

# Pathology

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**FN MOTOL**



**2. LÉKAŘSKÁ  
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KARLOVA**

# Welcome!



**We welcome the incoming 3<sup>rd</sup> year students to the new semester of pathology!**

- all information and materials can be found on the website [www.patologie.lf2.cuni.cz/en](http://www.patologie.lf2.cuni.cz/en)



# Institute's Management



- **head of the department**
  - prof. MUDr. Josef Zámečník, Ph.D.
- **deputy for medical affairs**
  - prim. MUDr. Petr Škapa, Ph.D.
- **deputy for teaching affairs**
  - MUDr. Jan Balko, Ph.D.
  - *+ head of teching of foreign students*
    - doc. Vira Tovazhnianska, M.D., Ph.D.
  - *+ head of Bachelor's courses*
    - MUDr. Miroslav Koblížek

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# Other teachers

- prof. MUDr. Roman Kodet, CSc.
- MUDr. Jan Soukup
- MUDr. Linda Čapková, Ph.D.
- MUDr. Miroslav Koblížek
- MUDr. Daniela Hamaňová
- MUDr. Marek Grega
- MUDr. Ludvík Kašpar
- MUDr. Jaromír Háček
- MUDr. Zora Šerková
- RNDr. Marcela Mrhalová, Ph.D.

# Other staff



- **secretary**
  - Mrs. Petra Poděbradská
  
- **laboratory workers**
  - Mrs. Vladimíra Kratinová
  - Mrs. Petra Toxová
  - Mrs. Dana Kočárníková

# Pathology

# Pathology



- **pathos** (πάθος) + **-logia** (-λογία)  
- suffering / passion + science / study
- study of **disease** and injury  
- its cause (**etiology**), development (**pathogenesis**)  
and structural changes (**morphology**)
- mainly **morphological** science  
- such as anatomy, histology and embryology



# Pathology



## Brief history of pathology:

- *everything starts in ancient **Egypt**...*
  - Alexandria + India, Greece and Rome
- **decline** in the Middle Ages and development during the Renaissance
  - Italy (Bologna, Padova)

# Pathology



- **Goiovanni Battista Morgagni**  
- founder of **pathological anatomy** (1761)

Morgagni diaphragmatic hernia

- comparing anatomical and clinical findings

# Pathology



- **Anthony van Leeuwenhoek**
  - inventor of the light **microscope** (17<sup>th</sup>-18<sup>th</sup> Cen)

# Pathology



- **Jan Evangelista Purkyně**  
- founder of the **cell theory** (1837-1839, Prague)

Purkinje cells of cerebellum  
Purkinje fibres of the heart

# Pathology



- **Rudolf Virchow**

- „the father of **histopathology**“ (19<sup>th</sup>-20<sup>th</sup> Cen)

Virchow trias (thrombosis)

Virchowova reaction (amyloidosis)

Virchow cells (leprosy)

# Pathology



## Czech history of pathology:

- strong tradition of pathology

# Pathology



- **Karel Rokitanský**
  - 85 000 autopsies (19<sup>th</sup> Cen, Hradec K./Vienna)

Rokitansky tubercle (teratoma)

# Pathology



- **Vincenc Bochdalek**
  - 1<sup>st</sup> true Czech pathologist (1837, Prague)

Bochdalek congenital hernia  
*foramen Bochdaleki* of the  
diaphragm  
*ganglion Bochdaleki* of the jaw



# Pathology



- **Václav Treitz** (19<sup>th</sup> Cen, Prague)
  - Treitzova kolitida, hernie a ligamentum duodena
- **Vilém Dušan Lambi** (19<sup>th</sup> Cen, Prague)
  - *Giardia lamblia (intestinalis)*, Lamblovy výrůstky
- **Jaroslav Hlava** (19<sup>th</sup>-20<sup>th</sup> Cen, Prague)
  - Institute of pathology of the 1<sup>st</sup> m. faculty
- **Heřman Šikl** (19<sup>th</sup>-20<sup>th</sup> Cen, Prague)
  - Šikl's cut of the heart
  - 1<sup>st</sup> bioptic station and 1<sup>st</sup> pathology textbook
- **Blahoslav Bednář** (20<sup>th</sup> Cen, Prague)
  - Bednar tumor, pathology textbooks

# Pathology



- **Anton Ghon** (19<sup>th</sup> Cen, Prague, German)
  - Ghon primoinfect and primocomplex (TBC)
- **Hans Chiari** (19<sup>th</sup> Cen, Prague, German)
  - Arnold-Chiari malformation, Budd-Chiari sy.
- **Edwin Klebs** (19<sup>th</sup> Cen, Prague, German)
  - *Klebsiella pneumoniae*
- **Carl Sternberg** (19<sup>th</sup> Cen, Brno, German)
  - Reed-Sternberg cells in Hodgkin lymphoma



# Pathology



## The use of pathology in medical practice:

- **patologist** = diagnostician
  - diagnosing according to the **morphology**
  - the only one who has to know diseases of **all organ systems** of both **pediatric and adult** patients (but we do not treat them)
  - **NOT** the forensic medicine

# Pathology



**Tissue/cellular diagnostics** are performed among:

- **dead = necropsies** (2 % cases = 500/year)  
- as part of a *pathological-anatomical autopsy*
- **living = biopsies** (98 % cases = 24 000/year)  
- typically "*anything that gets cut off in the hospital*"

