In silico animal experimentation

Hajar Desai*

Department of Pharmacology, AJ Medical College, Ludhiana, India.

DESCRIPTION

The *in silico* methods include models of diabetes, asthma and drug absorption. Potential new drugs identified using these techniques require verification in animal and human tests before licensing. Quantitative structure-activity relationship (QSAR) models also are used. These are mechanistic models that aim to predict sensitization from mechanistic knowledge and empirical models that are aimed toward predicting from a statistical perspective. Several QSAR systems are available, like TOPKAT, DEREK, TOPS-MODE, Multi-CASE, TIMES-SS, TOPKAT, ToxCast and DEREK. These are easier to use as compared to wet laboratory processes.

Several "virtual humans" are constructed by creating mathematical models of known human reactions. a couple of examples include computer models to model human metabolism, to review plaque buildup and cardiovascular risk and to guage toxicity of medicine . For instance, the protease inhibitors for patients with HIV were designed by computer and tested in human tissue cultures and computer models, bypassing animal tests thanks to the urgent need for a treatment. A replacement cardiovascular drug was developed and approved in 1997 supported data from a virtual heart as animal data were inconclusive. The day isn't far away when E-cell which resembles a hypothetical cell is probably going to revolutionize the drug research.

Development of alternatives to animal experiments in teaching seems less tedious. These alternatives are often substituted by demonstrations using computer-simulated learning programs.

Exercises within the sort of graphs, tables obtained from various animal experiments are often wont to teach students. They're going to analyze and interpret these applying different methods, formulae and statistics. After the discussions the learner can draw conclusions and correlate them clinically. Analyzing the results of any experiment or drug trial and drawing conclusions may be a good learning experience for college kids for developing clinical judgment skills. The varied alternatives used are mannequins, videos, observational and field studies, materials from slaughter house and fisheries, supervised clinical experience etc. Exact simulation of real animal experiments on a computer isn't easy because the biological responses are very complex. Hence, the results obtained with these simulated models might not be very accurate. It's pertinent to recollect however, that the aim of the software is to show the scholars about salient facts that have practical utility in their future role as decision makers in patient care.

Computer-based alternatives are getting used in many countries. In India, two models are currently available: Expharm and Xcology. These are available as free modules and as advanced paid versions. Both are well tested and used for years. Computer-based alternatives were wont to some extent by all countries. We evaluated these software programs and located that the alternatives are implementable and reduce the value and time spent on animal experiments. The scholars appreciated the alternatives and located these more useful to know the mechanism of action of medicine. Similarly, the response of college in India to training on alternatives was very encouraging. The digital frog and more recently award-winning virtual frog is out there where a student can dissect a frog layer by layer.

Surveys show that major barriers to the introduction of alternatives include "resources not available in local languages," "difficulty finding resources," and "lack of cash." Major factors that might persuade academic staff to introduce alternatives were: "published evidence of effectiveness," "colleague's recommendation," and "students' objections".

While we ponder on these alternatives and therefore the apparent difficulty in their implementation, it's encouraging to understand that similar initiatives have begun worldwide. The reported replacement of animal labs with computer-based alternatives is highest in Spain (73%), whereas in France and Italy, they're low. Poland, Czech Republic and Romania reported a comparatively high level of use of computer-based alternatives. Italy (64%) and Holland (67%) make the best use of free-of-charge computer-based resources. Countries like Spain (27%), Germany (41%) and Holland (22%) make the best use of in-house developed computer-based resources.