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COMPARISON OF EXPENDITURE OF USING EXPERIMENTAL MODELS OF CARCINOGENESIS

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Abstract

Despite significant advances in the diagnosis and treatment of oncopathology, the main epidemic indicators have a negative trend.

Based on the above, a very relevant topic is the development of experimental models of carcinogenesis. The importance of scientific work in this area is increasing because in experimental conditions it is better to test new methods, diagnostics and treatment. Thus, it becomes possible to study the peculiarities of the pathogenesis of any tumor at different stages.

The purpose of the work – to study and demonstrate the strengths and weaknesses of the main experimental models of carcinogenesis for further selection of the most appropriate.

Results The main directions of carcinogenesis modeling are presented in the article. Initially, the problem was justified. The next step is described in chronological order of using the models.

Of course, the achievements of clinical and experimental oncology played an important role in the emergence of models. Thus, the first model was the effect of physical

and chemical carcinogens on a laboratory animal. The latest achievement of experimental oncology is the use of stem cells in combination with genetic engineering.

No less important is the fact of comparing experimental models. We present the strengths and weaknesses of all these models.

Conclusions

1. To date, there are a large number of experimental models of carcinogenesis.

2. When planning a study, you need to calculate all the goals to be achieved and select the appropriate model.

3. The most effective and common model for ascites ovarian tumor is the transplantation of atypical cells to laboratory animals.

Key words: experimental models; carcinogenesis; rats

Topicality. To date, further study of the pathogenesis of oncological diseases is relevant for many countries of the world [1, 2]. This fact is associated with the frequency of diseases in terms of quantity and mortality. Unfortunately, these indicators only grow annually [3, 4, 5].

Despite significant advances in the diagnosis and treatment of oncopathology, the main epidemic indicators have a negative trend.

Based on the above, a very relevant topic is the development of experimental models of carcinogenesis. The importance of scientific work in this area is increasing because in experimental conditions it is better to test new methods, diagnosis and treatment [6, 7]. Thus, it becomes possible to study the peculiarities of the pathogenesis of any tumor at different stages.

The main problem in the development of such models is the fact of an unclear etiological factor. Therefore, it is extremely difficult in such conditions to reproduce a situation that would be close to clinical conditions [8]. The stages of the pathogenesis links may also differ in laboratory conditions, in comparison with clinical.

The purpose of the work – to study and demonstrate the strengths and weaknesses of the main experimental models of carcinogenesis for further selection of the most appropriate.

Materials and methods. Articles, monographs and dissertations on experimental oncology in open databases were selected for the work. When reviewing the literature, works were selected in which there was a detailed description of the experimental model, for the possibility of further reproduction in laboratory animals. Literature was selected according to the basic requirements of working with laboratory animals and publishing scientific data.

historical review. The first experimental models began to appear in the late nineteenth and early twentieth centuries. Models were created empirically rather than by a structured system of knowledge in experimental medicine. Only after the revolutionary methods of research at the cellular and molecular level it became possible to structure knowledge for their implementation in experimental and later in clinical medicine [9].

The essence of the first models was to collect material from a deceased patient through the cancer process, more precisely from the pathophysiological complications that he caused to the body. Subsequently, the cells were transplanted into the body of laboratory animals. At the same time, studies were conducted in changing the biological parameters of a sick laboratory animal [10].

The next step was the discovery of carcinogens. The researchers then tried to add chemical carcinogens to already transplanted cells, which affected cell mitosis. Of course, with such actions increasingly received more similar models of carcinogenesis with their clinical counterparts.

Subsequently, it was proved that carcinogenic effects have not only chemicals but also physical factors [11, 12]. That is, it has significantly expanded the tools for the reproduction of tissue neoplasms that have a high growth index.

In parallel, researchers in the field of biology began to develop and select animals that are tropical to neoplastic processes. Namely, special breeds of animals were bred in which the number of spontaneous cancers was higher than others.

After proving in experimental models Pidvysotsky VV polyetiology of carcinogenesis, many researchers have begun to combine risk factors. It is this approach in the early twentieth century and made it possible to develop experimental fundamental oncology. Pidvysotsky VV in experimental models began to work out algorithms of chemotherapy.

Two Nobel Prizes in the field of oncogenesis - in 1912 (A. Carrel) and 1926 (J. Fibeger) - made a significant contribution to the development of oncology. In the first case, cell culture models were discovered. This made it possible in subsequent generations of cells in the laboratory to subject them to mutations and produce signs and links in the metabolism of atypia.

Already in 1926, under experimental conditions, it was proved that there is a factor of biological external origin, which can also provoke the development of atypia in cells. And in 1966 the viral nature of carcinogenesis was clearly proven [13]. This fact gave a wide impetus to the development and use of viral strains in experimental modeling of atypia. Only 10 years later (1976) all viral antigens of sarcoma were studied.

Thus, after the rapid development of molecular biology, viruses began to be used to provoke atypia in monoclonal cells. The meaning of the method was to integrate the molecule of the genetic code of the virus into the DNA of the cell. Oncogenic proteins were synthesized after replication, transcription, and translation. Subsequently, they integrated and took over the basic functions of the cell with the subsequent development of atypia [14].