# Pathology



**Biopsies** = pathologist's routine:

- **basic samples**
  - gallbladders, appendices, nevi, tonsils, lipomas...
- **organ resections**
  - conizations, guts, lungs, kidneys, thyroid glands...  
+ **peroperative** examination
- **bioptic samples**
  - endoscopy, needle punctions
- **cytology evaluations**
  - smears, washes, liquor and urine samples

# Pathology



**Pathologists establish dg. for a living patients:**

- **1/5 of hospital diagnoses**
  - including „routine“ outcomes (gastritis...)
  - 20 pathologists in FNM (out of 650 doctors)
- **practically 100 % of tumor diagnoses**
  - microscopic evaluation is absolutely necessary („histology“ examinations)

# Pathology



## Predictive pathology:

- **targeted therapy** based on our dg.
  - carcinoma of the lung, breast, GIST, melanoma...
- **monitoring** of the therapeutic outcome
  - MRD...
- base of the **personalized medicine**
  - the future of pathology

# Pathology



**Pathologists establish dg. for the living patients:  
...without them knowing 😊**



# Pathology



**How about autopsies?**

# Pathology



**There are 3 types of autopsies / (dis)sections:**

# Pathology



- **anatomical** autopsy
  - performed by **anatomists** (donated bodies after fixation)
- **pathological-anatomical** autopsy
  - performed by **pathologists** (hospital patients)
- **forensic/medical** autopsy
  - performed by **forensic doctors** (deceased individuals outside the hospital)

# Pathology



## Pathological-anatomical autopsy:

- **diagnostic purpose**
  - basic + associated diseases, complications
  - **compulsory** = connection to the surgical procedure (*mors in tabula*), gravidity or childbed, fetuses and children (under 18 years), Tx donors, hospitalization under 24 hours, reported infections, unclear deaths

# Pathology



## Pathological-anatomical autopsy :

- **diagnostic purpose**
    - results in **autopsy protocol** (in latin, 3 months due, archiving for over 150 years..)
    - including photo-documentation, necropsies
- I** = main disease  
**II** = cause of death  
**III** = complications  
**IV** = incidental finding

# Pathology



**Morphology of both dead and living can be assessed on 3 levels:**

# Pathology



- **macroscopy** = pathological anatomy  
- „visible to the naked eye"
- **microscopy** = histopathology  
- „invisible to the naked eye "
- **ultrastructural** = molecular pathology  
- protein expression, aberrations of nucleic acids

# Pathology



## Macroscopical (pathological anatomy):

- evaluation of **anatomical aberrances**
  - autopsy, trimmig of the bioptic material



# Pathology



## Microscopical (histopathology):

- diagnosis of tissue aberrations on the **cellular level**
  - using **light microscopy**
  - every **tissue sample** is fixated (formol) → sectioned (microtome) → stained (allways H&E +/- other stains)

# Pathology



## Microscopical (histopathology):

- **fluids** can be assessed too
  - **cytology** examination via light microscope
  - isolated cells without tissue architecture

# Pathology



## Ultrastructural (molecular pathology):

- detection of aberrations on **subcellular level**
  - even molecular changes

# Pathology



## Ultrastructural (molecular pathology):

- detection of aberrations on **subcellular level**
  - even molecular changes
- cooperation with **biologists**:
  - **ultrastructural** microscopy (ELMI)
  - **protein** evaluation (IHC, flow cytometry)
  - **enzyme** evaluation (histochemistry)
  - **DNA/RNA** evaluation (PCR, FISH, sequencing, microarrays, NGS...)

# Pathology



- **+ pathologists also teach**
  - **pre-** = medical s., physiotherapist, nurses, lab workers
  - **postgradual** = Ph.D. students

# Pathology



**Follows previous medical subjects:**

- **1<sup>st</sup> year**(histology, anatomy)
  - *„what does a human body consists of“*
- **2<sup>nd</sup> year** (biochemistry, physiology)
  - *„how does a human body work“*
- **3<sup>rd</sup> year** (pathology, pathophysiology)
  - *„how is a human body **not** functioning properly“*

# Pathology



- **general pathology**
  - studies **general mechanisms** of the diseases (repeating patterns)
  - winter semester
- **special pathology**
  - studies **specific diseases** (nosological units) among all organ systems
  - summer semester (+ part of the winter one)

*„The time will come in every doctor's life when they must learn **all the diseases.**“*

# Pathology



...**all the human diseases** are taught during the 1<sup>st</sup> year (and there is plenty of them).

Because: „*You cannot diagnose a disease you have never heard about.*“

- pathology = **the hardest** exam in medicine



# Pathology



However, it is **NOT** our goal to train you to become future pathologists...

- it requires 5 more years after graduation

Who wants to be **clinician** instead?

# Pathology



Preparing students for the following clinical fields:

- **adult**
    - internal, surgery, gynecology, ENT, radiology, (ne)urology, dermatology... (all except psychiatry)
  - **pediatric**
    - pediatry, neonatology, pediatric subspecializations
- + it is also the **1<sup>st</sup> clinical** subject („pieces of patients“)

# Pathology



## Time-management:

- attend the **lectures**
  - explanation, importance (what is common or lethal), personal experiences and stories
- study **continuously**
  - exam period is NOT enough (Kahoots!)
- do not get **exhausted...**
  - reasonable sources, cover the basics

**Thank you for attention.**

