INTERACTIVE AND MODEL DRIVEN TEACHING PUSHES STUDENTS TO LEARN

Jörgen Bengtsson, PhD
Div of Pharmacokinetics and Drug Therapy
Dept of Pharmaceutical Biosciences
Uppsala University
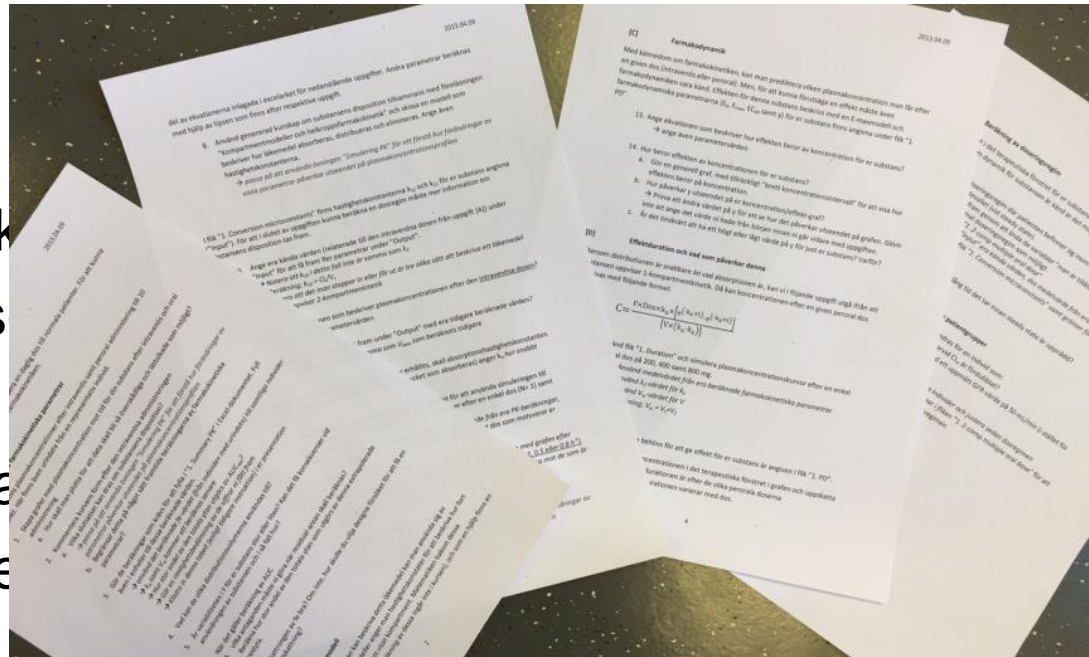
UPPSALA
UNIVERSITET

Introduction

- A 5-week course in pharmacokinetics (PK) and pharmacodynamics (PD)
  - Bachelor and Master of science in pharmacy program

- Need knowledge in and how to integrate mathematics, physiology and chemistry

- Complex topic, low completion rate of the course

Background

Used Microsoft
However;

1. The task
   → Old s

2. Examina
   → Some

3. Too detailed instructions
   → Focus on Excel instead of conceptual understanding
   → Does not reflect of why to do a specific task

Aim

To develop a web- and model based platform which generate a unique drug to every single student to be further evaluated with respect to PK and PD parameters in a "close to reality" environment

The project was able to develop and implement through external funding from the Uppsala University

Set-up

- Limited instructions

  - A link to the web page and "solve the task"

- The task is split up into 5 parts

  - PK (2), PD, dosage regimen and individual treatment

- Access to next part if

  - Satsifactory calculations

  - A personal reflection

- Summarize results in a Summary of Product Characteristic

Screenshots: First view, first task

Individual PKPD task

- Start
- 1. PK – Intravenous administration
- 2. PK – Oral administration
- 3. PD
- 4. Dose regimen
- 5. Individual treatment
- About
- My page
- Administrator
- Log out

PK – Intravenous administration

In this first part you will administer an intravenous dose to a healthy volunteer. Define when you would like to draw your blood samples and then you're ready to go!

Calculate the specified PK parameters to get access to the next task.

Intravenous dose ⓘ

[Dose ⇕] mg

Sampling time points [min] ⓘ

[Enter time points for blood sampling seperated by comma (i.e. 10,30,60,90 etc.)]

[Perform study]

Please report bugs or other technical problems to individualpkpd@gmail.com

An easy start for the students

5 parts to work with

Screenshots: First task

Individual PKPD task

- Start
- 1. PK – Intravenous administration
- 2. PK – Oral administration
- 3. PD
- 4. Dose regimen
- 5. Individual treatment
- About
- My page
- Administrator
- Log out

PK – Intravenous administration

In this first part you will administer an intravenous dose to a healthy volunteer. Define when you would like to draw your blood samples and then you're ready to go!

