Animal welfare and colony management in cancer research

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Summary

The use of animals in cancer research continues to be important for the study of tumor biology, the development and testing of new therapies, and risk assessment. The new knowledge generated from this research contributes to the health and welfare not only of human beings, but also of animals which develop cancer. However, the use of animals for cancer research is a privilege which carries with it scientific, professional, and moral obligations. The three tenets of a sound animal research program include good science, humane care, and regulatory compliance. Recognizing the complex interactions in the tumor-animal model, the investigator needs to address a wide range of issues during experimental design and implementation including animal welfare concerns, complicating factors in colony management, and compliance with laws, regulations, and policies. Therefore, both practical and philosophical considerations enjoin researchers to maintain the highest standards of animal care.

Introduction

The use of animals in cancer research continues to be important for the study of tumor biology, the development and testing of new therapies, and risk assessment. Yet, the use of animals in oncologic research is a privilege which carries with it special, and even unique, considerations. The formulation of a good animal research program integrates good science, humane care, and regulatory compliance (Figure 1). When designing an experiment, an investigator needs to address a wide range of issues to ensure that animal welfare and compliance with laws, regulations, and policies are respected. Equally important is that the investigator must appreciate a wide range of colony management issues which can affect the complex relationship between the tumor and the animal (the tumor-animal model). These considerations include quality assurance (QA) of the animals and tumor cells, environmental factors, and husbandry procedures. Recognizing that the animal plays the central role in animal research, any complicating factor which affects the animal will affect the research. Finally, biosafety concerns also need to be addressed for certain oncologic studies. Therefore, both practical and philosophical considerations enjoin researchers to maintain the highest standards of animal care.

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The purpose of this article is to provide an overview of the essential animal welfare and colony management considerations necessary for conducting animal-based cancer research. Although the principles apply across species lines, an emphasis will be placed on mice and rats since they are most frequently used in oncologic research [1]. Finally, regulatory issues discussed will be those currently found in the United States; investigators in other countries may have different legal obligations.

**Experimental design**

**Animal usage**

Attention to animal welfare begins with research planning. For both scientific and regulatory reasons, the experimental design of any project which uses animals should address five key issues [2,3]. First, there needs to be a rationale for using animals. If the experimental objectives can be reached using a non-animal system (e.g. *in vitro* biological systems, computers), then consideration should be given to these alternative methods, particularly if the animals involved would experience more than momentary pain or discomfort. Second, the appropriateness of the species selected needs to be defined. Several factors will determine which species is used including the tumor-animal model availability, scientific objectives, the investigator's experience, animal facility resources, and costs. Third, the numbers of animals to be used needs to be defended and should be the minimum number required to obtain valid results. Sample size calculations will depend upon the nature of the experiment and statistical methods used [4]. Consultation with biostatisticians on the exper-