The defined laboratory animal and health monitoring

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Laboratory animals are used for many different purposes. One main reason for their use is to measure biological responses to different treatments, chemicals, biological products etc. Hence the animals, in the hands of the scientists, are used as measuring instruments. Accordingly it is obvious that the more sophisticated investigations performed the more calibrated and uniform the animals have to be in order to obtain unambiguous and repeatable results.

Laboratory animals are also used to obtain a diversity of biological products as antibodies, organproducts, cells, etc. There are many factors that may influence the outcome of an experiment in which animals are used and to make it possible to repeat an experiment (Fig. 1).

The following circumstances and conditions of husbandry must be considered:

Genetic; species, strain, outbred, inbred, etc.

Adapted from Carstensen, J.
Scand. J. Lab. Anim. Sci. 1986, 13 (4), 139–141.

Fig. 1. Factors that could influence the biological response.

Metabolic; age, sex, weight at start of experiment, condition, lactation, pregnancy etc.

Environmental; temperature, humidity, ventilation, bedding, light, cage, density, personell, transports, quarantine or acclimatization periods, etc.

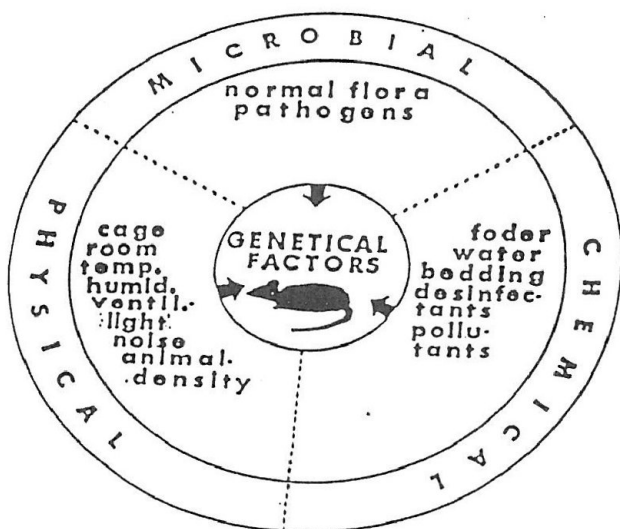Food; availability, palatability, changes, composition, etc.

Experimental factors; stress, pharmaca, anestesia, etc.

Diseases.

A perfectly defined animal is an animal in which all the above mentioned details have been checked and reported upon and it may be considered a "very accurately calibrated biological instrument". It is many times, however, not considered important to use animals free from all pathogens, potential pathogens or organ lesions but rather animals free from microbiological agents known to affect the outcome of ongoing research.

The known health status of the animals used, should anyhow be declared in order to, on one hand make research results repeatable and on the other hand to make it possible, in the future, to explain results obtained!

Diseases may play an important role as many maladies, infectious and noninfectious, although present in a subclinical state, are able to alter several physiological parameters. Health monitoring is a method used to calibrate the animals. It should be underlined that determining the microbiological status of the animals (virology, bacteriology, parasitology etc) has to be the major part of any health monitoring scheme but congenital, hereditary, malnutritional and other conditions must not be neglected and hence

investigations concerning these circumstances are also important.

There are several methods used to control the environment and the husbandry, such as barriers, isolators, decontamination of food and bedding material etc, in order to ascertain the microbiological status of laboratory animals.

Divergent health monitoring results may be indicative of alterations in the environment, regimen or experimental conditions. Hence, health monitoring is an important tool when assessing the quality of animals or to define them. In animals employed for the production of biological products, used on animals or man or in laboratories, health monitoring has to be considered essential to avoid the spread of infections to animals, man, tissue cultures, etc.

Health monitoring is also a valuable tool when measures have to be undertaken to solve health problems in animal colonies or when animals during experiments show signs of disease or an altered behaviour or produce unexpected or nonrepeatable results. The reliability of health monitoring investigations is dependent upon the quality of the laboratory methods used. Thus the laboratories performing health monitoring of laboratory animals ought to present or make available their standard operational procedure (SOP) of each investigation carried out and make sure that these methods and procedures are always used.

The increasing use of immunodeficient or immunocompromised animals will enhance the need to protect the animals but also bring about a demand for new diagnostic methods such as immunohistochemistry to prove the presence of infectious agents in animals not producing antibodies.

The results obtained are to a large extent depending on the sample investigated. Animals and samples must, as far as possible, be representative of the colony and means of transportation must be used that does not compromise the outcome of the investigations.

Thus, an animal is defined (or information on it's quality is reported) as far as details are given concerning species breed, sex, source, health status, etc and how that information in its turn was acquired.

Summary of discussion

There is a definite need to set standard for health monitoring in order to obtain defined animals. Currently few laboratories can provide health monitoring schemes. However methods and operational procedures vary.

GV-SOLAS has listed and published recommended methods to detect some pathogens. In the US, ILAR will publish a book with information on how diseases can affect research results. The FELASA working group on health monitoring is working to achieve recommendations, which could be widely accepted.

Health monitoring methods used were regarded as too variable, and some types of reports difficult to read. If health monitoring is practised in user units it is in most cases only limited. Most users rely on services of specialized laboratories or on breeders' reports. Transparency of all relevant information concerning animals and methods used for health monitoring (SOP:s) is vital.

While standard textbooks in laboratory animal science use diseases as an example of a variable readily appreciated by scientists, it probably applies to clinical diseases only. However, there is ample evidence that this also holds true for subclinical diseases.

The cost of health monitoring appears high, and hence there is a need to set a minimum standard. One way to define an animal could be through identification of significant organisms regarded to interfere with a certain study. The detection of significant organisms should result in due action.

Health monitoring is a specialized field, which requires expertise, trained staff and established and periodically revised methods. In order to achieve international standardization in this field reference centers are preferable. To meet these demands WHO has appointed four "WHO Collaborating Centres for Defined Laboratory Animals" (USA, Germany, USSR, Japan). Furthermore, ICLAS is currently revising its international "Reference and Monitoring System for Laboratory Animals".