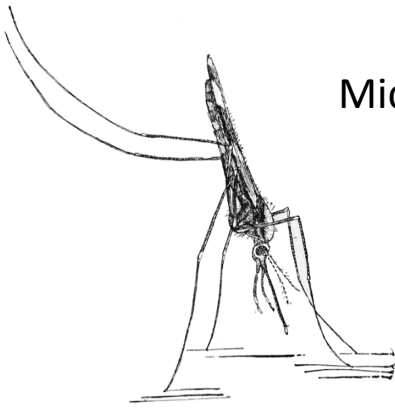


Microbiology Mystery



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First year biology practicals are often time-limited, recipe book-style exercises. Students lack engagement and enthusiasm, and guess answers, rather than working through the problems. The aim of this development was to give 700 first year students at the University of Glasgow the opportunity to carry out a three week long extended enquiry-based project (Kahn & O'Rourke, 2006) on tropical diseases.

Week 1

Students prepare by researching bacterial, viral and parasitic tropical diseases, modes of transmission, treatment and prevention strategies.

Week 2

Students work in groups of eight to review patient histories, signs and symptoms, and carry out a number of diagnostic tests to identify the pathogen(s) infecting their patient (Six patients in total, 48 students).

Week 3

Students receive results of tests and carry out further research to diagnose patient. Students present reasoning for diagnosis and recommend treatment or further tests to be performed.

Samples

Blood : *Neisseria meningitidis*, *Plasmodium falciparum* (malaria)
Cerebrospinal fluid : *Neisseria meningitidis* (bacterial meningitis)
Serum: Yellow Fever, Dengue Fever
Faecal matter: *Vibrio cholera* (Cholera), *Trichuris* eggs (intestinal worms)

Tests

Selective (TCBS) & enriched media (blood agar): *Vibrio*, *Neisseria*
Gram stain: *Vibrio*, *Neisseria*
Thin film (Giemsa): *Plasmodium*
ELISA: Yellow fever (+), Dengue fever (+) & *Neisseria* (-)
Microscopy: *Plasmodium* (-), *Trichuris* eggs

Safety

Vibrio & *Neisseria*: substituted with harmless *E. coli* & *N. lactamica*
TCBS: nutrient agar + green food colouring
Blood: uninfected horse blood
Serum, CSF: uninfected BSA (2° Ab in +ves)
Trichuris eggs: preserved in alcohol
Faecal matter: Weetabix + Oxo (gravy brown)

- Students do not know what their patient is suffering from without completing the tests.
- Tests are ambiguous and students must deduce diagnosis from patient history and more than one test.
- Students are more engaged.
- 90% agreed it helped their understanding of tropical diseases

"Today we earned our labcoats."

References

- Kahn, P., & O'Rourke, K. (2005). *Understanding Enquiry-based Learning*. Ireland. Retrieved from <http://www.aishe.org/readings/2005-2/chapter1.pdf>
- Tatner, M., & Tierney, A. (2015). An Extended, Problem-Based Learning Laboratory Exercise on the Diagnosis of Infectious Diseases Suitable for Large Level 1 Undergraduate Biology classes. *Journal of Biological Education*, DOI:10.1080/00219266.2014.1002520