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Microscopy in Veterinary Clinical Pathology: Attempts to increase feedback

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Background and Problem Definition

Clinical pathology is diagnosing disease by means of laboratory analyses, commonly performed on samples of blood, urine, feces, tissue or other body fluids. Mastering clinical pathology is understanding how to interpret laboratory test results together with the patient history, clinical presentation, clinical examination and other diagnostic modalities, considering the limitations of using diagnostic markers. To use and understand clinical pathology, it is vital to understand basic anatomy, physiology, pathophysiology, pathology and internal medicine. An essential competence within clinical pathology is microscopy of blood –, cell – and urine samples.

The present clinical pathology module is a 2-week course placed in the first or second year of the professional degree (candidate) part of the veterinary medicine curriculum. The course consists of lectures, microscopy exercises, theoretical exercises, theoretical cases and preparation time. The exam consists of ten multiple-choice questions of which approximately four are based on microscopy findings. The purpose of the course is to present the students with 1) the laboratory tests commonly used in the diagnostic workup of veterinary patients, 2) the challenges associated with the use of diagnostic markers, 3) an approach to the interpretation of common diagnostic markers and 4) establishment of basic practical skills in the preparations for - and performance of microscopy of blood, urine and cells from tissue or fluids.

Over the past years students are loosing competences in basic microscopy (teachers opinion, performance at examination, students evalu-

ations), a major learning objective of the course. This likely is a consequence of replacing microscopy exercises with virtual microscopy in previous courses like anatomy, physiology and pathology. More time is therefore needed to build up basic microscopy skills. However, during the practical microscopy days, board discussions on how to perform the microscopic evaluations take up significant time that could be spent practicing microscopy. In addition, a large part of the teacher-student confrontation time is currently spent lecturing basic knowledge fundamental to clinical pathology, subjects the students should already be familiar with. It seems however well established that passive learning in the form of lectures provides limited learning and many studies have shown that feedback is central to learning and development (Hattie, Biggs, and Purdie, 1996; Black and Wiliam, 1998).

Comprehensive teaching material is currently available in the e-learning platform (Absalon), including e-lectures, regular lecture slides, reading material, videos and handouts in form of algorithms and checklists. As home preparation sessions are integrated in the course schedule, it is a reasonable expectation that refreshing fundamental knowledge could take place at home and free-up more time for microscopy and feedback. Feedback is defined as 'information provided from an agent (e.g. teacher) regarding aspects of one's performance or understanding… and is thus a consequence of performance' (Hattie and Timperley, 2007). Feedback can largely be grouped into formative and summative feedback. Formative feedback is process-oriented and the students are provided with 'ongoing' feedback that they can reflect and act upon (Sadler, 1989). This contrast with summative feedback, which is focused on summarizing an achievement and has no immediate impact on learning (Sadler, 1989). The different effect on learning from formative versus summative feedback clearly demonstrates that it is essential for learning that the feedback is understandable, delivered at the right time and that students can act upon it (Gibbs and Simpson, 2004).

In the present project, the hematology part of the course was restructured by 'flipping' the teacher-student confrontation time away from traditional lecturing into classroom discussions and more practical microscopy. The communication was optimized with respect to learning goals, course structure, expectations, preparation time and confrontation time. The overall aim was to increase hands-on microscopy time and improve formative feedback through increased peer- and teacher-student feedback in the preparation for - and performance of hematology microscopy.

Changes Implemented

For the feedback to become meaningful, it is essential that the students understand the learning goals and 'what is expected to be understood' in all aspects of the course (Hattie and Timperley, 2007; Sadler, 1989). The feedback should aim at containing the three main essential points proposed in the feedback model by Hattie and Timperley (2007), which concern: 'Where am I going? How am I going? and Where to next?' (Hattie and Timperley, 2007). With this in mind, the course structure, learning goals and preparation expectations for all scheduled sessions were explained carefully in Absalon in advance and on the first day of the course (Appendix A-E). Basic hematology lectures were replaced by preparation sessions for the practical microscopy. This was done through: 1) A brush-up hands-on session on how to use the microscope (Appendix F), 2) a board discussion on how to perform a systematic microscopic analysis ('Preparation Microscopy'), which also included 3) an exercise of cell recognition based on pictures of cells (Appendix G). The board discussion was supplemented with hand drawn board illustrations. In respect to the one remaining 'traditional' lecture, the lecture was broken up by questions for peer discussions followed by plenum discussion. All sessions with cases, theoretical exercises and practical microscopy exercises were initiated with peer-discussions prior to plenum teacher discussions. Peer-feedback has been shown to enhance learning without necessarily increasing the teacher workload (Nicol, Thomson, and Breslin, 2014) and through peer-feedback students acquire the abilities to take ownership, to judge the quality of other's work and argue their points, which may facilitate evaluation and improvement of their own work (Nicol et al., 2014).

