

HEALTH ECOLOGY AND HYGIENE OF THE WORKING ENVIRONMENT	
GENERAL INFORMATIONS	
Course coordinator	Prof. Maja Miškulin, MD PhD
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Study Programme	Undergraduate university study of Medical laboratory diagnostics
Status of the course	elective
Year of study, semester	2 nd year, 4 th semester
ECTS	4
Workload (hours)	Lectures: 20; Seminars: 10; Exercises: 30
Expected number of students	30
COURSE DESCRIPTION	
Course objectives	
To enable students to understand and to interpret the impact of various environmental factors on the health of the population, to carry out laboratory diagnostics when the population is exposed to various environmental factors, and to effectively manage the health risks arising from the aforementioned impacts. To familiarize students with the basics of the origin and spread of infectious diseases, as well as the main characteristics of the origin and spread of hospital infections together with the basic principles of their control and prevention.	
Enrolment requirements and entry competencies	
In accordance with the conditions for enrolment in the 2 nd year of this study program.	
Learning outcomes at the Programme level	
1.1, 2.1, 2.3, 2.6	
Learning outcomes at the course level	
After completing lectures, seminars and exercises, independent study and passing the exam, students will be able: <ol style="list-style-type: none"> 1. To assess the possible health effects of environmental factors. 2. To judge the advantages and disadvantages of the ecological research method and the possibilities of applying medical laboratory diagnostics in the ecological research method. 3. To interpret the basic principles of environmental and biological monitoring and the role of risk analysis in protecting the health of the population from harmful environmental influences. 4. To review the basics of the origin and spread of hospital infections and support measures for their control and prevention. 5. To evaluate the role of medical laboratory diagnostics in the implementation of biomonitoring and to comment on the influence of environmental factors on reproduction. 6. To distinguish the fundamental reasons for the emergence of antibiotic resistance in hospitals and to distinguish the key elements in reducing the occurrence of infections caused by multi-resistant microorganisms in healthcare institutions. 7. To critically evaluate different methods of quantitative determination of the amount of toxic metals in environmental media and in biological samples. 8. To compare the risk of infection through medical equipment and the risk of infection due to inadequate management of medical waste. 	
Course content	
Lectures: Environment and health. Changes of the environment and human development. Health effects of environmental factors. Definition and tasks of health ecology. Ecological concept of health. Health-ecological standards.	

Development of ecological ideas in medicine. Historical development of ecological ideas in medicine. Historical development of health ecology in Croatia.

Ecological research method and medical laboratory diagnostics. Basic characteristics of ecological research method. Types of ecological research methods. Advantages and disadvantages of ecological research methods. Possibilities of applying medical laboratory diagnostics in the ecological method of research.

Fundamentals of ecotoxicology. Modes of the entrance of ecological toxins into the body and their fate in the organism. Peculiarities of the ecological toxin's activity. Types of toxicity. Determination of the threat to health caused by ecological toxins. Dose-effect ratio.

Risk analysis in health ecology. Danger or harm. Risk. Risk analysis - definition and division. Risk assessment - definition, degrees, basic task. Risk management - definition, basic steps, role. Risk communication - definition and meaning.

Biological monitoring and biological markers. Environmental monitoring and biological monitoring. Objectives and tasks of biological monitoring. Features of the implementation of biological monitoring programs. National biomonitoring programs. Limitations of biological monitoring. Benefits of biological monitoring. Biological markers. Interpretation of the biomonitoring results. The future of biomonitoring.

Organization of health ecology in Croatia, current situation and perspectives. Legislative and institutional framework of health ecology in Croatia. Organization and work of health ecology in Croatia - assessment of the situation and perspectives.

Ethical issues in health ecology research. Basic ethical principles of all scientific research. Ethical doubts related to the detection and impact of toxic substances in the human environment on the health of the population. Ethical issues related to biomonitoring. New threats to scientific integrity during the conduction of health ecology research.

Basics of the origin and spread of infectious diseases. The host and the causative agent - entry of the causative agent, defense of the host. Vogralik's chain – source of infection, routes of spread, entrance door of infection, amount and virulence of the causative agent, and the influence of the environment and the disposition /tendency/ and sensitivity of the host. Prevention of infectious diseases - measures for the patient, measures for the environment.

Hospital infections. Conceptual definition. Frequency. Strategy for the control of nosocomial infections. Physician responsible for the control of the hospital infection control. Nurse responsible for the control of the hospital infection. Team for the control of the hospital infection. Commission for the control of the hospital infection. Risk management within the control of the hospital infection.

