

## Supporting the use of computer-based alternatives to replace and reduce animal use in teaching and research

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### Main points to be covered:

- ❖ Animal use in UK Universities
- ❖ Learning objectives of animal labs
- ❖ Computer-based alternatives
- ❖ Persuading teachers to use them
  - Raising awareness of their existence
  - How can we encourage their use?
- ❖ Teaching better experimental design

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### The context: Animal use in HE teaching in UK

- ❖ Educational use is <1% of total but still >4000 each year (UK Home Office Statistics 2000)
- ❖ Trend is downwards despite increased student numbers
- ❖ This is probably a gross under-estimate
- ❖ Animals (mostly **isolated tissues from killed rodents**) are used primarily for **undergraduate labs (practical classes)** in **pharmacology, physiology, animal lab sciences, anatomy**

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## Animal Labs: what are the learning objectives?

### Teaching and practising:

- laboratory skills
- general animal handling skills;
- imparting good ethical thinking
- preparation-specific animal skills
- new knowledge and reinforcing existing
- data handling skills
- experimental design skills
- communication skills (oral, written)
- group work
- promoting staff-student interaction

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## Animal Labs: advantages & disadvantages?

### ❖ Advantages:

- really the only vehicle for effective teaching & learning of lab skills
- promote active, interactive learning
- promote group working
- promote staff -student contact

### ❖ Disadvantages:

- heavy on staff and student time
- require technical support, equipment, consumables, animals, specialist accommodation
- negative student perceptions of 'failed' experiments

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## What alternatives are there?

*A range of good quality alternatives are now widely available*

- ❖ Computer-based simulations - 2 types
- ❖ Video and interactive video
- ❖ mannekins, models and simulators
- ❖ human experiments
- ❖ non-animal experiments (e.g. using plant tissues, post-mortem material, cultured cells)

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## Computer simulations of preparations

### ❖ Typically:

- use algorithms to generate simulated tissue responses
- allow control over experimental parameters - good for design
- highly flexible
- need significant direct/indirect tutor support

### ❖ Examples:

Guinea pig ileum, Frog Skin, Squid Axon, Exercise Physiology, Blood Physiology

Ileum, Cardiolab, Vascular Rings, Sialic nerve-anterior tibialis  
SimNerve, SimMuscle, SimHeart, SimVessel

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## Computer simulations of experiments

### ❖ Typically :

- use 'real' data to generate simulated tissue responses - lifelike
- use tutor-designed (i.e. relevant) experiments
- may provide on-screen support & interactive self-assessments

### ❖ Examples:

Nerve Physiology, Muscle Physiology, Frog Heart, Intestinal Absorption, Cat Nictitating Membrane, Langendorff Heart, rat Blood Pressure, Inflammation Pharmacology, Finkleman, Respiratory Pharmacology, Intestinal Motility, Renal Function

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## The challenge

- ❖ Animals (mostly **isolated tissues from killed rodents**) are used primarily for **undergraduate labs (practical classes)** in **pharmacology, physiology, animal lab sciences, anatomy**
- ❖ The widespread availability of high-quality alternatives does not necessarily mean a significant fall in animal use for teaching.
- ❖ **Teachers need to:**
  - be made aware of their existence
  - be persuaded of their usefulness
  - be given advice about how to integrate them into their teaching practice

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## Raising awareness

- ❖ A number of quality databases exist providing information about a wide range of learning resources e.g. NORINA, InterNiche, AVAR (Association for Veterinarians for Animal Rights).
- ❖ Mostly the information is product-centred and lacks the level of detail teachers need to make decisions about use.
- ❖ Our experience suggests that teachers value:
  - the opportunity to evaluate their usefulness
  - reviews, evaluations, exemplar support materials
  - advice from experienced teachers

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## Disseminating information - EURCA project <http://www.eurca.org>

- ❖ Resource Centre with a collection of alternatives
  - ◆ role is to be pro-active in promoting alternatives to teachers
  - ◆ high 'visibility' at international science meetings
  - ◆ Centre 'manned' by academics experienced in using alternatives in their own teaching
- ❖ Web-based database of selected alternatives for HE
  - ◆ details, commissioned reviews, support materials, data from evaluative studies, users comments/experiences
- ❖ Electronic Newsletter, discussion groups, network of enthusiasts

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## Persuading teachers of the usefulness of alternatives

- ❖ Several ways of doing this:
  - demonstrate how they are being used in similar situations and which learning objectives/outcomes they can most usefully address
  - provide independent reviews
  - present evidence from evaluations of their effectiveness

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## Do they work? - the evidence is YES

### ❖ but it depends on what you measure

- knowledge gain is equivalent ;
- skills: data handling, experimental design, communication
- promoting group work, staff-student interaction
- Practical skills CANNOT be taught or practised

### ❖ teachers must accept that different goals are achieved and therefore must decide their primary learning objectives

### ❖ students' reaction to CAL is generally positive

### ❖ alternatives are usually less expensive

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## Integrating alternatives into mainstream practice - Key steps

### ❖ Successful implementation requires tutors to develop 'wrap-around' support materials e.g. text-based study guides or workbooks

### ❖ these may be similar to lab schedules and should include objectives and outcomes

### ❖ exercises, tasks and activities should be built-in

### ❖ self-assessment questions should be included to reinforce learning

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## What sort of tasks/activities?

May be individual or group centred

### ❖ Record and Measure - test accuracy of measurements

- observe responses of...to...
- compare....
- measure .... quantify....

### ❖ Data Analysis

- plot... extrapolate....
- determine.... calculate....

### ❖ Data Interpretation Skills

- describe.... list...
- explain.... discuss....
- formulate a model to... identify unknown X

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## What sort of tasks/activities?

- ❖ Presentation Skills
  - construct a table to... draw a graph to...
  - prepare an abstract... prepare a poster
  - give an oral communication to..
  - write a report
- ❖ Experimental Design
  - design an experiment to...
  - identify the unknown X...
  - formulate a hypothesis to explain... test your hypothesis
  - determine a range of suitable drug concentrations to...
- ❖ Knowledge of underlying principles
  - use MCQs, True/False etc

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## Teaching better Experimental Design - Refinement of practice

- ❖ Highly interactive CAL program - Festing , Dewhurst & Broadhead 2000.
  - Choosing an appropriate model
  - understanding the 'experimental unit'
  - eliminating bias
  - using valid statistical methods
  - improving precision
  - increasing range of applicability

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## Summary

- ❖ Animals are still being used (often unnecessarily) in HE
- ❖ the evidence is that alternatives:
  - are cost effective providing lab skills are not primary learning objectives,
  - are acceptable to students if they are well integrated into a course,
  - can reduce animal use whilst achieving many learning objectives
- ❖ Teachers should:
  - audit their courses and define teaching objectives more clearly,
  - justify inclusion of animal labs and use alternatives where possible to have an impact on animal use in HE
- ❖ teachers' level of awareness must be increased - they need a rich information - EURCA
  - to use them successfully teachers must develop their own support materials.

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Thank you for listening

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