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**"DRY PRACTICALS-CASE-BASED DISCUSSIONS"**



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**A MODEL OF A BIOCHEMISTRY DRY PRACTICAL FOR TEACHING LIVER FUNCTIONS AND BILIRUBIN METABOLISM IN A MEDICAL SCHOOL: STUDENT FEEDBACK**



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**PLAN:**

- "Dry Practicals"; What Does it Mean??
- Overview on DEU-SOM PBL Curriculum
- Model of a "Dry Practical" in this Curriculum  
(Liver functions and bilirubin metabolism)
- Logistics and Organization
- Student Feedback
- Conclusions

**INTRODUCTION**

- Traditionally, scientific training includes, as a major component, "wet" laboratory sessions.
- It is unquestionable that it makes students become competent in practical scientific investigation.
- However, it is difficult to fulfill all of our teaching objectives with "wet" practicals alone.
- There is much to be gained from considering "dry" laboratory activities to supplement and extend the "wet" lab experience.

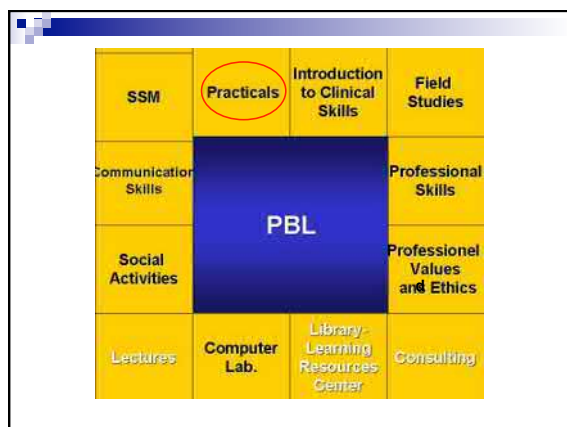
**TYPES OF DRY PRACTICES:**

- Computer-Based Exercises (1)
- Virtual Laboratories: example of a dry lab in a chemistry department (2)
- Problem-Oriented Small Group Discussions (3)
- Laboratory Exercises (Labex) (4)
- Simulated Laboratory Task (Enzyme Purification) (5)

1. PAMELA F. WICKMORE CT & WHELDRAKE JF. Biochemical Education 23: 158-161.  
2. CAPON R. Dry Labs Workshop, 12 April 1996, University of Sydney. [http://www.biochem.unsw.edu.au/workshop\\_drylabsession.html](http://www.biochem.unsw.edu.au/workshop_drylabsession.html)  
3. DAS S & SHIN S. Biochemical Education 2000: 28: 154-155.  
4. PURI D. Indian Journal of Clinical Biochemistry 2002: 17(2): 53-55.  
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**DRY PRACTICALS: CASE-BASED DISCUSSIONS (SMALL GROUP DISCUSSION ON "VIGNETTES"):**

**This innovation was introduced in DOKUZ EYLÜL UNIVERSITY SCHOOL OF MEDICINE (DEU-SOM) (IZMIR-TURKEY) with the PBL curriculum in 1996.**



### TYPES OF PRACTICALS AT DOKUZ EYLÜL

- In DEU-SOM, the practicals can be categorized as follows:
- Wet practicals
- Dry integrated practicals involving computer exercises
- Dry practicals involving small-group discussions on vignettes

*(DEU-SOM has a "Laboratory Practicles" Committee for the structuring of the laboratory practicals)*



### THE DRY PRACTICAL (SMALL GROUP DISCUSSION ON VIGNETTES) ON "LIVER FUNCTION TESTS AND BILIRUBIN METABOLISM"

- The discussion is based on three cases:
  1. Prehepatic jaundice due to sickle cell anemia
  2. Post-hepatic jaundice due to cholelithiasis
  3. Viral hepatitis