Construction and maintenance of health institutions. Assessment of the risk of infection. General hospital environment. Patient accommodation. Conditions for hand hygiene. Isolation rooms. Operating rooms. Ventilation and air conditioning. Cooling towers and water systems. Construction, renovation and demolition.

Monitoring and suppression of epidemics. Incidence of various nosocomial infections. Monitoring of nosocomial infections. Monitoring methods. Procedure in an epidemic.

Protection of healthcare professionals. Protection measures for healthcare professionals. The role of occupational medicine specialists and epidemiology specialists. Procedure with a sharp object injury. Protection against tuberculosis. Pregnant health workers.

Seminars:

The role of medical laboratory diagnostics in the implementation of biomonitoring. Application of medical laboratory diagnostics in biomonitoring. The importance and meaning of the mentioned application. Possibilities and limitations of the mentioned application.

Environmental mutagenesis. Biological principles of mutagenesis. Sources and types of environmental mutagens. Classification of mutagens. Evaluation of the risk to the human genome due to exposure to environmental mutagens.

Environmental carcinogenesis. Genotoxic and epigenetic mechanisms of action of carcinogens. Classification of carcinogens. Cancer prevention.

The influence of the environment on reproduction. Specific effects of some environmental chemical factors on reproduction. Specific effects of some physical environmental factors on reproduction. Nitrates, nitrites and N-nitrosamines and health. Use of nitrates and nitrites in the food industry. N-nitrosamines - origin, sources of human exposure, possibilities to prevent nitrosation reactions in food. Quantitative determination of N-nitrosamine in food. Toxic effects of nitrates, nitrites and N-nitrosamines.

Theoretical postulates of the program and organization of surveillance and prevention of hospital infections. Infection control as a standard of the quality of health care. Basic parts of a modern nosocomial infection prevention program.

Antibiotic resistance in hospitals. Definition of resistance. Frequency of resistance in the world and in Croatia. The fundamental causes of resistance. The main mechanisms of the emergence of resistance. The most significant resistant strains of microorganisms in Croatian hospitals.

Methods of decontamination. Choice of decontamination method. Cleaning as a prerequisite for starting disinfection and sterilization. Disinfection. Sterilization. Antiseptics. Disinfectants.

Hand washing and disinfection - antisepsis and personal protective equipment of healthcare workers. The importance of hand washing in the prevention of hospital infections. Levels of hand washing – ordinary washing, hygienic hand disinfection or antisepsis, surgical disinfection or hand antisepsis. The most important types of antiseptics and their use. Personal protective equipment of healthcare professionals - clothing and footwear, gloves, safety glasses, face mask, aprons and gowns, plastic shoelaces.

Prevention of infections caused by multi-resistant microorganisms. Key elements in reducing the occurrence and control of multiresistant microorganisms: methicillin-resistant *S. aureus*, vancomycin-resistant enterococci, multiple-resistant gram-negative rod microbes.

Exercises:

Impact of metals on human health. Acute and chronic toxicity of various metals and semi-metals. Distribution of various toxic metals in the environment. Methods of quantitative determination of the amount of toxic metals in environmental media and in biological samples.

Lead and cadmium. Sites. Use. Distribution in the environment and methods of quantitative determination. Impact on the human body.

Mercury and arsenic. Sites. Use. Distribution in the environment and methods of quantitative determination. Impact on the human body.

Effects of gases and steam on health. Gas irritants (irritants). Asphyxiate gases. Intoxicating gases (anesthetics, narcotics).

Impact of pesticides on health. Definition and application of pesticides. Pesticides and human health. Distribution of pesticides. Methods of quantitative determination of the amount of pesticides in the environment. Procedures for reducing risks to human health and environmental pollution with pesticides.

Polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), dioxins and furans. Conceptual definition. The most common sources of human exposure. Proven and hypothesized health effects. Methods of quantitative determination of these compounds in the environment. Procedures for reducing the risk to human health and environmental pollution with these compounds.

The influence of thermal factors on health. Definition and meaning. Excessive heat load of the organism - general and local changes. General and local changes in the organism caused by the reduced temperature of the environment.

The influence of atmospheric pressure on health. Definition and meaning. The effect of increased atmospheric pressure on health. The impact of reduced atmospheric pressure on health.

The impact of mechanical and electrical energy on health. Noise and health. Vibration and health. Injuries caused by electric energy.

Impact of electromagnetic radiation on health. Non-ionizing radiations of the electromagnetic spectrum – static electric and magnetic fields, very low frequency electromagnetic fields, radio frequency and microwave fields, optical spectrum. Ionizing radiations of the electromagnetic spectrum.

