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Cancer Research Using Induced and Spontaneous Animal Models

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Introduction

The variety of oncological malignancies is impacted by the complicated hereditary qualities and sub-atomic flagging pathways created by cancer cells collaborating with the growth microenvironment. In order to develop effective therapeutic strategies that can be used in clinical settings in the future, cancer research requires a comprehensive understanding of the disease's particularities. Important information about cells can be found in in vitro studies. However, we are unable to replicate complex pathological interactions within a living organism, so our data are limited. In contrast, experimental animal models enable in vitro analysis and yield more compelling results when used together. In current research practice, mice models are of the utmost importance for preclinical testing of novel therapeutic strategies with the ultimate objective of clinical implementation. In most cases, these models act as bridges between in vitro testing and the diverse structure of a living organism, where a pathological state can be maintained by a large number of interconnected cellular entities in a micro environment. Due to their low cost, availability, and variety of immuno competent and immuno deficient strains, mice are popular animal models for cancer research [1].

Description

External or exogenous factors, such as lifestyle and living space, and internal factors, such as genetics, interact to influence cancer incidence and progression. Due to the ease of use and accessibility of various protocols and methods, induced cancer models have attracted a lot of attention. Physical and chemical stimuli used to cause a desired disease are the focus of these studies. An animal disease model can be created by combining physical and chemical stimuli, such as light (irradiation), cancer cells, tumor tissue, and a variety of genetic constructs, such as viruses, homologous recombination, and gene editing. In addition, cell suspension injection and tumor tissue engraftment microsurgical procedures are the most common means of causing cancer. Utilizing genetic engineering to create genetically programmed cancer models is the most effective approach. Some protocols use a combination of physical and chemical factors to induce cancer in laboratory animals, depending on the particulars of the cancer [2].

On the other hand, the results may be more easily comprehensible if cancer develops on its own in a human-like organism. This is a common occurrence in large animals and provides important information about the molecular mechanisms involved in tumor development. Particularly, companion animals have a high rate of cancer disease and a very similar response to treatment to humans. The heterogeneity of the tumor mass and tumor microenvironment, resistance to therapy, and metastasis development in other organs are additional similarities between human and animal pathologies. Behavioral research has the potential to identify key factors that can influence the control process and prevention of cancer, but there is more interest in the quality of life after diagnosis. Understanding the impact of stress on cancer outcome is significantly aided by animal models that are similar to human disease evolution [3-5].

In addition to its anatomical, genetic, molecular, and biochemical similarities to humans, the mouse exhibits similar behavioral characteristics that are influenced by stress factors, emotional state, and circadian rhythms. In addition, the fact that the mouse genome contains synonyms for approximately 99 percent of human genes makes it easier to conduct systems biology research that integrates a variety of complex factors, including the environment, genetic background, and molecular changes that occur within a cell when it is infected with a disease, among others. In addition, the behavioral similarity between humans and mice is an important consideration when carrying out preclinical studies with the intention of gaining translational value for a patient. Therefore, the standard modulation of the environment (e.g., diet, housing, animal care) and the inclusion of models with similar emotional features (age and sex dependent) are key factors in maintaining a study's translational value, even if the final scope of the study is a novel oncology therapy. Similar standard circumstances are fundamental for between research center extrapolation of results, wherein social input is essential for evaluation of a helpful reaction. Nevertheless, the concept of a "controlled environment" is difficult to evaluate because of human intervention and the likelihood of results modifications in these circumstances. Behavior performance is also directly influenced by general health status. Therefore, when considering a behavioral observation, physical abnormalities, illness, immobility, and wounded mice must be ruled out. Various behavioural tests, such as the open-field test, the elevated plus maze for anxiety-like behavior, and the tail suspension test for depressive-like behavior, are currently used to evaluate stress-related conditions. The role of stress in therapeutic responses has been poorly studied using mouse animal models. When it comes to identifying immune/inflammatory aberrations and affective-like behavior during tumor growth and even after resection if survival is desired, all of these tests are useful indicators. The effects of stress on tumor angiogenesis must be taken into account, according to increasing evidence. An orthotropic mouse model of ovarian cancer, for instance, develops a more invasive disease pattern when subjected to daily cycles of immobilization. The majority of tests conducted on tumor-bearing mice focus on depressive symptoms. However, the fact that subjects can exhibit behaviors resembling obsessive-compulsive disorder is a fascinating topic.

Conclusion

New early diagnostic methods and therapeutic formulations are drawing a lot of funding for cancer research right now. However, the availability of experimental animal models that can be used to test new hypotheses prior to possible clinical implementation is essential for all of these funding opportunities. The relevance and safety of clinical trials are directly proportional to the similarities between human characteristics and cancer models. A successful preclinical model can determine rapid clinical translation of results that have an impact on the quality of life and survival of a cancer patient. These aspects have direct ethical, social, and economic effects on our health systems.

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