At the time of practical microscopy sessions there was no initial board discussion and the students spend the entire sessions making blood smears and performing microscopy. During microscopy, peer-discussion of microscopy findings was a requirement prior to teacher feedback through an existing interactive microscope-computer system. At the end of the course, the students evaluated the project by means of a questionnaire with 17 categorical questions and two qualitative questions asking for 'positive points' and 'improvement points' (Appendix H). This questionnaire along with the teacher assessment, microscopy exam results and students' exam evaluations served to evaluate the project.

Results and Discussion

Out of 32 students, 29 returned the questionnaire, which reflects an unexpected high participation rate. Based on the questionnaire, the student-perceived participation, preparation, learning gain with respect to obtaining intended learning objectives (ILOs) and sufficiency in feedback (peer as well as teacher) were very high (Figure 26.1). Even though the teacher perceived participation, discussion and feedback was increased compared to previous courses, especially in respect to peer-feedback, the general teacher perception was more moderate compared to the students. This could reflect a general mismatch in the expectations to participation between teachers and students but it may also reflect a limitation in grading the feedback in a questionnaire where you can only answer 'yes' or 'no'.

The general very high ranking of feedback was surprising, as some sessions provide better framing for feedback than others. As an example, the practical microscopy sessions with computer-based teacher feedback were a high-ranking theme in the subjective part of the questionnaire. This was expected, as the system provides the students with fast feedback from the teacher and the peer-discussions prior to asking for teacher feedback provided the teachers with more time for better and more detailed answers. However, the ability to provide sufficient teacher feedback during plenum discussions of patient cases seems harder but was graded high in the questionnaire. The students generally perceived peer-feedback as very helpful, which was a positive surprise. Students themselves are not experts (Strijbos, Narciss, and Dünnebier, 2010) and they can feel uncertain of the value of the peer-feedback, as they doubt their own and fellows students expertise within a subject and ability to perform an assessment (Hanrahan and Isaacs, 2001). Perhaps the idea of peer-feedback would have been rated differently, if the students had been asked prior to giving/receiving feedback. One study showed that prior to peer-feedback, students had high expectations to the process and the competences of the peers as reviewers, but after the peer-experience the opinions were more divided (Mulder, Pearce, and Baik, 2014).

Among the positive points from the subjective qualitative answers, the major theme was scheduled time for preparation. In this context, the majority appreciated the detailed instructions on what to prepare which reflects the importance of guiding the students. This is unsurprising as it provides the students with an opportunity to build a platform of knowledge/criteria on which they will be evaluated and receive more elaborated feedback. This

scenario somewhat corresponds to feedback on performance criteria, which improves the students ability to self-evaluation of the task given and their performance (Butler and Winne, 1995). However, an improvement point mentioned by several students was more realistic expectations to preparation, which likely reflects the frustration of not being able to accomplish the expected. This feeling may compromise feedback as the student's basic need to feel competent is compromised which may negatively affect the intrinsic motivation and interest (Ryan and Deci, 2000).

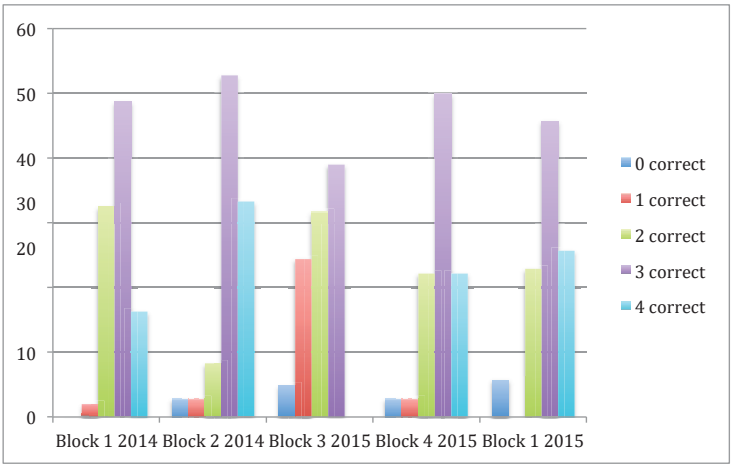

Fig. 26.1: Category questionnaire results from 29 out of 32 students. Questions are listed on the x-axis and number of answers of the categories 'yes', 'no', 'uncertain' or 'not present' are listed on the y-axis. ILOs: Intended learning outcome. FB: Feedback.

Another major positive point theme was the general course structure in respect to the combination of preparation time, e-lectures, classic lectures, board discussions, peer sessions, practical exercises and cases. This also included a noticeable appreciation of the systematic approach in performing and discussing hematologies, which illustrates an important accomplishment of the course facilitated largely by formative feedback. A standard systematic approach is a key take-away for the students, as it provides a systematic approach for them to build upon. As one student commented: ' I now for the first time know exactly what to look for and how to do it.'

