

Alternatives to Animal Procedures in Drug Development

Eleonore Frohlich*

Center for Medical Research, Medical University of Graz, Stiftingtalstr 24, A-8010 Graz, Austria

***Corresponding author:** Frohlich E, Center for Medical Research, Medical University of Graz, Stiftingtalstr 24, A-8010 Graz, Austria, Tel: +43 31638573517; Fax: +433163857009; E-mail: eleonore.frohlich@medunigraz.at

Rec date: June 24, 2016; **Acc date:** June 27, 2016; **Pub date:** June 30, 2016

Copyright:© 2016 Frohlich E. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

Drug discovery identifies new candidates for medications and drug development aims to deliver the efficient active pharmaceutical ingredient to the target site without causing adverse effects. In drug development animal studies usually represent an integrative part of the testing. In the past, animal procedures helped in salient discoveries of new drugs. Von Behring generated diphtheria and tetanus antitoxins in horses. Banting and Madeod identified the effect of insulin in dogs. Fleming tested penicillin in rats and Wäe C

-
- 4 Russell W, Burch R (1959) The principles of humane experimental technique. Methuen, London.
 - 5 Doke SK, Dhawale SC (2015) Alternatives to animal testing: A review. Saudi Pharm J 23: 223.
 - 6 Musther H, Olivares-Morales A, Hatley OJ, Liu B, Rostami-Hodjegan A (2014) Animal versus human oral drug bioavailability: do they correlate? Eur J Pharm Sci 57: 280-291.
 - 7 Tibbitts J (2003) Issues related to the use of canines in toxicologic pathology--issues with pharmacokinetics and metabolism. Toxicol Pathol 31: 17-24.
 - 8 Fernandes CA, Vanbever R (2009) Preclinical models for pulmonary drug delivery. Expert Opin Drug Deliv 6: 1231.
 - 9 Gordon S, Daneshian M, Bouwstra J, Caloni F, Constant S, et al. (2015) Non-animal models of epithelial barriers (skin, intestine and lung) in research, industrial applications and regulatory toxicology. Altex 32: 327-378.
 - 10 Fröhlich E, Salar-Behzadi (2014) Toxicological assessment of inhaled nanoparticles: role of in vivo, ex vivo, in vitro, and in silico studies. Int J Mol Sci 15: 4795-4822.