Mycotoxins and health. Definition and sources in food. Conditions for the formation of mycotoxins in food. Possibilities of quantitative determination of mycotoxins in food. Mycotoxicosis. Suppression of the presence of mycotoxins in food. The most important types of mycotoxins, sources of exposure and their proven and possible effects on human health.

Risk of infection through medical equipment. Critical or high-risk items. Semi-critical or medium-risk items. Non-critical or low-risk items. Objects of minimal risk or surfaces around the patient.

Food and food delivery in the hospital as a potential source of outbreaks of food-borne infections. The most common causes of food poisoning. The importance and significance of the HACCP system in the hospital. Staff health/hygiene. Production systems for cooking - cooling food. Basic rules of food hygiene. Hospital kitchen. Sectional kitchens. Ground and pureed food. Food cart. Refrigerators. Ice machines.

Sterilization I. Definition and types. Criteria for choosing a sterilization method. Features of the most important sterilization methods - dry heat sterilization, moist heat sterilization, ethylene oxide sterilization, formaldehyde vapor sterilization, hydrogen peroxide vapor sterilization, plasma sterilization, hydrogen peroxide plasma sterilization.

Sterilization II. Monitoring of the conditions in which the sterilization process takes place. Mechanical or physical indicators of sterilization - time, temperature and pressure of sterilization. Chemical indicators of sterilization. Biological indicators of sterilization (spores). Organization of sterilization activities in health institutions. European and Croatian sterilization standards.

Laundry and laundry service as a risk for the transmission and emergence of hospital infections. General principles of infection prevention. Laundry process. Microbiological sampling. Staff uniforms. Mattresses and pillows. Beds with air mattresses.

Disinfection I. Definition of disinfection. Chemical disinfectants and antiseptics - types and method of application. Alcohol. Chlorine - based disinfectants. Phenols. Chlorhexidine. Iodides and iodophors. Quaternary ammonium compounds. Hexachlorophene. Triclosan. Aldehydes. Peracetic acid. Hydrogen peroxide.

Disinfection II. Cleaning the environment. Procedure with spilled infectious material. Cleaning and disinfection of medical equipment.

Management of medical waste and the risk of infection. Definition and categories of medical waste. Methods for safe handling of medical waste. Methods for the safe use, handling and disposal of sharp objects. Disposal and permanent disposal of medical waste.

Mode of teaching

Lectures, Seminars, Exercises.

Student obligations

Attending all types of classes is mandatory and the student is required to participate in all types of knowledge assessment. The successful performance of seminars and exercises requires prior preparation of the student. The student can be justifiably absent from 30% of each type of classes.

Monitoring student work (*Connectivity of learning outcomes, teaching methods and grading*)

Exam method: Written exam.

Evaluation of the final written exam:

Teaching activity	ECTS	Learning outcome	Student activity	Assessment methods	Grade points	
					Min.	Max.
Attending classes	0.2	1-8	Class attendance	Attendance record	4	8
Seminars	0.8	5,6	Attendance and active participation in seminars by preparing a seminar presentation	Assessment of the quality of the seminar presentation	16	32
Exercises	1.0	7,8	Performing exercises	Assessment of the quality of the performed exercise	20	40
Final exam	2.0	1-8	Studying for the final exam	Written exam	10	20
Total	4.0				50	100

Percentage of correct answers (%)	Grade points
60.00-64.99	10
65.00-69.99	12
70.00-74.99	14
75.00-79.99	16
80.00-84.99	17
85.00-89.99	18
90.00-94.99	19
95.00-100.00	20

Calculation of the final grade:

Grade points earned in the final exam are added to the grade points earned during the course. Grading in the ECTS system is done by absolute distribution, i.e. based on total achievement and is compared to the numerical system in the following manner: A - excellent (5): 80-100 grade points; B - very good (4): 70-79.99 grade points; C - good (3): 60-69.99 grade points; D - sufficient (2): 50-59.99 grade points.

Required reading (available in the library and through other media)

Title	Number of copies in the library	Availability through other media
Puntarić D, Miškulin M, Bošnjir J. Health ecology (selected chapters) (in Croatian). Medicinska naklada, Zagreb, 2012	10	
Ropac D, Puntarić D. i sur. Epidemiology of infectious diseases (selected chapters) (in Croatian). Medicinska naklada, Zagreb, 2010.	13	

Additional reading

1. Kalenić S, Horvatić J. Handbook of infection control procedures (in Croatian). Merkur A.B.D. i Referentni centar za bolničke infekcije Ministarstva zdravstva Republike Hrvatske, Zagreb, 2004.
2. Published recent scientific research in the subject area.

Course evaluation procedures

Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Medicine Osijek.

Note /Other

E-learning is not included in the class quota, but it is used in teaching and it contains links to various sites and video and audio materials available on websites.