The major improvement point theme of the questionnaire concerned the dislike of students being asked to involuntarily answer questions (supposedly prepared from home). This was somewhat surprising, as it was meant

as a tool to activate students and provide more teacher feedback to more students. It likely reflects the delicate psychology in providing feedback within the students comfort zones and that intended constructive feedback can have the opposite effect if the students feel 'put on the spot' and unsafe (Yorke, 2003). This seems to reflect a feedback scenario at the 'self level' where students are put at risk of not fulfilling the assignment and the fear of failure dominates the opportunity to learn (Hattie and Timperley, 2007). Yang et al. 2013 define a social-affective dimension (as one of three dimensions in feedback), which relates to the students social role and emotions in the learning environment and especially negative emotions that affects the student's identity or self-esteem can result in unproductive feedback experiences (Yang and Carless, 2013; Harks, Rakoczy, Hattie, Besser, and Klieme, 2014).

With respect to the exam, the students interestingly did not perform noticeably better than in previous blocks (Figure 26.2). The exam results also do not correlate well with the results from the questionnaire, as better performance could have been expected if the ILOs had been met to the extent reflected in the questionnaire. This again likely reflects a weakness in a questionnaire built on yes/no answers, whereas a grading on the level of ILO obtainment perhaps would have reflected a more true and informative picture of the students' perceptions. Another downside to the questionnaire is the assumption that the ILOs could be obtained after individual sessions. This does conflict with the basic course design where the integration of preparation, lectures, board discussion, cases and practical exercises together ensures that the students meet the ILOs. A statement from one student, that the ILOs were not met right away but after some days seems to support this. It is also possible that the students would have painted a different picture had they filled out the questionnaire immediately after each session and not at the end of the course.

The exam results however do align well with the exam evaluations, though only 13 students submitted an evaluation. The exam generally was rated lower that the rest of the course and there was a general agreement that the microscopy part was too hard. It is obvious from the specific evaluation comments that they do not feel equipped in estimating e.g. normal cell counts and they did not feel confident in ruling out wrong answers. This clearly demonstrates that even though they are provided with - and appreciate the microscopy tools given during the practical microscopy sessions, they do not master the tools to their own expectations by the end of the course and they do not prioritize to spend more time practicing mi-

croscopy by own initiative. This may illustrate lack of so-called calibration, which reflects the correlation between the student's perception of own abilities and the student's true competences (Pieschl, 2009). Interestingly, the perceived usefulness of feedback has also not been found to correlate with performance (Strijbos et al., 2010), which seems to also be reflected in the present project in respect to exam performance. However, the exam performance could also reflect known scenarios where the feedback is not used (Gibbs and Simpson, 2004), not understood (Lea and Street, 1998) or not acted upon (Sadler, 1989). Presence of feedback in it self is not a guaranty for learning (Kulhavy, 1977) and it remains unknown from the present project, whether or not the teacher and students agree on the presence and the usefulness of the feedback.

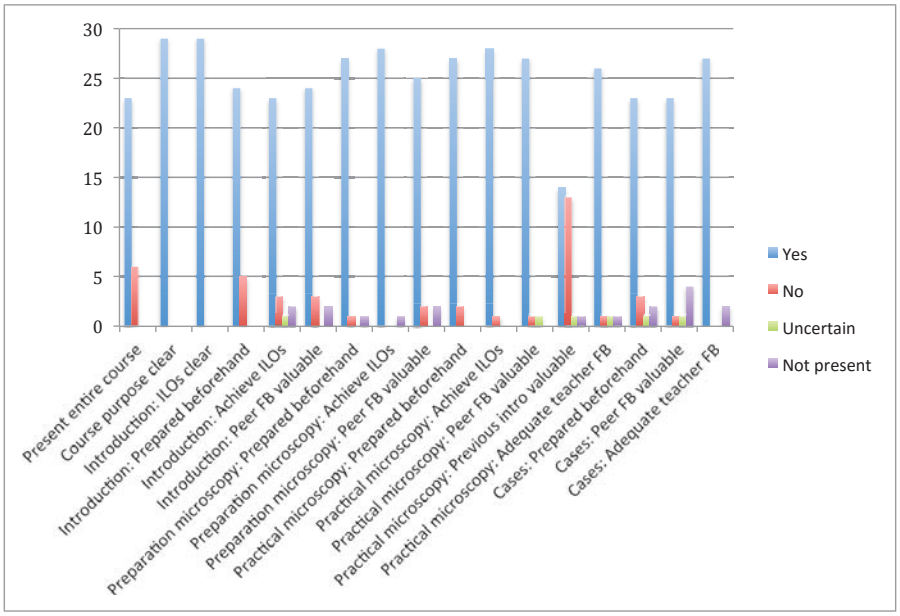

Fig. 26.2: Microscopy results from the present block (Block 1 2015) and the previous four blocks depicted as percentages of 0, 1, 2, 3 and 4 correct answers.

