



RISK MANAGEMENT OF EXPOSURE TO BIOLOGICAL AGENTS AMONG WORKERS IN WASTEWATER TREATMENT PLANTS DURING THE COVID-19 OUTBREAK

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ABSTRACT:

Purpose: To systematize the activities and relationships between employers, workers, and occupational health services in the process of risk management of exposure to biological agents in wastewater treatment plants (WWTPs) during the COVID-19 outbreak.

Material/Methods: We studied the Bulgarian and European Union legislation and the recommendations of international organizations related to risk management of exposure to COVID-19 concerning workers in WWTPs from March 2020 to September 2021.

Results: The EU and Bulgarian legislation has been updated with a focus on risk management of exposure to the SARS-CoV-2, including workers from WWTPs. Some of the Coronaviridae that are known to be pathogenic remain in the second group according to the degree of danger, while Coronaviridae such as SARS-virus, MERS-virus and SARS-CoV-2 are evaluated and classified in group 3 according to the level of risk of infection. The employers must take measures to protect workers in accordance with the new, higher level of danger. We systematized risk management measures.

Conclusion: Bulgarian and international legislation on health and safety at work has been updated in the period 2020-2021 with an emphasis on the risk management of exposure to biological agents at work. Co-operation between employers and workers in WWTPs, and occupational health services is an essential part of the risk management process, including prevention of outbreaks of work-related infectious diseases such as coronavirus disease 2019 (COVID-19).

Keywords: COVID-19 outbreak, legislation, risk management, wastewater treatment plants

INTRODUCTION

The COVID-19 pandemic has led to many problems in the world of labour. Contact with biological agents is probable when working in wastewater treatment plants (WWTPs) [1, 2]. In wastewater systems, biological agents can cause harmful effects in routine work (by respiratory droplets and direct contact, especially via hands, mouth, nose, and eyes) or in cases of incidences and accidents (through abrasions or cuts). The specific biological hazards depend and vary according to the job activity and the type of technological process of the sewerage system, but not only. The association between raw sewage, violation of health and safety practices at the workplace, and work-related infectious diseases are well established [3, 4]. Type and the amount of biological agents in wastewater are dynamic variables and may reflect their circulation among the population in a given area. The risk of infectious diseases is related to infectivity, pathogenicity and virulence, individual susceptibility to infection and disease, exposure, and infectious dose [5, 6]. There is evidence that survival of the coronaviruses is between 2 to 6 days in primary wastewater; slightly longer than in secondary wastewater, due to the higher level of suspended solids that protected human coronavirus from inactivation [7, 8, 9]. This determines the need to track the problem in each of its elements to reduce the risk of epidemic outbreaks.

The purpose of the study is to systematize the activities and relationships between employers, workers, and occupational health services in the process of risk management of exposure to biological agents in wastewater treatment plants (WWTPs) during the COVID-19 outbreak.

MATERIALS AND METHODS

We studied the Bulgarian and the European Union legislations and the recommendations of international organizations – World Health Organization, International Labour Organization, European Agency for Safety and Health at Work in the field of safety and health at work related to risk management of exposure to biological agents of workers in WWTPs during the COVID-19 outbreak, from March 2020 to September 2021.

