

**English Division I year**  
**Medical Biology 2015/2016**  
**Part I: Medical Ecology**

**Topic 1. Medical Ecology I – Abiotic factors**

1. Overview of the regulations of didactic training.
2. Rules of microscopic slides examination — slide of *Lillium sp.*- pollen, microscopic preparation, unstained
  - a. naked eye observation - description
  - b. microscopic observation - magnification 100x - description
  - c. microscopic observation - magnification 400x, or 600x - description
  - d. microscopic observation - magnification 1000x - oil immersion - description
3. Temperature and water as life functions limiting factors
  - a. anabiosis of moss fauna - experiment, report
  - b. freeze drying bacteria *Lactobacillus acidophilus* – demonstration, microscopic observation – magnification 400x
4. Teratogen-induced abnormalities in vertebrate organism
  - a. *Gallus sp.*
    - crossed beak and cyclopia - macroscopic preparation fixed in 4% formalin - demonstration
    - schistocelia - macroscopic preparation fixed in 4% formalin - demonstration
    - non-retracted yolk sac - macroscopic preparation fixed in 4% formalin - demonstration
  - b. *Homo sapiens L.*
    - exencephalia (cranialis atrophy) and abdominal hernia - fetus fixed in 4% formalin – demonstration

**Knowledge required before attending laboratory:**

- basic terms of ecology (biotope, biocenosis, ecosystem, population, ontocenosis, environment)
- basic principles of ecology, medical ecology, human ecology, human population growth
- influence of abiotic factors on organisms
- impact of smoking and alcohol to health

**Recommended literature:**

1. Syllabus
2. Campbell, J.B. Reece: Biology. Pearson, Benjamin Cummings, Seventh Edition 2005
3. Meder S., Windelspecht M.: Human Biology. McGraw-Hill Science/Engineering/Math, Twelfth Edition 2011

## Topic 2. Medical Ecology II - Biotic factors

### I. Antagonistic interactions

1. The effect of *Penicillium notatum* Mantelli et Negri on *Staphylococcus aureus* Rosenbach - description
2. Mycotoxins of *Aspergillus flavus* Link
  - a. infected arachidonic nuts (*Arachis hypogaea* L.) – demonstration
  - b. *Aspergillus flavus* Link - culture on Sabouraud medium – growth description
  - c. evaluation of the susceptibility of *Paramecium sp.* on the extract from fungus mold - experiment, report
  - d. *Phytophthora infestans* (Montagne) de Barry in potato (*Solanum tuberosum*)  
- infected potatoes - macroscopic preparation – demonstration
3. The effect of phytoncides of garlic (*Allium sativum* L), onion (*Allium cepa* L.) and horseradish (*Armoracia lapathifolia* Gilib.) on *Escherichia coli* (Migula) Castellani et Chalmers - demonstration
4. The kit of essential oils useful in medicine – demonstration

### II. Protective interactions

1. *Cetraria islandica* (L.) Arachius - Iceland moss
  - a. microscopic preparation, magnification 100x, 400x or 600x – figure
  - b. macroscopic preparation - demonstration
2. *Lupinus sp.* and *Rhizobium sp.*
  - a. The roots of *Lupinus* - macroscopic preparation, demonstration
  - b. *Rhizobium sp.* - bacteroids - fixed microscopic slide, magnification 400x – figure
3. *Neottia nidus-avis* – root with endotrophic mycorrhiza – fixed microscopic slide, magnification 400x – figure

### III. Microbiological and mycological evaluation of soil – experiment report.

#### Knowledge required before attending laboratory:

- terms: biotic and abiotic factors, symbiosis, mutualism, commensalism, parasitism, herbivory, predation, competition, antibiotics, volatiles in plants, lichens, mycorrhiza and its medical use