Conclusion and Perspectives

The results from the present project show that student-teacher time can successfully be restructured by reducing lectures and increasing students' activities without compromising student perception of learning. The changes

resulted in more practical microscopy time and more feedback time. However, the project also demonstrates that there are several challenges in providing and assessing feedback, as the students' perception of feedback from the questionnaire did not correlate well with their performance and perception at the exam. One challenge seems to be a misalignment between teachers and students perceptions on when feedback is received and perhaps also when the feedback is useful. Generally, very little is known about students' perception of feedback and how this influences the learning process (Strijbos et al., 2010). It is known that tutors generally perceive their feedback as more useful than the students do (Maclellan, 2001) and teachers tend to assume that the students automatically perceive, take in and process the feedback the way they intended it. One important conclusion from the project is the appreciation from several students on the systematic approach and structure obtained at the practical microscopy sessions, which they accomplished through formative feedback. This hopefully reflects students capable of on-going self-evaluation as a foundation for deeper learning. In this respect, it is important to also keep in mind that mastering microscopy takes years of learning and perhaps even more effort on expectations in the beginning of the course might decrease the gap between perceived and obtained competences at the end of the course.

Studies of feedback tend to focus on provision of feedback from the teacher; what is provided, when is it provided and how is it provided. Few studies address how the students view the feedback (Poulos and Mahony, 2008). More clarity of the usefulness of feedback may be gained through a dialogue between students and teachers (Carless, 2006). Involving the students in designing the kind of feedback that seems helpful to them may help teachers to effectively improve the usefulness of the feedback (Yang and Carless, 2013). This task is not easily carried out considering the resources of academic staff, but continuous evaluations in regards to feedback and perhaps a better and ongoing presence of feedback in the e-learning platform could be a reasonable starting point. In the end, feedback is essential for acknowledging the need to make a change, also for the teacher.

Results from Discussion of Project with a Colleague

The colleague generally found the project good, relevant and guiding with respect to the use of feedback in future teaching. Only a few changes were implemented with respect to wording and it was added that the students

do not practice microscopy enough by own initiative. More emphasize and encouragement on this part could likely be a tool and a necessity for better calibration between perceived learning and exam performance.

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A

DEPARTMENT OF VETERINARY CLINICAL AND ANIMAL SCIENCES
UNIVERSITY OF COPENHAGEN

To Students in
Veterinary Paraclinics
2015 Block 1

Introduction to the Veterinary Clinical Pathology part of Veterinary Paraclinics

SEPTEMBER 2015
FACULTY OF HEALTH AND MEDICAL SCIENCES

DYRLÆGEVEJ 16
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emilie@sund.ku.dk

REF: SEC

Welcome
Dear students,
First of all welcome to veterinary clinical pathology! We look forward to advancing your knowledge, approach and skills within veterinary clinical pathology.

What is clinical pathology?
Clinical pathology is in short laboratory diagnostics. The purpose of clinical pathology is to help diagnose disease and manage clinical cases through collection of appropriate clinical specimens and correct interpretation of laboratory data.
Correct interpretation of laboratory assays is life-long learning based on basic knowledge with respect to anatomy, biochemistry, physiology, pathology, pathophysiology, patient information and the limitations associated with the use of diagnostic markers!
You are already equipped to approach this learning.

Learning goals
1) Please make sure to carefully read the course description.
2) We cannot teach you how to interpret all diagnostic markers! ☺
The purpose of the present course is to present you with the laboratory tests commonly used in the clinic, to give you an overview of 'what markers fit where' and to give a systematic approach to interpretation of common diagnostic markers. You will learn about the challenges associated with the use of diagnostic markers and you will establish basic practical skills with respect to microscopy.

This happens through interactive lectures, practical exercises, cases, theoretical exercises and home preparation sessions.

Course structure, teaching methods and expectations
The key components of the course in veterinary clinical pathology will be:

Lectures, where we will go through the use of common assays within hematology, biochemistry and haemostasis, the background for proper validation of diagnostic biomarkers and quality control of a diagnostic laboratory.

Home preparation sessions, where e-learning modules, lectures, reading material, videos and hand-outs are made available in Absalon to enable your preparation for the practical exercises of haematology, urinalysis and cytology.

Expectations to individual home preparation sessions prior to practical exercises, cases/theoretical exercises and for some lectures will be carefully explained in separate files.

Cases and theoretical exercises, where you as students must prepare for the cases and exercises in advance in order to achieve a meaningful two-way communication with the teacher.

Practical exercises, where we will make use of our facilities to practice microscopy of hematologies, cytologies and urine samples.

Please familiarize yourself with the relevant learning material in Absalon. We expect you to always come prepared and all the learning material is available to help you prepare the various sessions.

Please also see separate schedule file in Absalon.

The program of the course is designed to allow time for preparation and the teaching is based on meaningful two-way communication for optimal active learning, thus we expect all students to be well prepared for each session! Most learning material will be available 1 week before course start at the latest.

Location
All veterinary clinical pathology teaching will be conducted in Building 1-72 on either the ground floor in our interactive microscopy laboratory (room N124) or in the auditorium on the 1st floor (room A 1151). You can enter the building from Ridebanevej 16 or Dyrlægevej 48. If doors are locked,

please enter either through the basement (entrance on Ridebanevej, outside the facilities for poultry diseases) or ring the doorbell located outside Ridebanevej 16. **We meet in room N124 on the first day!**

Examination

Examination will also take place in the microscopy lab, and will be a one-hour exam for the whole Veterinary Paraclinics course (see course description for details).
We will offer an exam-simulation, also in the microscopy lab.
NOTE! To qualify for the exam, 80% course attendance is needed.

