
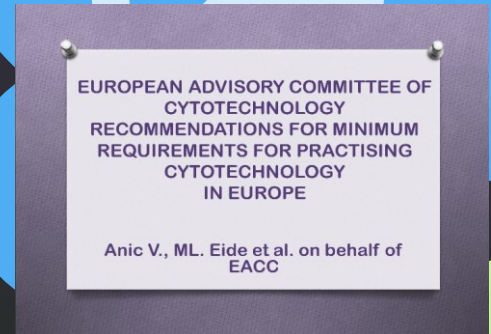
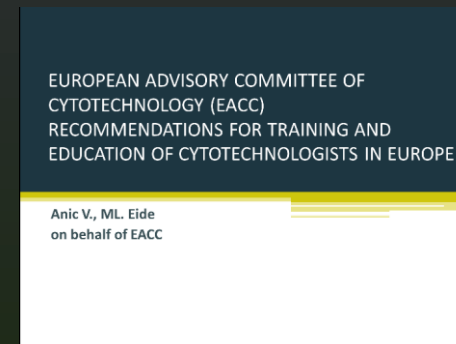
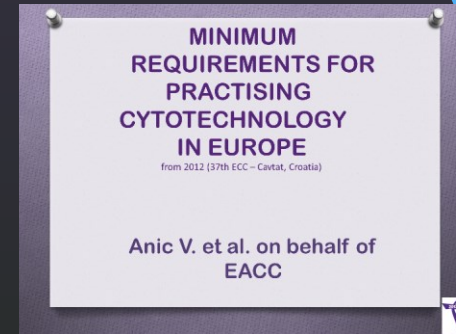


Non-gynecological education of Cytotechnologists

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Zagreb, Croatia

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- PRELIMINARY REPORT
BASIC REQUIREMENTS FOR
PRACTISING
CYTOTECHNOLOGY IN
EUROPE(2010)**
- from 2010 (17th ICC, Edinburgh, Scotland)
- V. Anic, A. Domanski,
ML. Eide , D. Ejersbo,
M. Morgan and
I. Srebotnik-Kirbis



- Today in most of the European countries cytotechnologists performs screening in gynecological cytology.
- Given the changes that are already taking place such as automatization and HPV vaccination, and will be more pronounced in gynecological cytodiagnostics, Cytotechnologists slightly lose their importance, and there will be less and less necessary for the purpose of screening.

REVIEW

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Survey of training and education of cytotechnologists in Europe

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V. Anic and M. L. Eide.

Survey of training and education of cytotechnologists in Europe

Objective: This report presents the results of a survey of the training and education of cytotechnologists (CTs) in 15 European countries and suggests guidelines on which future education should be developed.

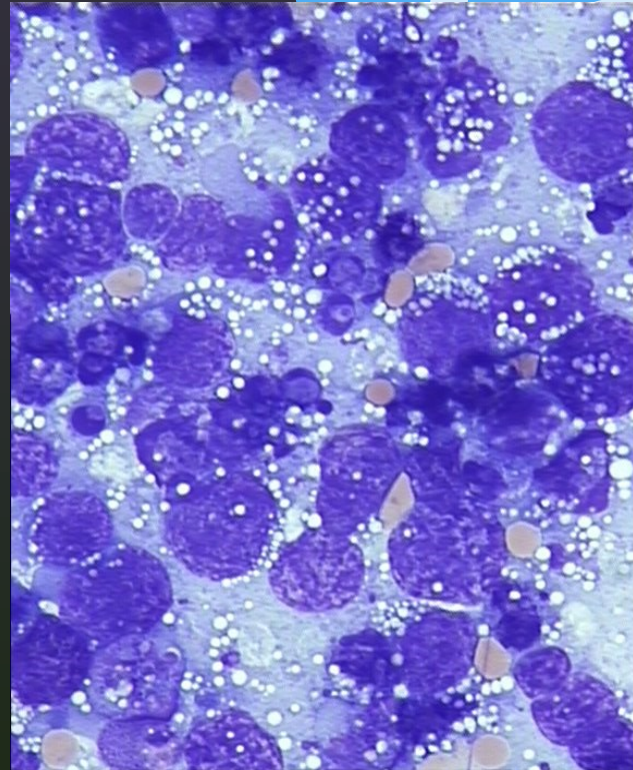
Methods: A questionnaire was sent to 25 countries in 2011: 14 with and 11 without a European Advisory Committee of Cytotechnology (EACC) member or representative. We received responses from 18 countries, among which three were excluded from the survey because they did not have CTs in training.

