



8 TOP Trends in Toxicology Testing

1

Continuing shift of focus from *in vivo* testing to *in vitro* testing (on human cell lines)

In today's industry, drug manufacturers want early tests that accurately reflect how a new compound will react in the human body. The industry is searching for new paradigms, such as human cell lines, to use in specialized, novel *in vitro* environments. The goal is to provide a more comprehensive and accurate picture of a drug's likelihood to succeed, which may not always be the case in an animal model.

2

In Silico Modeling

As computing power becomes stronger, the ability to integrate complex external data sets becomes more robust, coupled with the current increase in capabilities for modeling and simulation, more companies will employ these new technologies to better emulate the effects of new drugs on the human body. Predictive computational methods also offer promise for identifying possible off-target interactions beyond those typically assessed in off-target screening assays.

3

FDA improving its oversight

The FDA is now focusing more-and-more on familiarizing itself with new toxicology methods, in order to develop new ways to evaluate the technologies being used to conduct toxicology testing, and to facilitate understanding for regulatory decision making.

4

Cell culture chips

Emerging technology is being developed to better emulate human organs (by incorporating co-cultures within novel environments that more closely simulate the human body). For example, different cell types from the lung could be plated into a chip and subjected to different levels of pressure and stretch, thus mimicking the human lung during respiration. Other physiological parameters, such as blood flow and intercellular communication, may also be replicated more accurately in such systems.

5

Increasing partnerships

Every aspect of the drug development process is expensive. Both pharmaceutical companies (Amgen, Pfizer, etc.), and government agencies (such as the NIH and FDA, as well as European Agencies) are collaborating to share the cost of developing new toxicology methods.

6

Quicker and less costly assays

Assays that are efficient in the use of compound, time and money, will allow companies to choose and/or optimize the most likely drug candidates more quickly and accurately.

7

Going beyond gender testing, a wider range of age-related testing and ethnicity-testing will grow, as we move towards personalized medicine

Testing of animals of different genders and ages is already required, to support dosing in humans. And, if juveniles are to be dosed, juvenile toxicity studies in animals are required. However, there is a growing interest in testing at different older age points, as metabolism slows in old age, and testing ethnicities with different fundamental responses to drugs is also predicted to become more important. We certainly know that diseases/toxic substances affect humans in different ways, so actual testing or modeling of the results is definitely on the horizon.

8

Increasing importance of systems biology

Companies are looking to understand the entire physiological pathway changes related to why a particular toxicity is occurring, building a more comprehensive understanding of mechanism, rather than simply observing it. This will allow the industry to make safer drugs in the future.