#### Recommended literature:

1. Syllabus
2. Campbell, J.B. Reece: Biology. Pearson, Benjamin Cummings, Seventh Edition 2005

### Topic 3. Medical Ecology III - Lithosphere

1. Microbiological and mycological evaluation of soil – observation and description of cultures prepared on previous classes.
2. Soil as a reservoir of saprophytic and pathogenic organisms.
  - a. *Streptomyces sp.*
    - microscopic slide fixed with 70% ethanol, stained with methylene blue, magnification 100x, 400x or 600x - demonstration
  - b. *Trichophyton sp.*
    - cultivation on solid Sabouraud medium - demonstration
    - hair perforation test - description
    - hair perforation by dermatophytes - slide fixed with 70% ethanol, unstained, magnification 100x - demonstration
3. Parasitological evaluation of soil – experiment, report.
4. The most common parasites found in soil:
  - a. *Trichuris sp.* - whipworm
    - eggs - slide fixed with 70% ethanol, unstained, magnification 100x, 400x or 600x - figure
  - b. *Ascaris sp.* - roundworm
    - embryonated (invasive) and non-embryonated (non-invasive) eggs - slide unstained, magnification 100x, 400x or 600x – figure
  - c. *Ancylostoma duodenale* (Dubini, 1843) Creplin, 1845
    - adult worm (male, female) - macroscopic preparation fixed in 4% formalin, stained by aluminous carmine - demonstration
    - adult worm in the intestinal tract of the definitive host - microscopic slide fixed in 70% ethanol, stained by hematoxylin and eosine, magnification 100x, 600x – figure
5. Microbiological examination of water purity – experiment report

#### Knowledge required before attending laboratory:

- characteristic of lithosphere
- soil as a reservoir of pathogenic organisms
- structure, route of invasion, invasive forms, pathogenicity of *Trichuris sp.*, *Ascaris sp.*, *Ancylostoma duodenale*
- human impact to soil (pollution, use of resources)

#### Recommended literature:

1. Syllabus
2. Chomicz L.: Fundation of medical parasitology. Compendium for medical students. Medical University of Warsaw
3. Buczek A.: Parasitology for medical students. Koliber Lublin, Second Edition. 2007
4. Meder S., Windelspecht M.: Human Biology. McGraw-Hill Science/Engineering/Math, Twelfth Edition 2011

## Topic 4. Medical Ecology IV – Aerosphere, Hydrosphere

### I. Aerosphere

#### 1. Influence of dust pollution on mammal organism:

- a. *Homo sapiens L.*- lung with anthracosis - formalin fixed microscopic slide, hematoxylin and eosin stained, magnification 100x,400x or 600x - figure
- b. lung of healthy man - formalin fixed microscopic slide, hematoxylin and eosin stained, magnification 100x,400x or 600x - figure
- c. man's lung with anthracosis - macroscopic preparation, formalin fixed – presentation with description
- d. man's healthy lung - macroscopic preparation, formalin fixed – presentation with description

#### 2. Examples of microorganisms found in the Lodz air

- a. *Aspergillus niger* - culture in solid Sabouraud medium - growth description
- b. *Penicillium sp.* - culture in solid Sabouraud medium - growth description
- c. agar plate with micro-organism found in the Lodz air - microbiological analysis of the air with the Koch sedimentation method – experiment, report.
- d. *Alternaria sp.* - culture in solid Sabouraud medium – presentation

#### 3. The most common parasites transmit through air:

- a. *Enterobius vermicularis* (Linnaeus, 1758) Leach, 1853
  - adult worm (female) - microscopic slide fixed in 70% ethanol, unstained, magnification 25x - demonstration
  - eggs - microscopic preparation fixed in 70% ethanol, unstained, magnification 100x, 400x or 600x – figure

#### 4. Calculation of parasites growth index – mathematical task

### II. Hydrosphere

#### I. Classes of water purity:

#### 1. examination of direct water samples – microscopic slide, magnification 100x, 400x, 600x – description, figure

#### 2. examples of index organisms of different types of water:

- polysaprobic – *Tubifex sp.* (larvae) – figure
- mesosaprobic – *Hirudo medicinalis* (adult) – figure
- oligosaprobic – *Hydropsyche sp.* (larvae) - figure

#### 3. Microbiological examination of water purity – observation and description of cultures prepared on previous classes

#### II. The most common parasites transmit through water:

- a. *Acanthamoeba sp.* - methanol fixed slide, Giemsa stained, magnification 1000x – figure
- b. *Cryptosporidium parvum* Tyzzer, 1907
  - oocysts - fixed, Ziehl-Neelsen stained slide, magnification 1000x (immersion oil)– figure
- c. *Schistosoma mansoni* Sambon, 1907:
  - mature individuals- fixed microscopic slide, hematoxylin-stained, magnification 100x-figure
  - eggs- microscopic slide fixed in 70% ethanol, non-stained, magnification 100x, 400x or 600x - figure

#### Knowledge required before attending laboratory:

- air pollutants – types and pathogenicity
- characteristic of pneumoconiosis, collagen and non-collagen dust disease
- definition and types of smog
- biological contaminants and connected diseases
- water classifications and saprobity; classes of water purity
- definitions of BOD, COD, Bi, coliform titre, coliform index
- structure, route of invasion, invasive forms, pathogenicity of *Acanthamoeba castellanii*, *Cryptosporidium parvum*, *Schistosoma mansoni*, *Enterobius vermicularis*
- human impact to water and air (pollution, use of resources)