Results: The number of fully trained and employed CTs in these 15 European countries varied from 25 to

Table 1. Approximate number of fully trained and employed cytotechnologists (CTs) in different European countries

Country (number of CTs)	IAC	QUATE	Level of responsibility	Education before CT training	Nature of CT training	Accreditation of CT training
Austria* (300)	22 (7.3%)	32 (10.6%)	Basic, 13 Intermediate, 280	University of Applied Science bachelor degree**	In-house; gyn only allowed	University; only gyn
Belgium* (1300)	Few ()	Few ()	Intermediate	MLT and/or 3-year bachelor or masters degree	In-house; gyn only allowed	Not recognized
Croatia* (225)	0 (-)	0 (-)	Intermediate	High school or university bachelor degree	Separate course; gyn & non-gyn	Degree
Denmark* (175)	19 (10.8%)	≈ 130 (≈ 74.3%)	Intermediate, 165 Advanced, 10	3-year bachelor degree	In-house only	IAC and QUATE
Finland† (+200)	40-50 (20-25%)	0 ()	Basic: some Intermediate, some	University of Applied Science bachelor degree	Separate and in-house; gyn only allowed	Not recognized
France* (+800)	17 (2.1%)	0 (-)	Intermediate	MLT - bachelor degree	Separate course; gyn & non-gyn	University
Germany* (2600)	Few	German exam similar to QUATE	Intermediate, ≈ 2450 Advanced, ≈ 150	MLT - high-school	Separate and in-house; gyn only	Certificate

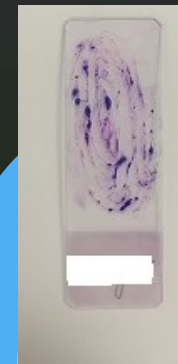
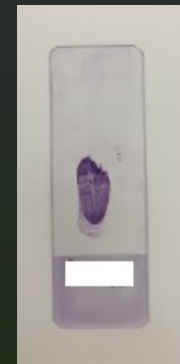
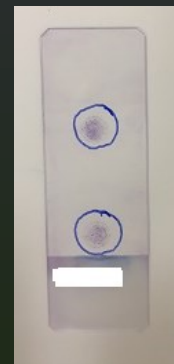
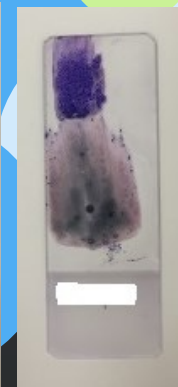
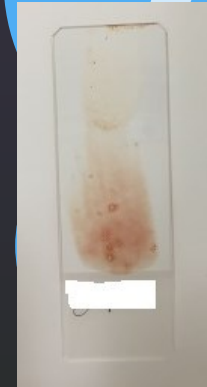
- There is a need to redirect existing and future generations of Cytotechnologists in other branches of cytodiagnostic such as non- gynecological cytodiagnosics.



- Considering that in some European countries exists deficient education in non gynecological cytodiagnostic, I would like to present a model of education for Cytotechnologists of the Croatian Society for Clinical Cytology of the Croatian Medical Association, which carried out a program of education for Cytotechnologists from 1968. Head of the course till 1993 was a Prof. Inga Črepinko, than prof. Znidarčić and after 2008, Prof. Ika Kardum Skelin.
- Lecturers who participate in education are cytologists and cytotechnologists with many years of experience in the diagnostic cytopathology.
- After basic education (whether this is a laboratory technician or bachelor) is obligatory one-year training in cytotechnology in duration of 630 teaching hours (lectures, seminars and practice) including 200 hours of practical training.



- Most of the lectures relates to gynecological cytology, but it also includes training in non gynecological cytodiagnostic - exfoliative and aspiration cytology.
- The curriculum in order to provide a quality basic education of Cytotechnologists includes assistance in taking samples, the principles of cytopreparation and the cytological evaluation of cell samples with an emphasis on pre-screening of cytopathology specimens from all non-gynecological body sites.



