Wet and dry approaches to enhancing contextual understanding of pharmacokinetics in UG and PG teaching

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**Background context**

- Pharmacokinetics is a key curricular area in UG and PG programmes.
- Traditionally, students struggle to cope with the material, particularly in making the connection between the numbers and their in vivo meaning.
- Students perform less well in the pharmacokinetics assessments compared to other areas of the course.

**Aim**

- To enhance the quality and effectiveness of PK teaching and learning at PG and UG level using 2 key strands:
  - **Blackboard to Benchtop:**
    - To design a series of practical exercises that bring pharmacokinetics to life.
  - **Benchtop to Laptop:**
    - To transform these practical exercises into flexible online simulations.

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**A suite of flexible online exercises**

- Same range of variables available as with the practicals, with delivery highly flexible:
  - **Flexibility of delivery:**
    - Tutorial
    - Interactive lecture
    - Simulated practical
    - Revision tool
    (unlimited open access available)
    - Assessment tool
    (secure access available)

**Evaluation**

- **Potential**
  - Feedback (improved):
    - “really useful for understanding concepts”
    - “clear and useful”
    - “I better understood the concepts when I was doing the lab work and writing up the report”
    - “They helped in understanding the theoretical part of the course”

- **Grades** (improved):

**Outcomes**

- These resources address some of the issues surrounding effective PK teaching and learning.
- They involve a catalogue of tangible exercises that require application of understanding in a visual and interactive way.
- Such approaches are clearly more engaging and effective in teaching students; and so enhance the Pharmacology student experience.
- The flexibility of these approaches increases their reach across HEIs and their potential for use in other curricular areas.
- Supported by a BPS teaching grant.

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**A suite of practical exercises**

**Potential applications modelled:**

- Single dose
- Multiple doses
- Continuous infusion

**Potential routes of administration modelled:**

- IV bolus injection
- IV line
- Oral

**Potential PK parameters varied / investigated:**

- Dose size
- Dose frequency
- Maximum concentration
- Time to maximum concentration
- Clearance
- Volume of distribution
- Time to steady state
- Loading dose

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**Blackboard to benchtop**

- Attempted to make PK teaching more applied and interactive rather than didactic.
- A series of practical exercises were designed utilising a simple model system.
- The system models elimination of methylene blue (the “drug”) from a central volume (the volume of distribution, \( V_d \)) using peristaltic pumps (the clearance, \( CL \)).