#### Recommended literature:

1. Syllabus
2. Chomicz L.: Foundation of medical parasitology. Compendium for medical students. Medical University of Warsaw
3. Buczek A.: Parasitology for medical students. Koliber Lublin, Second Edition. 2007
4. Meder S., Windelspecht M.: Human Biology. McGraw-Hill Science/Engineering/Math, Twelfth Edition 2011

## **Topic 5. Medical Ecology V – Fungi of medical significance: review of main pathogenic and toxic fungi. Plants of medical significance: selected plants with toxicological and pharmacological effects.**

### **Venomous animals.**

#### **I Fungi of medical significance**

1. *Candida albicans* Berkhout
  - culture on solid Sabouraud medium - growth description
  - microculture, fixed preparation, Giemsa-stained, magnification 100x, 400x or 600x - figure
2. *Candida tropicalis* Berkhout
  - culture on solid Sabouraud medium - growth description
  - microculture, fixed microscopic slide, Giemsa stained, magnification 100,400x or 600x - figure
3. *Rhodotorula rubra* Lodder
  - culture on solid Sabouraud medium - description of growth
  - microculture, ethanol fixed slide, cotton blue stained, magnification 100x, 400x or 600x - figure
4. *Geotrichum candidum* Link
  - culture on solid Sabouraud medium - description of growth
  - microculture, ethanol fixed slide, Giemsa stained, magnification 100x, 400x or 600x - figure
5. *Claviceps purpurea* (*Secale cornutum* L.) - macroscopic preparation -demonstration
6. *Amanita phalloides* L. *Amanita phalloides* (Vaill.:Fr.) Link. - Deathcap
  - mushroom's fruitbody - macroscopic preparation - figure
  - spores - microscopic slide, unstained, magnification 400x or 600x, 1000x - figure
7. *Agaricus campestris* L. - mushroom's fruitbody - macroscopic preparation - figure
8. Inoculation of the contents of mouth on liquid Sabouraud medium - execution and description.

#### **II Plants of clinical significance:**

1. *Atropa belladonna* L. - Deadly Nightshade - berries fixed in 70% ethanol, macroscopic preparation - demonstration
2. *Datura stramonium* L. - Thornapple - seed capsules, macroscopic preparation - demonstration
3. *Digitalis purpurea* L. - Digitalis - macroscopic preparation – demonstration

#### **III Poisonous animals:**

1. *Leiurus* sp. - Scorpion - macroscopic preparation fixed in 4% formalin – demonstration
2. *Apis mellifera* L. - Honey Bee
  - imago - macroscopic preparation – demonstration
  - sting - microscopic slide fixed in 70% ethanol, unstained, magnification 100x, 400x or 600x – figure
3. *Paravespula* syn. *Vespula vulgaris* L. - Common Wasp
  - imago - macroscopic preparation – demonstration
  - sting - microscopic slide fixed in 70% ethanol, unstained, magnification 100x, 400x or 600x - figure
4. *Vespa crabro* L. - European Hornet - imago - macroscopic preparation – demonstration
5. *Vipera berus* L. - Viper, adder - macroscopic preparation fixed in 4% formalin - demonstration

#### **Knowledge required before attending laboratory:**

- the structure of fungi
- fungi impact on ecosystems and human welfare
- pathogenic fungi: *Candida albicans*, *Candida tropicalis*, *Rhodotorula rubra*, *Geotrichum candidum*,
- poisonous fungi: *Claviceps purpurea* (ergot), *Ammanita phalloides*
- plants: *Atropa belladonna*, *Datura stramonium*, *Digitalis purpurea* and their role in medicine
- characterization of venom components and their effects on human of *Apis mellifera*, *Paravespula* (*Vespula*) *vulgaris*, *Vespa crabro*, *Leiurus* sp., *Vipera berus*
- differentiation between poisonous and venomous animals

#### **Recommended literature:**

1. Syllabus
2. Campbell, J.B. Reece: Biology. Pearson, Benjamin Cummings, Seventh Edition 2005

## **Topic 6. Medical Ecology VI - Pathogenic protozoa. Helminths of medical significance: parasites in the ontocenoses of the digestive tract and blood. Arthropods of medical significance.**

### **I. Pathogenic protozoa:**

1. *Trichomonas tenax* (Muller, 1773) Dobell, 1939  
- culture in Simić's medium - direct microscopic slide, magnification 100x, 400x or 600x - figure
2. *Entamoeba gingivalis* (Gros, 1849) Brumpt, 1913  
- culture in Pavlova's medium - direct microscopic slide, magnification 100x, 400x or 600x - figure
3. *Trypanosoma brucei gambiense* Dutton, 1992  
- trypomastigote - fixed microscopic slide, Giemsa-stained, magnification 100x, 400x or 600x - figure

