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Design of Computer Management System for Reproductive Toxicity Tests

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Abstract: Hospital is also the most active field of modern information trend. In the process of continuous improvement of computer performance, its price is also declining. Computer has been widely used in modern medical, scientific research, teaching and management. In order to carry out the reproductive toxicity test, the computer management system can quickly collect, access, process and analyze the accurate reliability, and improve the efficiency of the test work. This paper briefly introduces what is the reproductive toxicity test. At the same time, the demand of computer management system for reproductive toxicity test is raised. The experimental design of reproductive toxicity test is carried out, and the design theory of computer management system is summarized.

1. Introduction

In the process of continuous development and integration of computer technology, communication technology and network technology in China, information technology has been widely used in various fields in the world [1-3]. Hospitals belong to a relatively special service industry, and their management methods are quite different, and in the process of management, they will use a large number of advanced instruments and equipment, and deal with a large number of business every day, thus generating a large amount of information. Therefore, each hospital requires a set of hospital information system to meet the needs of the hospital to collect and manage information [4-7]. Improving hospital management level, improving the quality of medical services and promoting the pace of clinical medical research are the further improvement of hospital internal competitiveness [8-11]. In the process of drug development, the aim of reproductive toxicity research is to investigate the effects of the subjects on reproductive function and development of mammals through animal experiments, and to predict the possible adverse effects on reproductive function of the parents such as germ cells, pregnancy, childbirth and breast-feeding, as well as on embryo-fetal development and postnatal development of the offspring [12-15]. The purpose of exploring reproductive toxicity by computer management system is to reveal any effect of one or more active substances on reproductive function of mammals. It is an important content of non-clinical safety evaluation of drugs.

2. Connotation of Computer Management System for Reproductive Toxicity Tests

2.1. Meaning of Reproductive Toxicity Test

The aim of reproductive toxicity research is to reveal any effect of one or more active substances on reproductive function of mammals, which is an important content of non-clinical safety evaluation of drugs. In the process of drug development, the aim of reproductive toxicity research is to investigate the effects of the subjects on the reproductive function and development of mammals through animal experiments, and to predict the possible adverse effects on reproductive function of the parents, such as germ cells, pregnancy, childbirth and breast-feeding, as well as on embryo-fetal development and postnatal development of the offspring.

2.2 Computer Management System for Reproductive Toxicity Tests

Computer Management System for Reproductive Toxicity Tests: The main window includes nine main menus: documents, data recorders, printing original records, printing logs, statistical analysis, data query, modification of data, port settings and assistance; grouping by computer automatic grouping and manual grouping before and after mating; weighing and feeding can be determined according to the requirements of test specifications or special requirements of test. Frequency of consumption detection; self-contained database contains most abnormal behavior signs of experimental animals. The database of appearance, visceral and skeletal deformity examination items coexists with the names of common deformities or variations of more than 800 experimental animals; two ways are used to solve the omission or misselection of the objects caused by the complex and tedious test procedures: data statistics: nest-based analysis method; stage test results can be analyzed at any time during the test process. As a result, the changing trend of toxicity was judged, and a multi-level safety code was set up to ensure that all kinds of researchers could obtain the data they should know in time. Help module can provide guidance information for system operation and test operation at any time.

2.3 Requirements of Computer Management System for Reproductive Toxicity Tests

The main purpose of creating a management system is to solve the problems in the current system and meet the needs of reproductive toxicity experiments. In the process of system design, first of all, it is necessary to determine the objectives and problems to be solved, and the needs of users. Users of the system focus on whether the system functions can be helpful to the experimental process and whether the operation is simple. And the system is not simply required to provide add, delete, modify and query functions, but to specific application and each experimental step to achieve design; maintenance personnel needs. System maintenance support mainly includes data backup, recovery and modification of erroneous data. Maintenance and support of information system in the use process is the key content of whether the system can run normally or not, and it belongs to online transaction system. Because the system is not easy to operate for a long time, if the system is not easy to maintain, it will increase the burden of maintenance personnel. Therefore, in the process of system design and development, this project should be integrated into the product development process.

3. Reproductive Toxicity Test Operation

3.1. Explore the Purpose of Reproductive Toxicity Test

Reproductive toxicity needs to investigate the effects of drug administration on adult and developmental stages from conception to puberty sexual maturity, and determine the rapid and delayed effects of drug administration. The observation should last a complete life cycle, that is, the time period from one generation to the next generation. Life cycle is usually divided into the following stages: A from pre-mating to conception (adult male and female reproductive function, gamete development and maturity, mating behavior, fertilization); B from conception to implantation (adult female reproductive function, pre-implantation development, implantation); C from implantation to hard palate closure (adult female reproductive function, embryonic development, main organ formation); D from hard palate closure; To terminate pregnancy (adult female reproductive function, fetal development and growth, organ development and growth); E from birth to weaning (adult female reproductive function, adaptability of young to extrauterine life, pre-weaning development and growth); F from weaning to sexual maturity (development and growth after weaning, adaptability of independent life, reaching sexual maturity).