Questions

If you have questions, please do not hesitate to contact us. You can find us in Absalon and we are:

Signe E. Cremer
Assistant professor, teaching responsible (veterinary clinical pathology part)

Clara B. Marschner
PhD-student/scientific assistant

Liselotte B. Christiansen
Post doc/scientific assistant

Tina M. Sørensen
PhD-student/scientific assistant

Annemarie T. Kristensen
Professor, course responsible

On behalf of all of us and with best regards ☺

Signe

Veterinary Paraclinics Block 1 2015

Veterinary Clinical Pathology module — **Week 43 - Oct 19-23**

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-09:45	Introduction	Preparing microscopy: Blood smear evaluation	Hematology exercise	Preparation 5	Biochemistry cases and theoretical exercises
10:00-10:45	Lecture 1			Lecture 2	
11:00-11:45	Preparation 1 & 2	Hematology cases		Lecture 3	
12:00-13:00		Lunch break	Lunch break	Lunch break	Lunch break
13:00-13:45		Preparation 3	Preparation 4	Hematology exercise	Preparation 6
14:00-15:00					

Veterinary Clinical Pathology module — **Week 44 - Oct 26-30**

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-10:00	Lecture 4	Cytology exercise	Preparation 8	Preparation 9	Preparing microscopy: Urinalysis
10:15-11:00	Lecture 5				Urinalysis exercise
11:15-12:00	Preparing microscopy: Cytology evaluation				
12:00-13:00	Lunch break	Lunch break			Lunch break
13:00-14:00	Preparation 7	Cytology exercise			Urinalysis
14:00 -15:00					Exam simulation

Session	Title	Lecturer
Introduction	*Course structure, expectations, learning goals*	SEC
Lecture 1	*Clinical pathology and the use of diagnostic markers*	SEC
Preparing microscopy	*Blood smear evaluation*	SEC
Lecture 2	*Biochemistry*	LBC
Lecture 3	*Biochemistry*	LBC
Preparing microscopy	*Cytology*	SEC
Lecture 4	*Hemostasis*	CBM
Lecture 5	*Test Validation*	CBM
Preparing microscopy	*Urinalysis*	TMS
Cases	*Hematology*	SEC
Cases	*Biochemistry*	LBC
Theor. Exercises	*Hematology & Biochemistry*	CBM/LBC
Pract. exercises	*Hematology*	SEC/CBM
Pract. exercises	*Cytology*	SEC/CBM
Pract. exercises	*Urinalysis*	TMS/AB/CBM
Preparation 1-8	*Home study time: See seperate plans*	

SEC: Signe Emilie Cremer

LBC: Liselotte Bruun Christiansen

CBM: Clara Büchner Marschner

TMS: Tina Møller Sørensen

AB: Armina Barbovic

C

Lecture 1
Refresh your knowledge/Session subjects for preparation:
• When to use biomarkers
• Challenges associated with the use of biomarkers
• Causes of analytical errors
• How reference intervals are generated
• The difference between analytical performance and diagnostic performance
• How to use diagnostic sensitivity
• How to use the diagnostic specificity

D

Preparation 1 & 2
Structure

This is preparation for the sessions:

- Preparation Microscopy: Blood Smear Evaluation
- Hematology cases
    - Note: For the case session, you will also have to prepare the individual cases!

This will be discussed in the 'Preparation Microscopy' session:

- How to use a microscope:
    - In theory
    - Short practice of using the microscopes
- How can we perform microscopy systematically?
    - What do you do first?
    - What cell categories do we assess?
    - What do the erythrocytes look like?
    - How do we describe the erythrocytes according to:
        - Number, size, color, shape and content
    - What do the leukocytes look like?
        - Recognize: neutrophils, eosinophils, basophils, lymphocytes, monocytes
    - What changes do wee look for in the leukocytes?
        - Changes in neutrophils
        - Changes in lymphocytes
    - How do we describe the thrombocytes?

Refresh your knowledge/Subjects for preparation:

- How to use a microscope:
    - Watch the video tutorial
- Why do we perform a blood smear evaluation?
- How do we evaluate erythrocytes?
    - How do we describe changes in erythrocytes according to size, color, shape and content?
- How do we evaluate leukocytes?
    - How do we recognize the various types of leukocytes?
    - How and why do we describe changes in leukocytes?
- How do we evaluate platelets?
    - Why do we tend to forget the platelets?
- How do we evaluate anemia?
    - Why do we need to characterize the anemia?
    - Is it done the same way in dogs and cats?
- How do we evaluate the leukogram?
    - What are the different kinds of leukograms?
    - What is the purpose of grouping leukocytes according to patterns?