Calculate the specified PK parameters to get access to the next task.
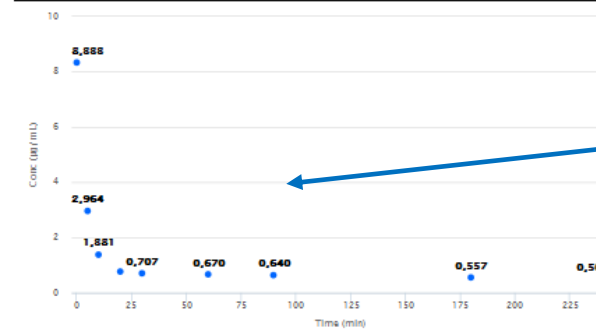
Intravenous dose

200 mg

Sampling time points [min]

0,5,10,20,30,60,90,180,240

Urinary data

Fraction	Collection start time (h)	Collection end time (h)	Volume (L)	Concentration (ug/mL)
1	0	12	0,9	33
2	12	24	0,9	10
3	24	72	3,6	<LOQ
4			-	<LOQ

Perform study

Time (min)	$Conc_{pl}$ (µg/mL)
0	8,33
5	2,96
10	1,38
20	0,77
30	0,71
60	0,67
90	0,64
180	0,56
240	0,51

Linear Chart   Logarithmic Chart

Limitations

Student generated data

Visual

Screenshots: provide answer and reflection

Your Answers

$CL_{tot,pl}$	23.6	L/h	correct
V_c	30	L	wrong
V_{Beta}	265	L	correct
$t_{1/2\ beta}$	7.6	h	correct
fe	0.42	-	wrong

Instant feedback

Flexibility and awareness

Personal reflection ⓘ

The substance shows a clear 2 compartment profile when administered iv. The distribution phase is obvious at early time points, especially on a logaritmic scale on the y-axis.

Oppertunity to reflect of their learning

Hand in Study Results

Screenshots: find a dose regimen

UPPSALA UNIVERSITET

Individual PKPD task

Start

1. PK – Intravenous administration

2. PK – Oral administration

3. PD

4. Dose regimen

5. Individual treatment

About

My page

Administrator

Log out

Dose regimen

The aim in this part of your work is to find a suitable dose regimen for the optimal treatment of patients. (i.e. obtain plasma concentrations at steady state that fits with the therapeutic window for your substance).

Dose

280 mg

T

12 h

Number of doses

5

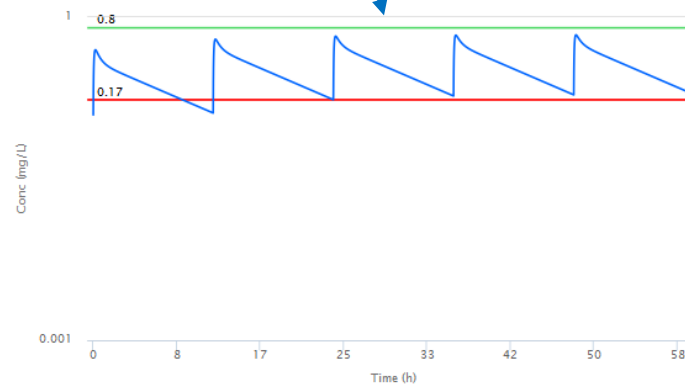Time to follow concentrations

60 h

Additional information:

CL (L/h)	23.562
V_c (L)	24
K_a (/h)	2
F	0.36
Therapeutic window	0.17 - 0.8 mg/L

Perform study

Learning by trying

Conc (mg/L)

1
0.8

0.17

0.001

0   8   17   25   33   42   50   58

Time (h)

Highcharts.com

Linear Chart   Logarithmic Chart

Evaluation

Students:

- "It was the best thing I have experienced. It was impossible to progress unless one had gotten it right, so one was forced to really understand."

- "I would say that it's primarily through the PKPD task that I've assimilated the information given in the lectures and that I not at all would have achieved such a deep understanding for the subject without it."

Results/discussion

- Tutoring is held on a conceptual level

- Progression within our study programs

- Individual examination

- Students are better prepared

- Extended written and oral presentation

Conclusions

- With this dynamic and model based approach we lay the responsiblity for learning to the students
  - Pushing students to learn

- In addition we've observed that the students are better prepared to the seminar and the written exam

- Finally, with the same resources we've increased the understanding for PK and PD and extended the training in oral and written presentation

Acknowledgement

Martin Grydén, Sofia Gustafsson,
David Kahn and Siv Jönsson

http://media.medfarm.uu.se/farmbio/
send me a mail for a test account
jorgen.bengtsson@farmbio.uu.se

Thank you for your attention!
Questions/comments?