RESULTS AND DISCUSSION

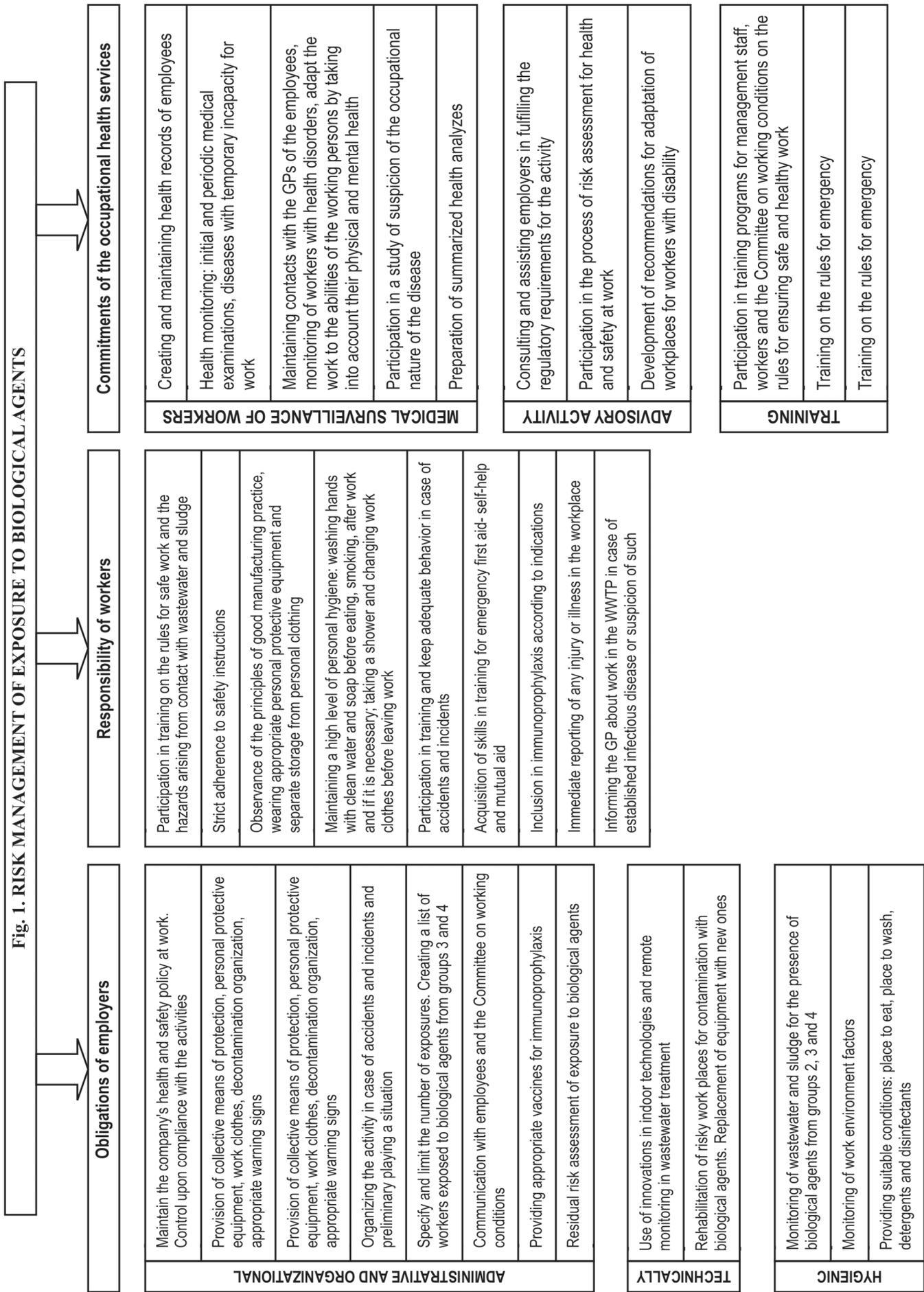
Wastewater treatment activities are an important mechanism for the protection of public health. At the beginning of the COVID-19 pandemic, the WHO established a protocol with recommendations for risk management [10]. The target groups for the recommendations were Health Care and Public Health Professionals, but they are also applicable to WWTP workers. In the context of COVID-19, there are a number of relevant provisions in international labour standards and guidance to protect the safety and health of workers across a wide range of sectors and occupations [11]. In May 2020 ILO published key provisions of international labour standards relevant to the evolving COVID-19 outbreak. However, the ILO acknowledges that the prevention of professional diseases and work-related accidents caused by most biological hazards presents a regulatory gap [12]. The establishment of SARS-CoV-2 in wastewater raises the question of the potential risk to workers in these enterprises [8]. Further investigations are needed to determine the importance of wastewater in the risk of COVID-19 transmission and to ascertain work-related health effects [13]. In February 2021 ILO reviews legislation in 49 countries as an opportunity to recognize COVID-19 infection as an industrial accident or an occupational disease. Bulgaria does not appear in this report [14].