E

Cases in Hematology and Biochemistry & Theoretical Exercises

General Structure

Preparation:

- Preparation sessions are scheduled in the course to allow time for preparation
- Cases/theoretical exercises are prepared and answered to the best of your knowledge in advance
- Cases/theoretical exercises should be answered individually

Expectations in class sessions:

- Answers will be presented by you (not a board presentation)
- Answers are discussed in plenum
- Prior to this presentation and discussion, you will sit in small groups and discuss your thoughts and answers for 5-10 min
- You will take turn presenting the answers; everyone should be prepared to present their thoughts
- Note: The most important thing is to make the effort of answering the questions and explain your thoughts. This is not a test that counts toward anything.

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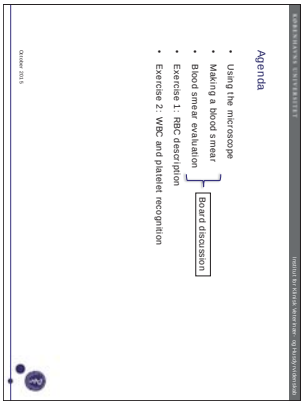
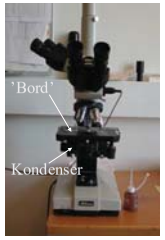


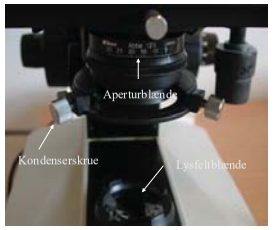
Learning objectives: Microscopy

After the microscopy session you should:

- Understand how to use the microscope
- Feel comfortable using the microscope
- Be able to trouble shoot if you are having difficulties

Using the Microscope





Courtesy of Annemarie Kristensen

Using the Microscope

Courtesy of Annemarie Kristensen

First localize:

- The oculars/eyepieces (okularer)
- The nosepiece with objectives
  (Objektiver: 4x, 20x, 40x, 60x)
- The table (bordet) and table adjusters
- The condenser (kondenser)
  - The condenser screws
  - The condenser (iris) diaphragm (aperturblænde)
- The light diaphragm (lysfeltblænde)
- The light switch
- The coarse and fine adjustment knob (grov- og finskrue)

Make sure you…

- Focus the oculars
  - First the right eye, then the left eye
- Start at 4x magnification
- Raise the table to the top
- Turn the condenser diaphragm all the way to the left and place it approximately ¼ to the right:
  - Correct position between 2/3 and 1 (1 is 100% open)
- Turn the light source all the way down prior to turning on the microscope
- Use only the fine adjustment knob > 4x objective

Microscope Tutorial

Did you watch it?

Was it helpful?

https://www.youtube.com/watch?feature=player_detailpage&v=oMASHb4VyyU#t=571

Unable to Focus

- The ocular is not focused to your eyes
- The slide is upside down
- The ocular or slide are not clean
- The light path is not centered
- The condenser diaphragm is not placed correctly

Optimizing the Path of Light

(Indstilling af Køhler)

- Focus your slide using the 10x objective
- Close the light diaphragm until you see a small circle of light
- Is the circle of light in the center?
- If yes: Reopen the light diaphragm again until it exactly frames your field of view
- If no: Use the condenser screws to center the light circle and secure the screws
- Reopen the light diaphragm again until it exactly frames your field of view

Questions?

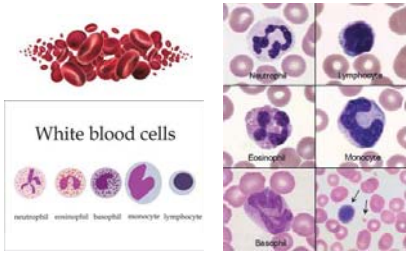
05/01/16

Learning Objectives: Hematology

After the hematology session you should know how to:

- Prepare a blood smear
- Identify healthy and abnormal erythrocytes, leukocytes and platelets
- Perform a leukocyte differential count

Cell recognition



Blood Smear Evaluation

Exercise 1: Red Blood Cells

- Look at the cells marked with a letter
- Place the cells in the correct box in the schedule based on cell size (cytosis) and cell color (chromasia).
- Note whether or not there is presence of poikilocytosis:
  - If yes: what kind?
- Note whether or not there is presence of inclusions:
  - If yes: what kind?

Exercise 1: Red Blood Cells

	Microcytic	Normocytic	Macrocytic
Hypochromic			
Normochromic			
Polychromasia			

Exercise 2: Leukocytes and Platelets

Letter	Cell
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	
N	

Exercise 2: Leukocytes and Platelets

- Look at the cells marked with a letter
- Name the cells correctly in the provided schedule

