

Development of laboratory simulations for pharmacology teaching

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Background and Aims: We recently reported the development of SimXL, a Microsoft Excel-based package that simulates functional responses from a variety of pharmacology preparations¹. The package is user-customizable and can be distributed to students without copyright restrictions. Here, we describe the further development and evaluation of this package and its supporting material.

Summary of work and outcomes: We have authored a series of four exercises based on SimXL: actions of muscarinic antagonists at the guinea pig ileum (aimed at level 1 students); investigation of antagonist mechanisms at the guinea pig ileum using Schild analysis (level 2 students); modulation of GABAA receptors using simulated whole-cell patch clamp; effect of subunit composition of nicotinic acetylcholine receptors using simulated two-electrode voltage clamp. To support these exercises and allow further customization, we have produced a user manual and generated a suite of high quality illustrations of the functional techniques being simulated. These materials are available free of charge upon request.

The GABAA and nicotinic receptor exercises simulations have been trialled on second year B.Sc. Pharmacology students as part of their semester 4 Research Skills Module. Students' opinions of the exercises was largely positive: 76% agreed that the software was easy to use, 66% agreed that it looked professional and 64% agreed that the exercises enhanced their knowledge of receptor pharmacology. However, only 12% of students expressed a preference for the simulated experiment over a 'wet-lab' version of the same exercise, if one were available.

Discussion: A wide variety of commercial and free pharmacology simulations are available to pharmacology teachers and many have proved effective alternatives to the use of animal or cell-based systems in undergraduate teaching². However, feedback from users to the VirtualPharmacologyLab repository has revealed a strong desire for such resources to be user-modifiable². We believe that SimXL may meet the need for a teaching resource that is not only effective, but also user-customizable.

Conclusion: Students appear to value the simulation exercises and for techniques such as patch-clamp and two-electrode voltage clamp, for which facilities do not exist in most undergraduate teaching laboratories, the packages may prove of value in pharmacology teaching.

References:

1. Prince R et al. (2016) Proceedings of the British Pharmacological Society at: <http://www.pa2online.org/abstract/abstract.jsp?abid=32888&author=Prince&cat=-1&period=61>
2. Dewhurst D and Ward R (2014) PiLAS: A discussion forum for bio-science topics. <http://pilas.org.uk/the-virtual-pharmacology-lab-a-repository-of-free-educational-resources-to-support-animal-free-pharmacology-teaching/>