

# CAL: A Modern Tool For Pharmacology

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## Abstract

Learning skills development and computer-assisted learning methods are key factors of a student's education. Computer assisted learning (CAL) is a collection of experimentation on the course software package to understand the concepts and techniques. A number of interactive multimedia software has been developed to demonstrate the Pharmacological experiments to medical students. Recently, there is a huge demand and increasing interest in introducing CAL techniques in pharmacology. The purpose of this study is point out the major advantages and limitations of computer simulated learning in pharmacology experiments. These newer methods of instruction are proving to be more advantageous over conventional methods of teaching and learning. They also reduce the total investment in space, equipment and faculty time required in the traditional sequence of laboratory experiments. Even though there are certain limitations, it has been proven to be a novel alternative to the traditional and conventional animal experimental methods.

## INTRODUCTION

In the modern century, pharmacology has turned into an emerging area with high career orientation. Recently the undergraduate training in pharmacology has been revolutionized with adoptions of newer teaching tools like group discussions, role plays, using audio-visual aids, clinical and community pharmacology studies.<sup>1</sup> Nowadays, these are being adopted by many colleges at both postgraduate and undergraduate levels. Today, computer assisted learning has become a vital part in the pharmacology curriculum. Recent trends in the developments of information technology support such methods. Both CAL and laboratory practical classes are valuable tools for pharmacological experiments. Further, it is quite time consuming to demonstrate minute details of pharmacological procedures and drug effects to a batch of students and the increasing strength of practical batches is making it difficult to interact with each student. Hence CD containing CAL software for teaching animal experiments is becoming a revolution in pharmacological teaching.<sup>2</sup>

The term Computer Assisted Learning deals with a range of computer-based packages, which are focused on to provide interactive instruction usually in a specific subject area. CAL projects are designed in such a way that it helps to provide students with an alternative to traditional lectures. These can range from sophisticated and expensive commercial packages to applications developed by projects in other

educational institutions or national initiatives to simple solutions developed by individuals with no funding or support to tackle a very local problem. They offer a range of benefits like it is convenient and flexible. It has got unique presentational benefits, helps in personalized learning, and helps in achieving the ultimate goal of higher education.<sup>3</sup>

This paper aims to convey information about the useful web resources available for handling pharmacology practical with special emphasis on its advantages and limitations.

## CAL IN PHARMACOLOGY

Computer-assisted learning is almost similar to the experiential model of learning. Demonstration of the effect of drugs on various models like tissues or on whole animal is an integral and essential part of practical pharmacology teaching for medical students. But it requires the usage of a large number of animals and a lot are sacrificed during each experiment even for studying and demonstrating the action of drugs which are already established. With our own experience we felt that this affects the mental state of the student also. So it should be the constant effort of a pharmacology teacher to bring down the usage of animals and increase the teaching quality in pharmacy. One of the best ways to reduce this is to utilize the web resources available for the same. Like a laboratory class, it must be fully integrated into a module if real benefits are to be obtained. Students need to be taught how to learn from

computer-based learning materials and how to integrate this learning tool in their learning strategy. Thus by the use of CAL we can replace the use of animals in pharmacology practical classes.

A few use of CAL in pharmacology is listed below

- Pharmacy practical with demonstration of various preparations
- Demonstrations of routes of drug administration using colorful pictures
- Learning by role play in therapeutics
- Therapeutic teaching with visual aids
- Teaching pharmacology theory without visual aids
- Pharmacokinetic learning with the help of CAL software
- Pharmacodynamic learning with the help of CAL software
- Community pharmacological case studies
- Clinical pharmacology case studies etc.<sup>4,5</sup>

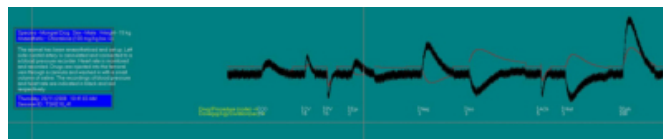
**Figure 1**

Figure 1: An interface showing video demonstration of effects of drugs on dog blood pressure and heart rate



**Figure 2**

Figure 2: Graph showing recordings of blood pressure and heart rate of different drugs



**Figure 3**

Figure 3: An interface showing video demonstration showing isolation and mounting of frog heart



## COMPARISON BETWEEN TRADITIONAL METHODS AND CAL

One of the major problems of performing tissue based experiments is the variability in tissue response. There are certain other limitations while carrying out the routine animal experiments. A few of them include lack of ready availability of animals, cost of purchasing and maintaining them are major constraints in many institutions, and also large animals like dog and cat are difficult to handle during demonstrations in the laboratory etc.

Although traditional live animal experiments are invaluable, they do have shortcomings, and their cost effectiveness has been questioned. Apart from being time consuming, animal experiments can only test a limited number of drugs at a given period of time. Furthermore, animal experiments, in particular whole animal studies, are often labour-intensive and costly.<sup>6,7</sup>

### Major Advantages Of CAL

1. Avoids use of animals
2. Exercises difficult to be conducted in the laboratory can be demonstrated using CAL.

3. Many students can observe experiments at the same time.
4. Experiments can be observed repeatedly without loss of animals with minimum errors.
5. Many experiments can be demonstrated in a short time.
6. Drug effects can be visualized clearly
7. No experimental errors are seen as in laboratory exercises

### **LIMITATIONS OF CAL**

Even though there are various advantages of CAL, some arguments against this new method of learning are

1. No direct interaction with living tissue
2. Experiment is programmed with prefixed doses
3. Many a times, variations in response as observed in living tissue cannot be observed.
4. Requires expertise to handle problems related to computers.
5. Expensive method of teaching.
6. Experiments performed in laboratory are easier to remember and one may easily forget these methods.
7. Above all practical knowledge of how to do the experiment is lost.

The traditional practical classes should not be replaced with the computer simulation. It is therefore essential that the merits of both forms of teaching are considered and that a balance is struck in the armory of the educationalist. This can only be to the advantage of students receiving such equity.<sup>8,9,10</sup>

### **CONCLUSION**

In conclusion, computer-simulated experiments appear to be feasible and effective as a major part of practical lessons of pharmacology. Given the learning objectives of pharmacology practical lessons in medical students is to enhance students' understanding of the subject, computer-simulations may serve as an alternative to the traditional live animal experiments.

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