Use of Invertebrate Animals as Model to Investigate Infectious Diseases and Toxicity of New Drugs

Janaina de Cássia Orlandi Sardi[*]

Departamento de Ciências Fisiológicas-Lab. de Farmacologia, Anestesiologia e Terapêutica. Faculdade de Odontologia de Piracicaba-UNICAMP-SP, Brazil

[*]**Corresponding author:** Janaina de Cássia Orlandi Sardi, Departamento de Ciências Fisiológicas-Lab. de Farmacologia, Anestesiologia e Terapêutica. Faculdade de Odontologia de Piracicaba-UNICAMP-SP, Brazil, Tel: +55-19-2106-52; E-mail: janasardi@gmail.com

Introduction

The study of infectious diseases and toxicity of new drugs initially requires animal model before you even follow the protocols and reach the human model (final stage of studies). The most widely used animal model is the *Mus musculus* (mices, rats), easily accept the fact that its similarity to the human response. While it is recognized that basic research generally takes place with the use of testing *in vitro* or *ex vivo*, very little of these alternatives are designed specifically to predict the effects that a substance may have for regulatory purposes. Because of the concern of the ethics committee in animal research and the ease of manipulation and low cost of invertebrate animals, it has sought improvement techniques with various invertebrate animals. Therefore, new technologies based on alternative methods to animal testing should be in some mechanically more relevant cases to predict an effect on human health than traditional animal experiments [1-3].

Among the alternative models to study microorganisms are amoebas (*Acanthamoeba castellanii* and *Dictyostellium discoideum*) which are useful for phagocytosis studies and evaluation of hyphae formation, the nematodes (*Caenorhabditis elegans*), which in addition to the known genome allowing using different mutants can be used for toxicity evaluation and testing of new drugs. Insects such *Drosophila melanogaster* enables the use of genetic tools such as microarrays and RNA interference. Moreover, *Galleria mellonella* facilitates phagocytosis studies, hyphae yeast formation, pathogenicity and evaluation of new compounds. Zebrafish (*Danio rerio*) also features the fully sequenced genome, and genetic and physiological similarities with mammals being useful in drug discovery; even techniques for generating transgenic lines, target mutation, and nuclear transfer become the Zebrafish model even more useful for researchers. However all models have advantages and disadvantages with respect to pathogen inoculation route, inoculation concentration of accuracy, cost, ease of handling, growth at 37°C genome availability. During evolution, animals developed the invertebrate immune system against pathogens and so there is great functional and structural similarity between the immune systems of mammals and insects this being another reason that supports the use of these models [1-5].

Conclusion

Thus, the use of invertebrate models is a new alternative in the search for knowledge parasite-host and which has been widely used and accepted by the scientific community [5].

References

1. Mylonakis E, Casadevall A, Ausubel FM (2007) Exploiting amoeboid and non-vertebrate animal model systems to study the virulence of human pathogenic fungi. PLoS Pathog 3: e101.

2. Mylonakis E, Ausubel FM, Perfect JR, Heitman J, Calderwood SB (2002) Killing of Caenorhabditis elegans by Cryptococcus neoformans as a model of yeast pathogenesis. Proc Natl Acad Sci U S A 99: 15675-15680.

3. Mylonakis E, Moreno R, El Khoury JB, Idnurm A, Heitman J, et al. (2005) Galleria mellonella as a model system to study Cryptococcus neoformans pathogenesis. Infect Immun 73: 3842-3850.

4. Okoli I, Coleman JJ, Tampakakis E, An WF, Holson E, et al. (2009) Identification of antifungal compounds active against Candida albicans using an improved high-throughput Caenorhabditis elegans assay. PLoS One 4: e7025.

5. Clavijo-Giraldo DM, Matínez-Alvarez JA, Lopes-Bezerra LM, Ponce-Noyola P, Franco B, et al. (2016) Analysis of Sporothrix schenckii sensu stricto and Sporothrix brasiliensis virulence in Galleria mellonella. J Microbiol Methods 122: 73-77.