International Journal of Genomics

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Special Issue on

Genetic Diseases in Animals and Humans: Applications in Pharmaceutical R&D

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Despite the significant advances in science and technology over the past few decades, clinical drug R&D productivity is declining. This in part can be attributed to the inability to demonstrate the efficacy of novel drugs in late phase clinical trials. Failure of the common laboratory animal models to predict drug safety/efficacy in humans and incomplete understanding of the genetic architecture of complex human diseases are the major reasons. Inbred, knockout, and transgenic laboratory animal models only partially mimic the human disease pathology and drug screening results from these models are not highly predictive in humans. The effect of gene by gene interactions and environmental influences on clinical outcomes is poorly understood because of the high level of genetic heterogeneity in complex human diseases. Diseases in humans and animals which have clear genetic causality generally have well defined biological mechanisms and relatively homogenous clinical manifestations, compared to more common complex diseases. Several neurological, metabolic, immunological, and proliferative diseases in human have similar naturally occurring counterparts in animals. Hemophilia A, amyotrophic lateral sclerosis, and X-lined muscular dystrophy in humans and dogs are good examples. Further companion animals with genetic disorders are often exposed to similar environmental influences as their human owners, offering an opportunity to observe the disease in the complex environmental conditions rather than observing it strictly in the laboratory. Effectiveness of potential new medicines for humans can be investigated in animals if the mechanism of drug action overlaps with disease biology. Efficacy of enzyme replacement therapy in a Dachshund dog model of human Batten disease is an excellent example to highlight this approach. This special issue is intended to present and discuss recent advances in the use of rare genetic diseases in animals and humans in drug discovery and development.

Potential topics include, but are not limited to:

- Comparative genomics
  - Use of genomics technologies in identifying parallel diseases in animals
  - High-throughput genetics in identifying etiology of rare genetics diseases in human and animals
- Comparative epigenomics
  - Epigenomic variations across species, time-course, and individuals
  - Chromatin epigenetics in animals and humans
- Orphan and companion animal drug development Landscape
  - Current state-of-the art in orphan drug development (humans)/MUMS drug registration (animals)
- Orphan and companion animal drug development examples
  - Case examples of successful/ongoing activities in drug development in genetic diseases in humans
  - Case examples of successful/ongoing activities in companion animal drug development for application in human research

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