- Example of education from non gynecological cytology which has a very high quality educational base and can easily be expanded with additional required courses.

Flow
cytometry

Cytochemistry and
immunocytochemistry

Image
cytometry

Molecular
methods,
polymerase
chain
reaction

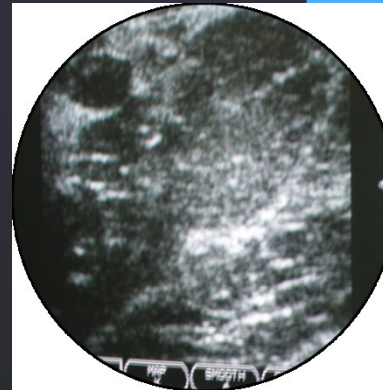
Cytogenetics

Cell
blocks

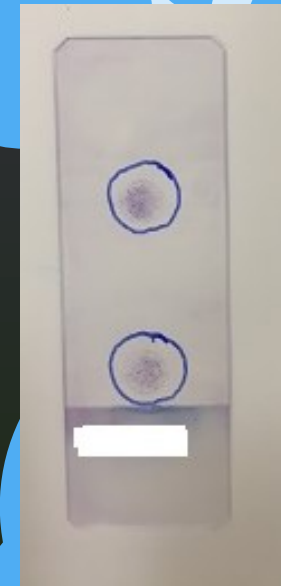
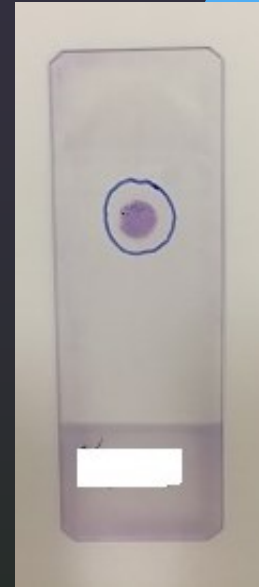
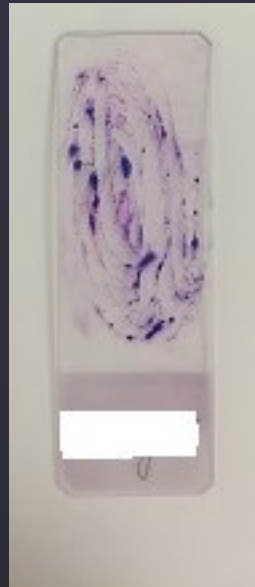
LBC

What this education provides?

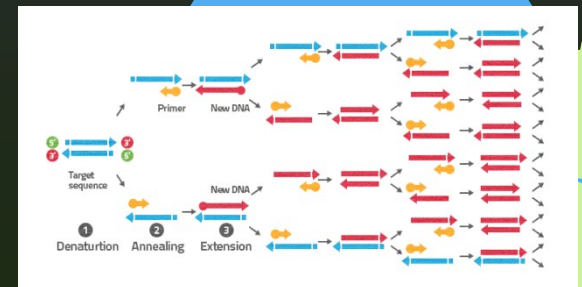
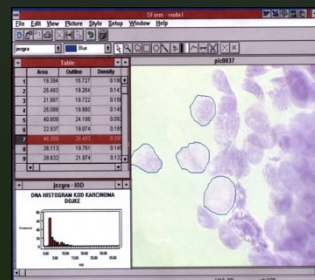
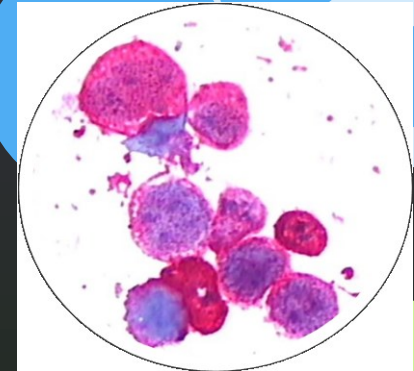
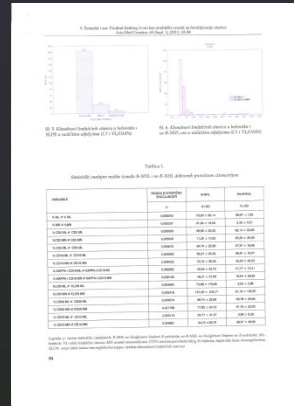
- Assisting and preparation of smears at aspiration and biopsies of bone marrow, lymph nodes, breast, thyroid, salivary glands, abdominal organs and other soft tissue tumors under ultrasound control - and CT.
- Basics of collecting samples for additional tests: immunophenotyping, genetics, molecular methods, microbiology and others.



