnik evidencije i obrade mikrobiološkog otpada***) and Mounthly Waste Status (***Mesečni bilans otpada***) in order to ensure of quality system in accordance with the standard SRPS ISO/IEC 17025:2006

5. DISPOSAL OF MICROBIOLOGICAL WASTE

The packaged and evidented waste from the Department of Microbiology is disposed as shown in Table 2.

Table 2. Disposal of waste

Municipal waste		
Place of collection	Frequency of collection	Place for disposal
Rooms 241, 242, 243, 244, 245, 246, 247	Once per day	Container JKP, Novi Sad
Chemical waste		
Place of collection	Frequency of collection	Place for disposal
Room 247	As needed	Storage FINS 016

Ambalage waste		
Place of collection	Frequency of collection	Place for disposal
Room 247	Once per day	Room 5

Final disposal of microbiological waste is recorded on the form DEO1 in accordance with the Pravilnik o obrascu dnevne evidencije i godišnjeg izveštaja o otpadu sa uputstvom za njegovo popunjavanje [4].

Packaged infectious waste generated in the Department of Microbiology is disposed temporarily until the moment of its final decontamination by autoclaving to produce municipal waste.

Permission for described waste treatment, i.e. *Permission for Waste Management*, is obtained from the Pokrainski sekretarijat za urbanizam, graditeljstvo i zaštitu životne sredine, in accordance with Pravilnik o obrascu zahteva za izdavanje dozvole za skladištenje, tretman i odlaganje otpada [6].

Infectious microbiological waste that is packed in biohazard bags which have to be marked and recorded is disposed temporarily until autoclaving at place labeled as *Temporarily disposal - Biohazard waste!* (***Privremeno skladištenje - Opasan otpad!***).

The storage period for infectious microbiological waste at the marked place is a maximum of 72 hours in winter and a minimum of 48 hours in summer.

The infectious microbiological waste must not be stored in corridors, passageways and other places that are available to other persons.

6. TREATMENT OF INFECTIOUS MICROBIOLOGICAL WASTE BY STAEM STERILIZATION IN AN AUTOCLAV

The main goal of infectious microbiological waste processing is sterilization that transforms the infectious waste into nonhazardous municipal waste. The basic requirement for sterilization is to reduce the level of biological agents in waste to the specified decreased level. This implies temperature of the sterilization of 121 °C, pressure 1.2 bar and sterilization during 1 h.

In order to check the effectiveness of the sterilization of the infectious microbiological waste generated in the Department of Microbiology constant monitoring of autoclave is needed. The monitoring of autoclave is carried out in accordance with Instruction for Sterilization Control (***Uputstvu za kontrolu sterilizacije*** – FINSLab-5.3-3.004) and control records of sterilization are recorded in a notebook Autoclave Operation Control (***Kontrola rada autoklava*** **–** FINSLab-5.5-4.003).

The autoclaving is performed by a lab assistant. After the sterilization hazardous waste is converted into nonhazardous municipal waste. The label for biohazard waste is removed from hiohazardous bag and treated waste is put into black bag and disposed in continer of Public Utility Company „Čistoća".

Final disposal of microbiological waste is recorded on a form DEO1 in accordance with Pravilnik o obrascu dnevne evidencije i godišnjeg izveštaja o otpadu sa uputstvom za njegovo popunjavanje [4].

7. PROCEDURE IN A CASE OF LEAKAGE OF MICROBIOLOGICAL WASTE

If there is a leakage of potentially infectiuos or infectious waste in the rooms of the Department of Microbiology the access to the place of leakage is forbidden. It is necessary to wear personal protective clothing (lab coat, gloves, goggles) if a person approaches to the place where the leakage occurred.

The procedure in a case of leakage:

- absorb the leakage material using paper towels/cotton wool as much as possible;
- clean the leakage place with detergent and water if the cleaning is needed;
- dispose the material used for cleaning in biohazard bag together with safety clothes;
- if there are pieces of broken glass in the leakage material they should not be touched by hands; Piece of cardboard or plastic is recommended for removing the pieces of glass and disposing them into the box for sharp objects;
- it is required to disinfect hands after working with leakage material;
- inform a responsible person of Laboratory for Technology, Quality and Safety about leakage (manager of Laboratory).

8. CONCLUSION

This work describes a part of the activities of the researchers and management team of the Institute of Food Technology in Novi Sad (FINS) related to the development and continuous implementation of FINS Waste Management Plan and other supporting documents which define the activities that have to be conducted in order to manage waste (chemical, microbiological, packaging and municipal). The main goal of the mentioned activities is to reduce generated waste in FINS, i.e. to achieve recycling of some types of waste in accordance with the legislation.

The creating of FINS Waste Management Plan is one of the first steps in environmental protection. It confirms the commitment of management team and provides the guidance for the organization and implementation of all activities in FINS focused on environmental protection. The Plan has to be an integral part of environmental protection policies that must be communicated to employees and available to the public. FINS Waste Management Plan should be harmonized with the general organization of FINS and has to insure the continuous improvement of all activities focused to the reduction of waste quantities in accordance with legislation.

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