3.2 Suitable Age of Female and Male Animals in Reproductive Tests

Adult animals, young and sexually mature at mating time, should usually be selected. Females need to be unproductive. Specifically, in the first stage of reproductive toxicity test, in order to evaluate the effect of the tested substance on spermatogenesis, it is necessary to administer the drug throughout the spermatogenesis period (including division, growth, development and maturation of male germ cells); in order to evaluate the effects of the tested substance on mating and fertilization of male animals, male animals should continuously administer the drug from sexual maturity to the end of mating. Therefore, in the first stage of reproductive toxicity test, the age of male rats should be more than 100 days during mating. At this time, the male rats have just reached the reproductive age, and the female rats need to be sexually mature; the female rats need to be more than 100 days old when they are given medicine. For example, if male rats were given 63 days before mating, they could choose males born (> 37 days); males born (> 72 days) for 28 days; and males born (> 86 days) for 14 days. That is to say, no matter when the drug is administered, the male animal must reach sexual maturity at least when mating, and the practical experience shows that the male animal should reach physical maturity. In the second and third stages of reproductive toxicity test, female and male rats need to mature sexually, and the age of female and male rats should be more than 100 days during mating. In the second stage of rabbit reproductive toxicity test, female and male rabbits need sexual maturation. The best age of female rabbit is (> 5-6 months) and its body weight is more than 4.0 kg. The best age of male rabbit is (> 6-7 months), and its body weight is more than 3.5 kg. However, according to the actual scientific research experience in China, New Zealand breeds of male rabbits more than 3.0 kg, female rabbits more than 2.5 kg, can be mated.

3.3 Overall Consideration of Administration

The route of administration should be similar to the clinical route. The frequency of administration is usually once a day. At least three dose groups are set up to determine the dose-response relationship. The dose similar to the repeated toxicity study can be selected. It is generally expected that some mild maternal toxicity should occur at high doses. The main factors limiting the high dosage of reproductive toxicity test include: slowing down the growth of body mass; accelerating the growth of body mass, especially when the change is related to the imbalance

of homeostasis mechanism in vivo; special target organ toxicity; hematological and clinical biochemical tests; enlarged pharmacological effects, which may not necessarily have such effects. The physical and chemical properties or dosage forms of the tested substances, as well as the route of administration, may limit the actual dosage. In most cases, 1g/(kg.d) is the maximum dosage limit. Kinetic studies are helpful to determine systemic exposure to high doses of low toxic compounds. If the increase of dose does not lead to the increase of plasma or tissue concentration, the significance of dose increase is very small. In the preliminary experiment, the mortality of Embryo-foetus increased significantly.

4. Design of Computer Management System

4.1 Network Architecture Design

Based on the usage and economy, star-shaped topology is generally used. If the use process requires large-scale, repeaters and servers can be added. Computer network architecture can be described from three aspects: network architecture, network organization and network configuration. Network organization describes computer network from the physical structure of network and the realization of network. Network configuration describes the layout of computer network from the aspect of network application. Hardware, software and communication lines describe computer network and network architecture. Describe the structure of computer network from the function. Network protocols are indispensable to computer networks. A complete computer network needs a complex set of protocols. The best way to organize complex computer network protocols is hierarchical model. The hierarchical model of computer network and the set of protocols of each layer are defined as the architecture of computer network.

4.2 System Function Module Design

The central problem of computer management system is how to realize module partition and definition, so as to improve module independence. Generally, in the process of system module design, coupling and cohesion index are used to divide the rationality of modules. In the specific design process, not only coupling and cohesion issues should be considered comprehensively, but also function combination and hierarchical structure should be considered. Its division principle is: first, high cohesion. Processing function is required to divide the modules, because it has less relevant factors, is easy to understand, and has strong independence, so the design is simple. Second, low coupling. Reduce the data transmission between modules, so as to improve the independence of modules. Secondly, we need to design the hierarchical structure diagram of functional modules. Its main purpose is to realize the design of data flow chart, module partition and data function matrix diagram, divide the system processing flow into three parts: input and output, and then use the system as a module to realize the decomposition module from top to bottom, until the structure diagram is satisfied. In general, the hierarchical structure of functional modules is also analyzed by using the structured analysis method which regards business as the center.

4.3 Database Design

The database belongs to the data collection organized and stored in the corresponding structure. It is the basis of modern management and automated production of database and network, and it can realize information integration. The requirement of computer management system for reproductive toxicity test for database is to have client or server structure, so as to make full use of the overall resources of computer and reduce the amount of data transmitted by network.That is, the proportion

of importance of each plate is shown in Figure 1.

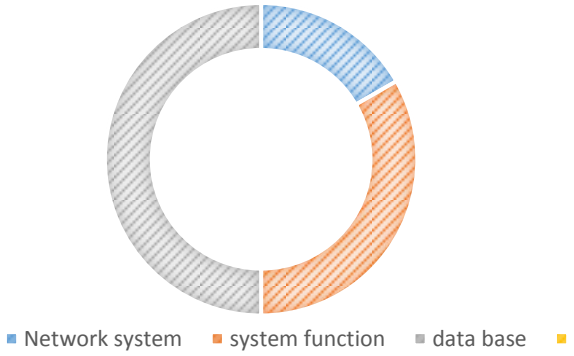

Figure 1. Proportion of design plate

5. Conclusion

In a word, strengthening the construction of computer network information management system can effectively improve the quality of laboratory management, and also can improve the reliability and authenticity of information and ensure the stable operation of network information system in the experimental process. At present, the computer management system of reproductive toxicity test is not perfect, and it is impossible to clarify the action mechanism of compounds. All these need to be further explored by reproductive toxicologists and pharmacologists. However, with the development of GLP laboratory and the compilation of new guidelines for reproductive toxicity test, more progress will be made in this field in China.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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