- Download and processing of bronchoscopic materials
- Processing and knowledge how the smear sputum, urine, gastric juice, cyst and effusion.
- Preparation and production of cyto-centrifuge sediments.

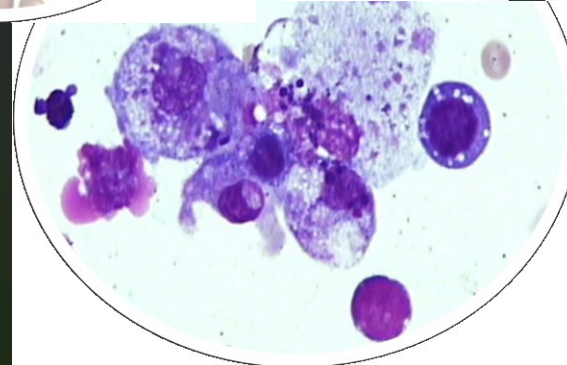
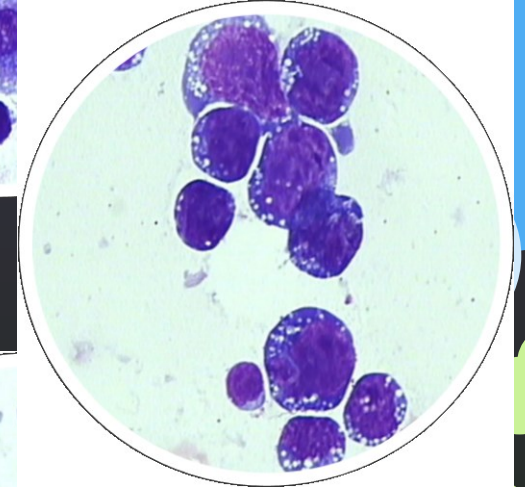
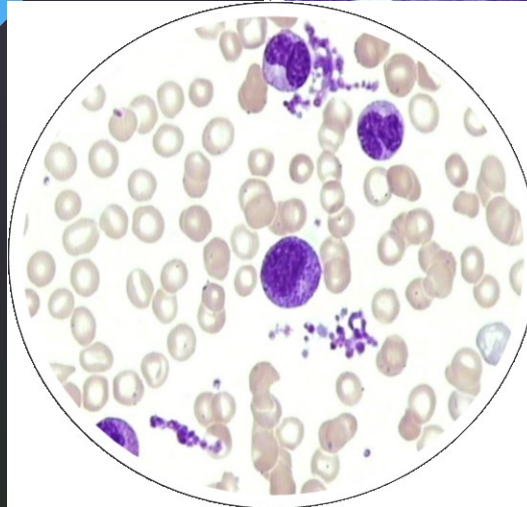
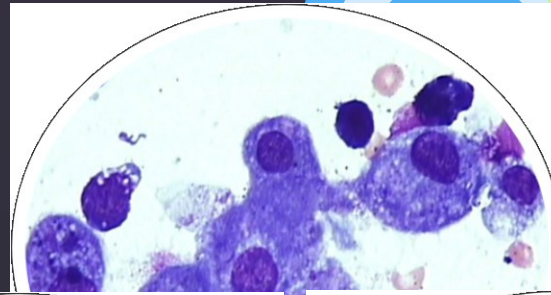


- Introduction of other technologies: cytogenetics, immunophenotyping, polymerase chain reaction (PCR) and others.