VIGNETTES DISCUSSED IN SMALL GROUPS		
VIGNETTES	MAIN SUBJECT AREA(S)	LEARNING ISSUES
1. Sickle Cell Anemia (Pre-hepatic jaundice)	<ul style="list-style-type: none"> <li>• Hemoglobin and Its Metabolism</li> <li>• Introduction to Clinical Enzymology</li> </ul>	<ul style="list-style-type: none"> <li>• Hemoglobin types</li> <li>• Hemoglobin metabolism</li> <li>• Synthesis of bilirubin</li> <li>• Bilirubin types</li> <li>• Introduction to isoenzymes</li> <li>• LDH isoenzymes and clinical use</li> </ul>
2. Obstructive Jaundice	<ul style="list-style-type: none"> <li>• Jaundice Types and Mechanisms</li> <li>• Liver Function Tests</li> </ul>	<ul style="list-style-type: none"> <li>• Obstruction jaundice and differential diagnosis</li> <li>• Concepts and principles of liver function tests</li> <li>• Use of enzyme profile and other biochemical parameters in differential diagnosis of jaundice</li> <li>• ALP isoenzymes and clinical use</li> </ul>
3. Viral Hepatitis	<ul style="list-style-type: none"> <li>• Biochemistry of viral hepatitis</li> <li>• Liver function tests</li> </ul>	<ul style="list-style-type: none"> <li>• Diagnosis of viral hepatitis</li> <li>• Integrative review of liver function tests</li> </ul>



**CASE I**  
**PART I**

- An 18-month-old girl (Songül Sapmaz) has been brought to DEUSOM Pediatrics Outpatient Clinic because of scleral icterus, fatigue and pallor. The Outpatient physician (Dr. Deniz) has noted that Songül has pallor since the age of 5 months, recurrent infection, anorexia, fatigue and recurrent jaundice which regresses spontaneously. Songül's mother has stated that her husband and herself are cousins and her brother has also pallor and complains of pain in various parts of his body. Dr. Deniz examines the patient after the history.
- Physical examination findings:**
  - Appearance: Anxious, always crying
  - Skin colour: Pale
  - Sclera: Icteric
  - Abdominal examination: Splenomegaly (Spleen span is 4 cm)
  - Other systemic examinations are normal.
- Dr. Deniz asked some laboratory tests to determine the causes of complaints.

**PART II**  
**Laboratory values include the following:**

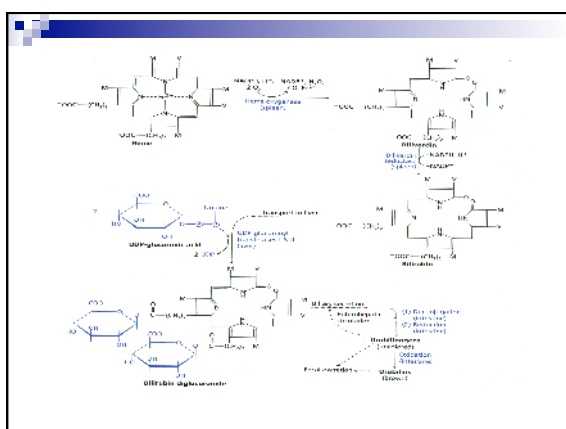
	Normal ranges (18-month-old)
<b>Whole blood count:</b>	
Hemoglobin: 6.5 g/dL	11.5-15.5 g/dL
Hematocrit: 21 %	35-45 %
MCV (Mean corpuscular volume): 88fL	70-80 fL
<b>Peripheral blood smear:</b> Anisocytosis, poikilocytosis, normochromia, 4 percent nucleated red blood cells (normoblasts) (Normal: Normochromic, normocytic red blood cells and there are no normoblasts).	
<b>Total bilirubin:</b> 4 mg/dL	0.4-1.1 mg/dL
<b>Direct bilirubin:</b> 0.9 mg/dL	0.1-0.4 mg/dL
<b>Indirect bilirubin:</b> 3.1 mg/dL	0.2-0.7 mg/dL
<b>LDH:</b> 550 U/L	
LDH 1: 32 %	17-27 %
LDH 2: 40 %	28-38 %
LDH 3: 18 %	18-38 %
LDH 4: 5 %	5-15 %
LDH 5: 5 %	5-15 %
Other liver function tests are normal.	
<b>Urine examination:</b>	
Bilirubin: Negative	Negative
Urobilinogen: 1.2 EU/dL (EU: Erlich unit)	<0.2 EU/dL
<b>Serum viral hepatitis markers (Hepatitis A,B,C,D,E):</b> Negative	

**EVALUATION OF LABORATORY DATA**

- Which type of jaundice does this patient have, prehepatic, hepatic or posthepatic?
- Evaluate the urine examination values. Why is bilirubin negative in the urine?
- How do you explain the increase in LDH1 and LDH2 isozymes?  
 What is an isozyme?  
 Do you know any other isozymes used in clinical laboratory?
- How do you explain the reason why other liver enzymes are normal?
- Discuss other mechanisms of indirect bilirubin increase in serum.

