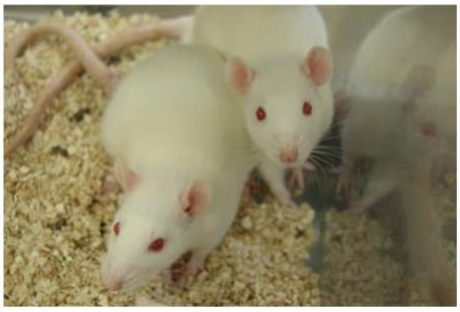
Model Medicine
By Rob Hammerstad

There are many kinds of models in the world. There are model airplanes, model cars, even *super*models! Ok, nevermind the supermodels and model cars, they're not the reason we're here today. We're here to talk about disease models. So, what is a disease model? Generally it is an animal—perhaps a rat—that has some abnormality that mimics the pathology of a human disease. But before we continue to discuss disease models, I would like to return to the toy models and talk about the qualities that make any particular model a good model.

Imagine a toy jet fighter that a child is playing with, pretending to fly at the dinner table as their hand passes over their plate, which is actually a fortified enemy installation made of vegetables. As it passes over, the pilot launches 200 nuclear missiles, demolishing the broccoli! Yay! Time for dessert!

A toy jet might not be the best model for testing aerodynamics.



A rat is a very good model for disease, but not perfect.

Now wait a minute, can a single jet really launch 200 missiles? Not likely. That isn't an accurate representation of the real thing. Does that mean it's not a good model? That depends on its purpose. The purpose of this particular model is to stimulate the imagination of a bored kid. Job well done! But what if the purpose of was to test aerodynamics? We would need a model that behaves similarly to the real thing, so this particular model wouldn't be well suited for testing aerodynamics.

Ok, so we know that whether or not a model is good depends two things: its purpose, and how accurately it mimics what is being tested. What does that mean in terms of an animal model of disease? It means we would need the disease pathology in the animal to behave similarly to how it does in humans. Fortunately, because of our close relatedness to other life on Earth, many diseases do. You've probably heard of both dogs and people having cancer, a disease that threatens our mortality *every bit* as much as it threatens any other animal. This is because we share similar essential processes of life. Errors in DNA replication can happen in dogs just like it can happen in us. This fact is fundamental to how medical science is advanced. There is, however, an important issue—just because we are similar doesn't mean we aren't different.

Consider the jet fighter. A key difference between a jet that we design and build from the ground up and an animal disease model is the understanding of how the thing works. The engineers that designed the jet have an excellent understanding of how each moving part within their creation works, after all…they made it! Research scientists, on the other hand, didn't design the rat, and there remains a great deal to learn about the processes of life. So, if there is such a gap in knowledge, how can research into disease modeling even work? It works because it is the best available model, *but we know it's not perfect.*

It is very important that we recognize the differences and unknowns between us and our disease models. We must continue to improve our understanding of disease pathologies so that we may cure those diseases, but we must also bear in mind the differences between our models and us. It may be the difference between life and death!