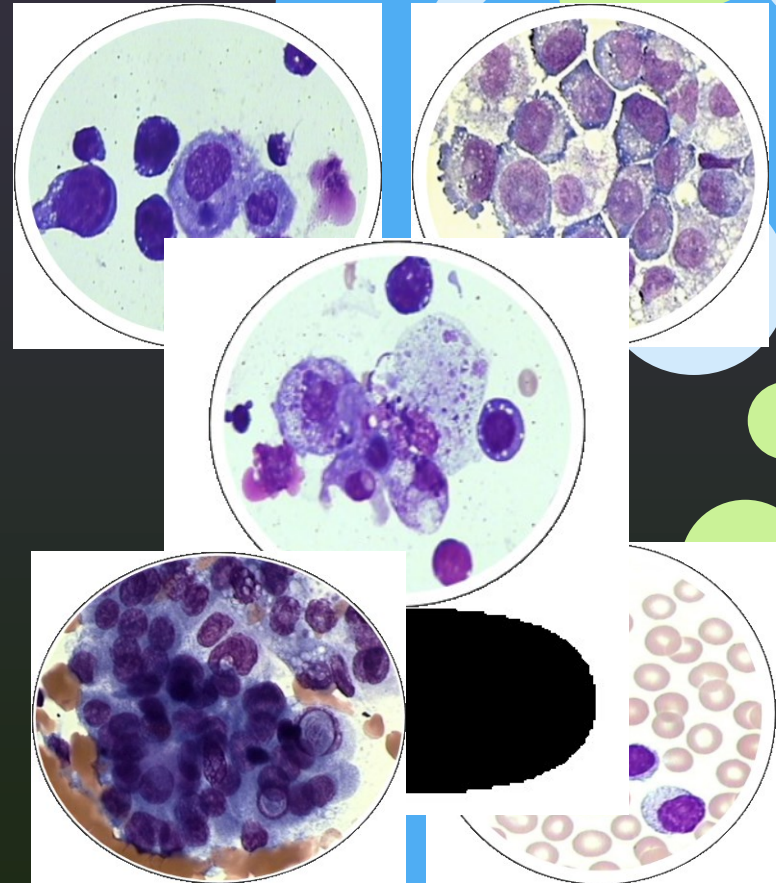
Theoretical and practical knowledge from obtaining and processing of material to microscopic examination and differentiation of normal, inflammatory and pathologically changed cells in the following cytodiagnostic fields:

- gastroenterology
- urology
- breast
- endocrinology
- hematology
- pulmology
- effusions
- cerebrospinal fluid and musculoskeletal system
- other organs, tumors

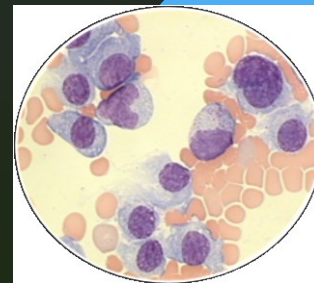
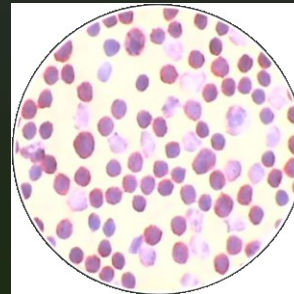
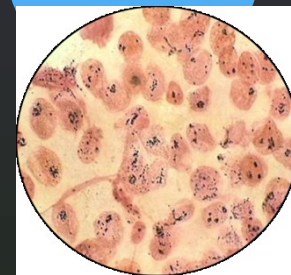
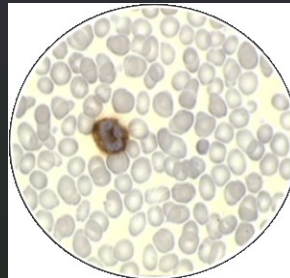
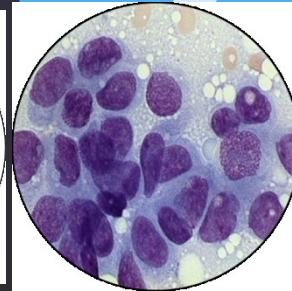
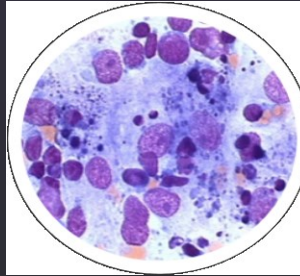


Microscopic control of stained smears:

- Quality assessment of stained smears: cellularity, accuracy of smearing, quality of the staining.
- Microscopic examination ("screening") of stained smears, identification of normal cells, inflammatory and degenerative changes, atypical and tumor cells.
- Labeling foreign, suspicious or atypical cells on slides.