**PART III**

- Hb electrophoresis values are the following:
  - Hb S: 70 percent
  - Hb A2: 2.5 percent
  - Hb S > Hb A
- Diagnosis: Sickle cell anemia**



The diagram illustrates five types of jaundice (A-E) with their characteristic clinical and laboratory findings:

- A: Pre-hepatic jaundice:** Characterized by pale stool, dark urine, and negative urobilinogen. It is caused by hemolysis.
- B: Hepatic jaundice:** Characterized by pale stool, dark urine, and positive urobilinogen. It is caused by liver dysfunction.
- C: Post-hepatic jaundice:** Characterized by pale stool, dark urine, and positive urobilinogen. It is caused by obstruction of the bile ducts.
- D: Hemolytic jaundice:** Characterized by pale stool, dark urine, and positive urobilinogen. It is caused by hemolysis.
- E: Obstructive jaundice:** Characterized by pale stool, dark urine, and positive urobilinogen. It is caused by obstruction of the bile ducts.

## The Evaluation Processes

- Students are evaluated by the tutors on the basis of their performance in the discussion sessions.
- On the end-module written exams, there are questions on the topics discussed during the dry practicals
- The feedback of students for each session is taken at the end of the session by the tutors.
- The Education Department conducts a survey at the end of each year.

## QUESTIONNAIRE USED FOR STUDENTS' FEEDBACK

Title of Practice: Interpretation of Liver Function Tests					
Items tested:	1	2	3	4	5
Explicitness in the exposition to the objectives					
Explicitness in the expression of the steps					
Sufficiency of time allocated					
Quality of learning materials					
Understanding of theoretical concepts					
Efficiency of discussion and interpretation of data					
General organization of the practical session					

OTHER COMMENTS:

## STUDENTS' PERCEPTION OF DRY LABORATORY PRACTICALS: (Average results obtained for a period of three years)

Title of Practice: Interpretation of Liver Function tests		%	%	%	%	%
Items questioned	N	1	2	3	4	5
Explicitness in the exposition to the objectives	77	1	-	0.9	1.5	96.6
Explicitness in the expression of the steps	77	-	-	1	4.5	94.5
Sufficiency of time allocated	77	0.1	-	0.9	3.0	96.0
Quality of learning materials	77	-	-	1	3.2	95.8
Understanding of theoretical concepts	77	-	-	1.5	3.0	95.5
Efficiency of discussion and interpretation of data	77	-	-	1.6	4.9	93.5
General organization of the session	77	-	0.3	2.3	3.3	94.1

## QUALITATIVE ASSESSMENT OF DRY PRACTICALS BY THE STUDENTS

STUDENT OPINION	N
"I believe that the session was very useful; we may encounter the cases any time in real life; thank-you very much"	2
"A very efficient practical.. I would like them to be more frequent"...	1
"I can say that this was the best practical of the year; special thanks to our tutor, Dr...."	
"Discussions based on cases are always very helpful; I would like to encounter more of these in the coming modules"	4
"Thank-you very much; it was an enjoyable and very useful practical; in addition, the hand-outs were very well prepared; we would like to have more of these sessions"	1
"A very enjoyable and useful practical! Thank-you"	2
"A very good and useful session; thank-you"	6

"An efficient practical; a very conscientious preparation; thank-you"	1
"A very useful practical... The cases were very well prepared. The discussion of the group was very effective; all of the questions were thoroughly discussed"	1
"It was an interesting practical; during this year, I have observed your progress as an academician with great pleasure"	1
"This practical was effective in the reinforcement of the learning issues of the module; thank-you very much"...	1
"The cases were excellent! A very efficient practical"...	1
"It was an enjoyable practical"	1
"I liked it"	1
"Super"	1
"This type of practicals are always very useful; thank-you"	1
"Useful for my understanding of the learning issues and in making them more clear".	1
"Thank-you; a very well structured and an integrated practical".	1
"It was good; no time to get bored"...	1
"It was an excellent practical; we expect them to continue. One suggestion: you could use both sides of the paper for the cases, to save on paper. Thank-you"	1

## CONCLUSIONS

- Enhancing the value of the learning experience will improve the quality of our graduates and their ability to operate as professional scientists.
- A number of important issues must be considered in the implementation of "dry" laboratory sessions, including questions of intellectual property, teaching efficiency, effectiveness, and logistics.
- Dry practicals based on small group discussions on vignettes are highly regarded in the students' view at Dokuz Eylül Medical School.
- They bring motivation, challenge and variety to students' learning process.