### **II. Helminths of medical significance:**

1. *Fasciola hepatica* Linneus, 1758  
- adult worm - microscopic slide, fixed in Bouin's liquid, alum-carmin stained, magnification 25x - figure  
- eggs - microscopic slide, fixed with 70% ethanol, unstained, magnification 100x, 400x or 600x - figure  
- metacercariae - microscopic slide, fixed with 70% ethanol, unstained, magnification 100x, 400x or 600x - figure
2. *Diphyllobothrium latum* Linneus, 1758  
- scolex - slide — demonstration  
- strobila - macroscopic preparation, fixed with 4% formalin - figure  
- proglottid - microscopic slide, fixed in Bouin's liquid, magnification 25x - figure  
- eggs - microscopic slide, fixed with 70% ethanol, unstained, magnification 100x, 400x or 600x - figure
3. *Loa loa* (Cobbold, 1864) Castellani et Chalmers, 1913:  
- microfilariae in peripheral blood smear - fixed microscopic slide, Giemsa-stained, magnification 100x - demonstration

### **III. Arthropods of medical significance:**

1. *Pediculus humanus* Linnaeus, 1758  
- imago - microscopic slide, magnification 100x - figure  
- eggs - microscopic slide, magnification 100x - figure
2. *Phthirus pubis* Linnaeus, 1758  
- imago - microscopic slide, magnification 100x - figure  
- eggs - microscopic slide, magnification 100x - figure
3. *Anopheles maculipennis* Meigen, 1818  
- imago — microscopic slide, magnification 100x, figure  
- larva - microscopic slide, magnification 100x - figure  
- mouthparts - microscopic slide, magnification 100x - figure
4. *Culex pipiens* Linnaeus, 1758  
- imago — microscopic slide, magnification 100x - figure  
- pupa - microscopic slide, magnification 100x - figure  
- larva - microscopic slide, magnification 100x - figure  
- mouthparts - microscopic slide, magnification 100x - figure
5. *Pulex irritans* Linnaeus, 1758  
- imago - microscopic slide, magnification 25x - figure
6. *Calliphora vicina* Rubineau-Desroidy  
- imago - macroscopic preparation - demonstration
7. *Sarcophaga haemorrhoidalis* Fallin  
- imago - macroscopic preparation - figure

### **IV. Microscopic examination of the oral cavity contents which was made during the previous lab. practical**

- liquid Sabouraud medium - direct microscopic slide made with the use of a loop, magnification 100x - description

**Knowledge required before attending laboratory:**

- structure, route of invasion, pathogenicity of protozoa: *Trichomonas tenax*, *Entamoeba gingivalis*, *Trypanosoma brucei gambiense*
- structure, life cycle, route of invasion, pathogenicity of helminthes: *Fasciola hepatica*, *Diphyllobothrium latum*, *Loa loa*
- morphology, epidemiology, development, pathogenesis, diagnosis, prevention of arthropoda: *Pediculus humanus*, *Phthirus pubis*, *Anopheles maculipennis*, *Culex pipiens*, *Pulex irritans*, *Calliphora vicina*, *Sarcophaga haemorrhoidalis*

**Recommended literature:**

1. Syllabus
2. Chomicz L.: Foundation of medical parasitology. Compendium for medical students. Medical University of Warsaw
3. Buczek A.: Parasitology for medical students. Koliber Lublin, Second Edition. 2007

## **Topic 7. Medical Ecology VII – Homeostasis in humans – regulation systems**

### 1. Unstable regulation system:

- a. Traube's cell – experiment, report

### 2. Stable regulation systems:

#### a. exercise tests:

- Ruffier's and Master's trials – experiments, reports
- changes of heart action after exercise in humans with different physical efficiency – graph, demonstration

#### b. buffer properties of blood serum – experiment, report

#### c. regulation of glucose concentration in human blood – structural scheme – demonstration with description

#### d. thermoregulation system in humans – structural scheme – demonstration with description

### **Knowledge required before attending laboratory:**

- terms: homeostasis, positive feedback, negative feedback, mechanisms of human thermoregulation
- blood, urinary system, skeletal and muscular systems, endocrine system contribution to maintain homeostasis

### **Recommended literature:**

1. Syllabuses
2. Campbell, J.B. Reece: Biology. Pearson, Benjamin Cummings, Seventh Edition 2005
3. Meder S., Windelspecht M.: Human Biology. McGraw-Hill Science/Engineering/Math, Twelfth Edition 2011

## **Topic 8. Medical Ecology VIII – Theoretical and practical assessment of Medical Ecology**