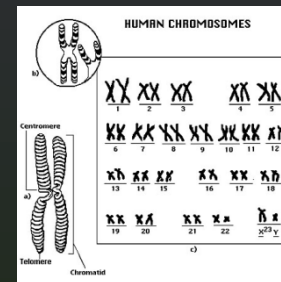
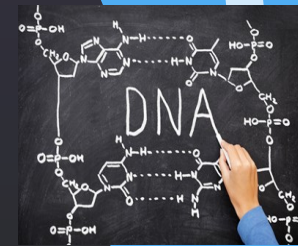


- Semi-quantitative analysis in cytological smears: determination of the of certain types of cells in the blood smears, in fine needle aspirates and other samples.
- Determination of the level of enzymatic activity in individual cells ("score"), analysis of other cytochemical and immunocytochemical reactions.
- Determination of the cells viability.



Covers the theory and practice from the following chapters:

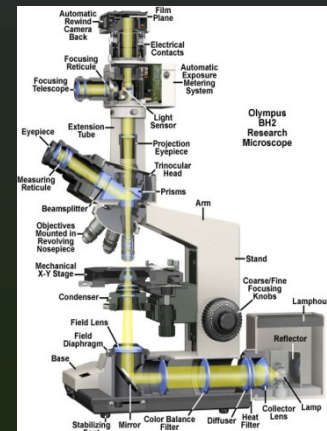
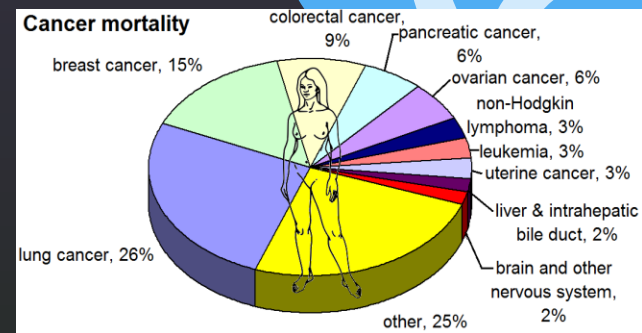
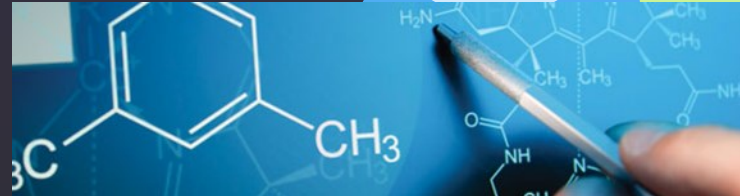
- Anatomy and physiology with selected chapters in pathology and histology of non gynecological tissues and organs: breast, thyroid, gastrointestinal tract, uropoietic system, skin, central nervous system and hematopathology.
- Basic skills in the histopathological laboratory: downloading and processing, fixation, paraffin procedures, HE and special stainings.
- Biology and human genetics -chromatin structure, cell cycle, the human genome, the types and laws in the process of inheritance, the application of genetics in certain areas of medicine, laboratory analysis. Cell cultures, the processing of samples for analysis, the preparation of culture media, processing cells, microscopic examination of the specimens.



- Chemistry and medical biochemistry.

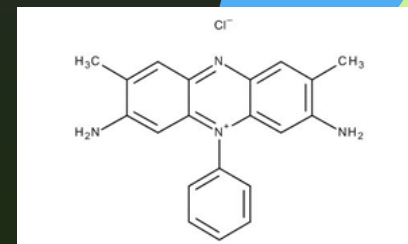
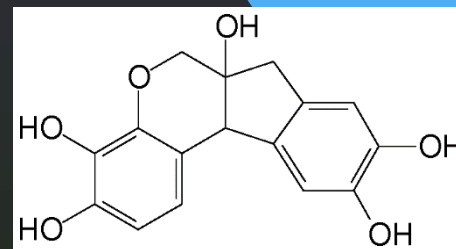
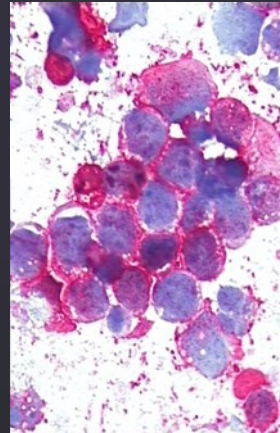
- Epidemiology of malignant tumors – introduction and methods.