In 2006, this method began to be used to correct pathological conditions. That is, blocking the genetic apparatus at the DNA level. Although in parallel since 2001, it has been proven that chiral molecules also have the property of inhibition and selective carcinogenesis.

Already in 2011, the existence of the role of innate immunity in the fight against cancer was proved, through specific immunoglobulins using monoclonal cells that are grown from stem cells. Thus, we obtain in pure form and with all the pathophysiological and biochemical properties of atypical cells *in vitro*. Subsequently, these cells are transplanted into a laboratory animal [15].

Comparison of properties of basic models. To begin with, we need to compare the biological material to be studied. To date, these are laboratory animals and cell lines.

Researchers tested different species of animals. The most suitable were mice. Other laboratory animals have a number of biological systems that protect genetic material from mutations. Animals that are more similar in genetic material to humans also play an important role.

Therefore, mice have almost all the elements for their subsequent work in the laboratory. Also, this species of animals has proven itself quite well in terms of the similarity of carcinogenesis and human. The next advantage is the high reproductive capacity of the species. This leads to the fact that one can practically influence different generations in one experiment by carcinogenesis, or observe pathological changes in their subsequent generations. The next element is the significant cost-effectiveness of the method over cell populations.

However, the next step is the derivation of special breeds of mice that are tropical to oncological pathology. The first such breed was bred in 1909 by oncologist Little under the name Inbred Mouse Line (DBA). A positive element of this method is the ease of modeling inherent neoplasms for rocks. A significant negative point is the difficulty in keeping the animals themselves and maintaining the purity of the breed.

High cancer tips are A / Sn, C3H / Sn, DBA / 1, CBA / 1 (breast cancer); CBA / Lac, SZNA (liver tumors); AKR / 1, C58, DBA / 2 (leukemia); line 101 / N is used to induce skin tumors.

In models using strains of oncogenic viruses are also widely used in experimental oncology. The essence of the method can be used in two ways. The first direction is the infection of animals with a virus that causes neoplasia on its own. In addition, the animal is exposed to physical and chemical factors to achieve the goal in the experimental study. The positive point of this model is the fact of achieving the viral etiology of atypia. Thus, it is possible to test chemotherapy. At the level of the genetic code. However, the negative effect is the removal of a pure strain of the virus in other laboratory centers. This method is also extremely knowledge-intensive and expensive compared to other methods. The next negative point is the selection of frequency, type and dose of physical and chemical factors.

Another line of this method is the effect of viral agents on genetic material, as a result of which atypia will be expressed much more often than under physiological conditions. That is, the virus is embedded in the DNA of the host to inhibit, or vice versa, the activation of oncogenic triplets or control proteins. A striking example of such a tumor is DNA-containing papilloma in rabbits. After the introduction of papillomavirus in animals, warty growths of benign nature are formed. However, in the future there is a process of degeneration of a benign tumor into a malignant one. The positive aspect of this model is the high percentage of positive results in experimental conditions. Along with this, there are a number of negative points regarding modeling.

The first such problem is the cultivation of a viral agent. Another problem is the delivery and integration of the viral agent into the genetic material of experimental animals.

The next large group is the use of monoclonal cells. That is, these cells can be primary or transplantable. In the first case, cells are taken from a healthy organism, which are then subjected to enzymatic treatment to isolate atypical properties. In the case of transplanted cells, the culture in the laboratory is induced to a large number of division by mitosis. In essence, we will get daughter cells that will have more pronounced atypical properties compared to mother cells.

The mechanisms or patterns of carcinogenesis, both in the genetic and in the phylogenetic variant, are studied in these cell strains. However, each of these populations is in a special environment that actually reflects their physiological conditions.

The positive fact of using such cultures is the closest proximity of the pathological process that occurs in clinical medicine. Compared to laboratory animals, this method is the best from the standpoint of verifying the course of carcinogenesis and the retention of genetic material similar to human. In this case, we can trace at what stages there may be atypia and

the ability to metastasize a tissue to the human body. At the same time, animal models sometimes have less pronounced processes of metastasis of the same tissue.

One of the first disadvantages of cell populations is their significant economic cost. On the one hand, this cost is due to the intake of material, and on the other hand to maintain the functioning of cells in nutrients. The next negative component is the fact that there is no influence on the pathological process of neurohumoral factors present in the body. This component sometimes excludes pathogenetic links in the development of carcinogenesis.

Therefore, when analyzing the whole situation in the modeling of experimental carcinoma, many factors must be taken into account. Accordingly, the most optimal experimental model is chosen. Therefore, the most common model is cell culture transplantation with atypia in laboratory animals. This method of combination is quite optimal. The researcher essentially has a highly purified culture of atypical cells found in clinical variants prior to transplantation. In the future, there is a high probability of integration of these cells for further study of carcinogenesis. Only after histological confirmation in a group of laboratory animals of oncological pathology it becomes possible to perform clinical experimental tasks.

During the analysis we came to the following **conclusions**:

1. To date, there are a large number of experimental models of carcinogenesis.

2. When planning a study, you need to calculate all the goals to be achieved and select the appropriate model.

3. The most effective and common model for ascites ovarian tumor is the transplantation of atypical cells to laboratory animals.

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