

Editorial

Animal Models and Better Understanding of “One Medicine”

Duncan C. Ferguson

Founding Editor-in-Chief of Veterinary Sciences, Department of Comparative Biosciences,
University of Illinois College of Veterinary Medicine, Urbana, IL 61802, USA;
E-Mail: dcf@illinois.edu; Tel.: +1-217-333-7417

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Medical science has long been informed by the study of animal physiology and pathophysiology, both spontaneous and induced. Physiologist Claude Bernard studied dogs to better understand pancreatic, hepatic and cardiovascular homeostasis [1,2]. Best and Banting uncovered the function of insulin through studies in experimental dogs [3]. More recent studies of obesity in cats have found similarities and interesting differences in the manifestation of the adverse effects of overnutrition between cats and humans [4]. The complete sequencing of the human and mouse genomes, and deep sequencing of pig, cattle, dog and cat have opened up the opportunity to systematically compare genetic similarities and differences [5,6].

However, we are informed by the careful clinical observation and study of the phenome, the complex product of genomic, postgenomic, epigenomic effects, and feedback mechanisms in each of these species. At which level does the apparent resistance of the naked mole rat lead to a diminishingly small incidence of spontaneous neoplasms [7]? Veterinary medical science has uncovered important spontaneous diseases which have important similarities to similar diseases in man: drug allergies and autoimmune diseases, feline immunodeficiency virus (FIV), Cushings’ disease in the dog, feline thyrotoxic nodular goiter, feline diabetes, a variety of neoplasms including canine osteosarcoma and lymphosarcoma, to name just a few.

There are great biomedical needs to better understand the science of comparative disease pathogenesis and therapeutic response. As examples, the following questions might be explored:

- Could improved knowledge of critical interspecies differences in drug metabolism and action allow the choice of pre-clinical species which are more predictive of the drug’s efficacy in the human or animal target species?
- Are there better spontaneous animal models of mammary cancer that manifest the wide variety of tissue responses of human breast cancer?

- How far do neurochemical and behavioral models in insects (e.g., fruit flies, bees) take us in the understanding complex behaviors in “higher” species?
- What lessons are to be learned from the phenotype of genetically modified animals?

The imperative for careful study of comparative medicine is not only associated with the appropriate choice of induced and spontaneous animal models of disease, but in the increasing and appropriate societal sensitivity to the use of animals in research. We hope that the first Special Issue of this new journal, Animal Models of Disease, can be a forum for careful exploration of these species comparisons in order to optimize the appropriate selection of a species for an induced disease, and to raise greater awareness of spontaneous diseases seen in veterinary clinical practice.

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