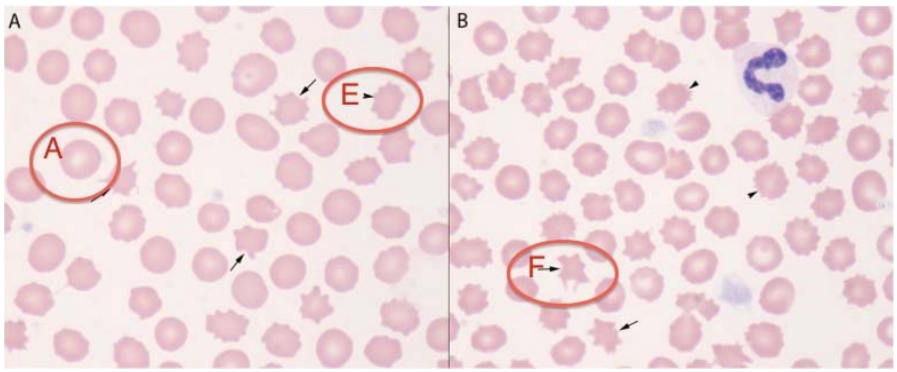
Exercise 2: Leukocytes and Platelets

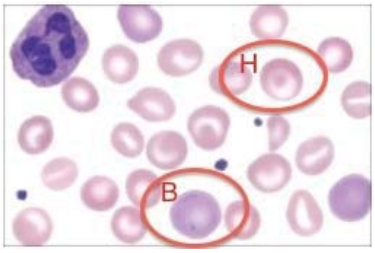
- How would you perform a manual differential count?
- How you perform a manual platelet count?

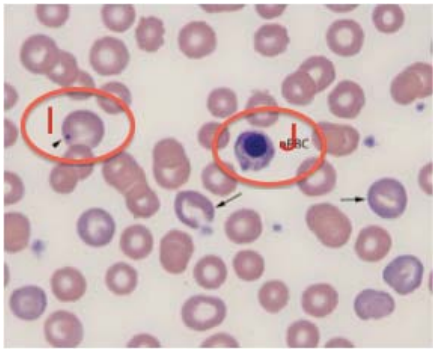
Questions?