- Theoretical and practical knowledge of the basics of microscopy techniques and types of microscopes - light, phase invert, electron microscope.



- Introduction and special techniques in cytodiagnostics : methods of collection, processing and analysis of materials for cytochemical, imc. analysis, flow cytometry, molecular analysis, computer analysis of the image (morphometry, densitometry, DNA cytometry ...).The principles of flow cytometry, monoclonal and polyclonal antibodies, qualitative and quantitative analysis of the imc. reaction, the biological behavior of the tumor, kinetic methods, the cell cycle, molecular biology, hybridization and amplification methods

- Preparation of reagents: fixing and staining solutions, buffers, substrate solutions, solutions for contrast-staining etc.

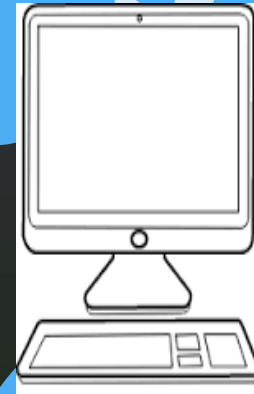


- Safety at work and automatization in laboratory medicine.

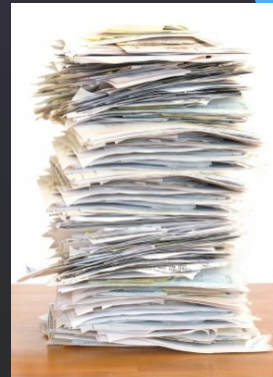
- Quality control in laboratory medicine and the organization of medical - laboratory services.

- Basics of medical informatics, computer processing of laboratory data.

- Foreign language - english and elective courses.



- Processing of findings according to the type of samples, issuing and archiving of findings, slides storage, managing of laboratory documentation and computer data processing.
- Inventory guidance and procurement of necessary chemicals and other materials for laboratory work, maintenance and servicing of the appliance.
- The implementation of quality control.



CURRICULUM OF SPECIALIZED EDUCATION IN CYTOTECHNOLOGY

Basics of microscopy techniques L: 2, S: 2, P: 4: 8

Selected topics in biology and human genetics 6,4,- :10

Selected topics in chemistry 4,4,-:8

Epidemiology of malignant tumors 5,1,4:10

Basics of medical informatics 2,2,6:10

Selected topics in pathology 12,5,3: 20

Introduction to cytodiagnosics 2,2,8: 12

Special techniques in cytodiagnosics 2,4,12: 18

Cytodiagnosics in gynecology 10,32,124: 165

Cytodiagnosics in pulmonology 8,28,66: 101

Cytodiagnosics in hematology 8,28,66: 101

Cytodiagnosics in urology 6,20,30: 55

Cytodiagnosics in gastroenterology 3,13,24: 40

Cytodiagnosics of breast 24

Cytodiagnosics of thyroid 16

Cytodiagnosics of cerebrospinal fluid and effusions 3,6,13: 22

Cytodiagnosics of locomotor system 2,2,6: 10

Lectures, seminars,
and practice: 630
hours



Professional practice: 200 hours

Cytodiagnostics in gynecology: 80 hours

Cytodiagnostics in pulmonology: 40 hours

Cytodiagnostics in hematology: 40 hours

Cytodiagnostics of other areas: 40 hours

Upon passing exams and completed practical training, students take the final exam. The final exam consists of practical and theoretical parts, and includes all the listed courses of cytodiagnostic.

This model of education is a good example of the basic educational program that can be easily extended with additional classes due to requirements imposed by the implementation of new technologies.

This model provides an educated cytotechnologists that after the training have the basic skills and knowledge from a wide range of cytological preparations, procedures and technologies used in cytopathology.

In this way cytotechnologists can easily accept tasks from non gynecological cytology and thereby maintain their position in cytodiagnostics.





Thank
You!!

Many thanks for the help and support to prof. Ika Kardum Skelin