We found an update of the European Union and the Bulgarian legislation in 2020: the Commission Directive (EU) 2020/739 of 3 June 2020 amending Annex III to Directive 2000/54/EC of the European Parliament and of the Council as regards the inclusion of SARS-CoV-2 in the list of biological agents known to infect humans [15] and the corresponding changes in the Bulgarian Ordinance No. 4 of 2002 on the protection of workers from risks related to exposure to biological agents at work [1]. Our legislation is entirely relevant to that of the EU. We compared information on *Coronaviridae* before and during the COVID-19

pandemic. In 2002, *Coronaviridae* were described in a risk group 2 depending on the level of risk from infection. There is an improvement in the classification of viruses according to the level of risk to infect humans in light of the latest developments in science. The update of Ordinance No 4 in 2020 includes a description of biological agents: type of viruses according to their taxonomic order (O), family (F) and genus (G). Coronaviruses belong to *Nidovirales* (O), *Coronaviridae* (F), *Betacoronavirus* (G). This allows using the classification of coronaviruses into different groups according to the degree of danger. Thus, *Severe acute respiratory syndrome-related coronavirus (SARS-virus)*, *Middle East respiratory syndrome coronavirus (MERS-virus)* and *Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)* are classified into group 3, while *Other Coronaviridae known to be pathogenic* remains in the second group by a degree of danger. The legislation defines the obligations of employers to ensure health and safety at work. The organization of work and working conditions are important to minimize and supervise this risk in wastewater treatment plants. Furthermore, the employer must update and provide written instructions and guidance at the workplace regarding the procedure to be followed in the case of an accident or incident of work with biological agents of groups 3 and 4.

The best way to protect workers from exposure to Group 2, 3 and 4 biological agents is to maintain good work practices [1, 16, 17]. Risk management upon exposure to biological agents in the work environment of WWTPs is a dynamic process involving both the employers and the employees, especially in an emergency of epidemic setting [16]. During the performance of their duties, WWTP workers have a higher frequency of potential exposure to pathogenic microorganisms than the general population. However, the risk of occupational diseases is significantly reduced by the keeping of rules of occupational safety and personal hygiene from this type of workers. According to Bulgarian legislation [17], every worker is obliged to take care of own health and safety, as well as the health and safety of other persons directly affected by his activity, based on his qualifications and instructions from the employer. Risk management measures include the obligations of employers, the responsibility of workers and commitments of occupational health services [18]. We have tried to systematize these obligations and commitments [19, 20, 21, 22, 23, 24, 25] (Figure 1).

Fig. 1. RISK MANAGEMENT OF EXPOSURE TO BIOLOGICAL AGENTS



Due to the specific features of the technological process of wastewater treatment, measures such as physical distance, hand hygiene and the use of personal protective equipment are observed even before the COVID-19 outbreak. The aim of periodic medical examinations is to analyse the health status of workers and to diagnose the early forms of diseases, and to reveal the risk factors for the occurrence of widespread and socially significant diseases [22]. Vaccination recommendations for workers exposed to sewage and sludge should be up to date on the legislative level as a part of the prevention of occupational infectious diseases [19, 20, 21]. Deadlines, resources and responsible persons for the implementation of the planned measures should be de-

termined when introducing a company policy for managing the risk of exposure to biological agents [1, 16].

CONCLUSION

Bulgarian and international legislation on health and safety at work has been updated in the period 2020-2021 with an emphasis on the risk management of exposure to biological agents at work.

Co-operation between employers and workers in WWTPs, and occupational health services is an essential part of the risk management process, including prevention of outbreaks of work-related infectious diseases such as coronavirus disease 2019 (COVID-19).

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