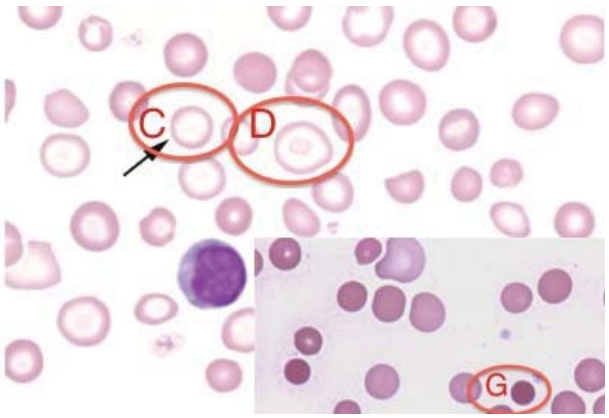
G

Exercise 1: Erythrocytes





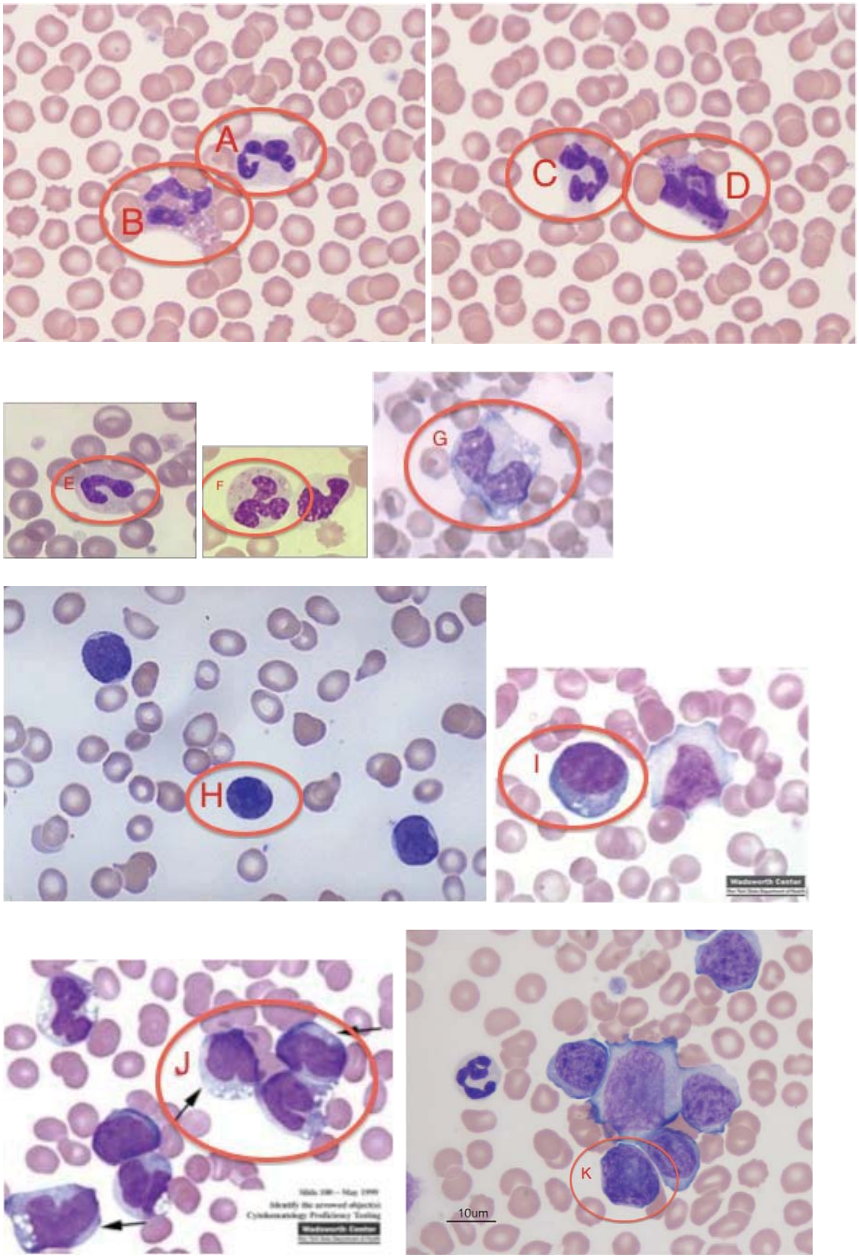


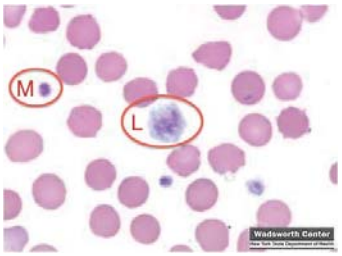


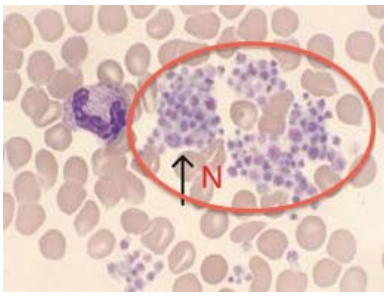
- Place the letter of the erythrocytes (circled with a red letter) in the correct box.
- Note presence of poikilocytosis
- Note presence of inclusions

	Microcytic	**Normocytic**	**Macrocytic**
Hypochromic			
Normochromic			
Polychromic			

Exercise 2: Leukocytes and Platelets




M
L
Wadsworth Center


N

- Name the cells correctly in the schedule below

Letter	Cell
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	
N	

H

Spørgeskema: Pædagogikum projekt i paraklinik klinisk patologi

Signe E. Cremer

1. Deltog du i hele kurset?

Ja: _____

Nej: _____

Hvornår var du ikke til stede?:

2. Var formålet med kurset klart ved kursets begyndelse?

Ja: _____

Nej: _____

Forklar:

3. Var læringsmålene klare ved kursets begyndelse?

Ja: _____

Nej: _____

Forklar:

4. Dag 1: Kursusintroduktion og Lecture 1

Havde du forberedt dig ifølge forberedelsesinstruktionerne?

Ja: _____

Nej: _____

Forklar:

(4. Dag 1: Kursusintroduktion og Lecture 1 fortsat)

Opnåede du de beskrevne læringsmål?

Ja: _____

Nej: _____

Forklar:

Hjalp det på forståelsen at diskutere spørgsmål med sidemakkeren?

Ja: _____

Nej: _____

Forklar:

5. Dag 2: Mikroskopi – og hæmatologigennemgang

Havde du forberedt dig ifølge forberedelsesinstruktionerne?

Ja: _____

Nej: _____

Forklar:

Opnåede du de beskrevne læringsmål?

Ja: _____

Nej: _____

Forklar:

I hæmatologigennemgangen, hjalp det på forståelsen at diskutere exercises 1 og 2 med sidemakkeren?

Ja: _____

Nej: _____

Forklar:

6. Dag 3 + 4: Mikroskopiøvelse i hæmatologi

Havde du forberedt dig ifølge forberedelsesinstruktionerne?

Ja: _____

Nej: _____

Forklar:

Opnåede du de beskrevne læringsmål?

Ja: _____

Nej: _____

Forklar:

Hjalp det på forståelsen at diskutere spørgsmål med sidemakkeren?

Ja: _____

Nej: _____

Forklar:

Gjorde det en forskel at have afprøvet mikroskopet på dag 1?

Ja: _____

Nej: _____

Forklar:

Fik du tilstrækkelig feedback fra underviserne?

Ja: _____

Nej: _____

Forklar:

7. Dag 4: Cases i hæmatologi

Havde du forberedt dig ifølge forberedelsesinstruktionerne?

Ja: _____

Nej: _____

Forklar:

Hjalp det på forståelsen at diskutere spørgsmål med sidemakkeren?

Ja: _____

Nej: _____

Forklar:

Fik du tilstrækkelig feedback fra underviserne?

Ja: _____

Nej: _____

Forklar:

8. Ris og ros

Hvad fungerer godt?

Hvad bør forbedres?

SKAL AFLEVERES LIGE INDEN PRØVEEKSAMEN

Tak for hjælpen!! ☺

All contributions to this volume can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/improving-university-science-teaching-and-learning---pedagogical-projects-2017---volume-9-no.-1-2/