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Current Situation and Solutions of Laboratory Safety Management in Medical Colleges and Universities

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Abstract: ***There are teaching laboratories and research laboratories in the laboratory, and their safety guarantee is related to the overall development of the school. Therefore, analyzing the current situation of laboratory safety work in medical colleges and universities, grasping the safety hazards such as incomplete safety management systems, daily supervision, and non-standard waste disposal in medical college laboratories, and proposing corresponding countermeasures and suggestions, can promote the scientific, standardized, and standardized safety management of medical college laboratories, and improve and improve the level of laboratory safety management.***

Keywords: Medical colleges and universities; laboratory; security management.

1. INTRODUCTION

1.1 Safety hazards of biological/chemical reagents

The majority of students entering the laboratory are students with medical backgrounds, but their understanding of chemical reagents is not comprehensive. Some students have insufficient understanding of toxic, harmful, volatile, or corrosive reagents, making it difficult to classify and store them with ordinary biochemical reagents. Common safety hazards in the laboratory include: (1) improper storage of reagents, resulting in toxic, harmful Flammable and explosive chemical reagents are placed in the same experimental cabinet as ordinary reagents; (2) The weak self-protection awareness during the experiment is mainly reflected in conducting the experiment directly without wearing protective gloves and experimental clothing; Not conducting experiments on toxic and harmful reagents in biosafety cabinets; (3) Experimental personnel wearing experimental gloves and pressing the elevator button can be seen everywhere.

1.2 Safety hazards of experimental instruments and equipment

The commonly used laboratory instruments and equipment in medical colleges mainly include fully automatic biochemical analyzers, flow cytometry, high-performance liquid chromatography, mass spectrometry, ultraviolet spectrophotometer, amino acid analyzers, overspeed centrifuges, ultra-low temperature refrigerators, etc. There are various types of instruments and equipment, and their working principles, maintenance, environmental and condition requirements are different, which brings great difficulty to the safety management of instruments and equipment. For example, if the placement of an overspeed centrifuge is unbalanced or the operation is not standardized, mechanical failure or damage to the centrifuge sample may occur. If the centrifuge sample is toxic and harmful, it may leak, causing suffocation or poisoning of personnel. (2) Heating equipment, such as a drying oven, muffle furnace, electric heating sleeve, bath pot, thermal rotator, etc., should be manned or regularly inspected during use; The drying oven cannot bake flammable and explosive chemicals, plastic products, etc., and flammable materials, gas cylinders, etc. cannot be placed around these instruments and equipment. (3) Correct placement of gas and gas cylinders, fixation and illumination of pipelines Clear identification; Close the main valve of the gas cylinder in a timely manner after use and conduct frequent leak detection. (4) Pressure vessels, steam generators, and other high-temperature and high-pressure thermal energy equipment are special equipment that must have clear product qualification certificates, annual inspection certificates, usage certificates, etc. Operators must hold certificates to work. (5) The ultraviolet lamp of the ultra clean table can burn the eyes and skin of the experimental personnel.

1.3 Safety hazards of laboratory waste

Medical laboratory waste includes waste liquid, empty bottles, solid waste reagents, animal carcasses, and medical waste. Medical waste is divided into infectious, pharmaceutical, pathological, chemical, and injurious waste [1]. (1) Due to the weak safety awareness of students, phenomena such as non classified recycling or even non recycling of experimental waste liquid can be seen everywhere; (2) There is a widespread phenomenon of disposable consumables contaminated with blood or infectious waste being discarded at will; (3) Untreated culture media often pours into the sewer and other situations occur. The incorrect handling of laboratory waste not only pollutes the environment, but also increases the possibility of pathogen infection.

1.4 Safety of Laboratory Test Samples

Due to the diverse types of laboratory experimental samples, such as solid, liquid, or gaseous samples, microorganisms, biological tissues, metals, etc., improper storage or use can easily lead to cross contamination, fire, or even explosion, which can cause irreversible losses [2].

2. COUNTERMEASURES AND MEASURES FOR LABORATORY SAFETY MANAGEMENT

2.1 Laboratory Safety Management System

A safety management responsibility system consisting of three levels: schools, colleges, and laboratories should be established. To ensure the safe and normal operation of the laboratory, a unique and effective laboratory safety management system has been established through active exploration and extensive practice. Mainly including: ① Developing a laboratory safety self inspection system. Normalize laboratory safety inspections and regularly conduct safety inspections on water, electricity, doors and windows, instruments and equipment, chemical warehouses, etc. The number of self inspections per month shall not be less than 4, and records shall be kept after each inspection. Laboratory Safety Self Inspection Ledger, promptly report any issues found and eliminate safety issues Hidden danger. ② Establish various laboratory usage record books, such as the "Laboratory Usage Record Book", "Laboratory Instrument Usage Record Book", and "Holiday Laboratory Usage Safety Responsibility Letter", to record the usage of laboratory instruments and equipment. Each use should be signed by the user, ensuring that safety responsibilities are assigned to each individual Establish a laboratory safety officer system. Set up a safety officer for each laboratory, warehouse, and instrument room, and post the name and contact phone number of the safety officer at the entrance. The safety officer needs to understand the storage status of instruments, reagents, and other items in the responsible room, and create a list of items. The phone number needs to be clear 24 hours a day. If there is an emergency situation such as fire or flooding, immediately contact the laboratory safety officer and carry out corresponding first aid measures according to the laboratory inventory to avoid delay in disaster relief due to unclear storage of chemicals and instruments in the laboratory, resulting in serious personal and property losses.

2.2 Improve rules and regulations, implement safety responsibilities

The safety issues of university laboratories are the focus and difficulty of school safety management. Both students' internships and teachers' scientific research activities must be completed in the laboratory, with a high frequency of use and relatively complex personnel entry and exit. Therefore, higher medical colleges should start from reality, enhance safety awareness, strictly implement safety responsibilities, and formulate a set of safety management systems and regulations in strict accordance with safety operating procedures, which should be posted and hung in prominent positions in the laboratory, And it is required that all students, teachers, and other operators who enter the laboratory must participate in laboratory safety knowledge training and relevant instrument and equipment usage training before entering the laboratory. Practice has proven that if the system is not standardized and supervision is not in place, safety accidents will occur. Therefore, it is necessary to implement the improvement of safety management system and strengthening supervision in specific work, assign laboratory safety responsibility to specific responsible persons, who are responsible for the safety of drugs, instruments, and experimental operations, implement safety inspection work, strictly follow regulations, and avoid safety accidents.

2.3 Configuration of commonly used safety emergency protection facilities in laboratories

The commonly used safety emergency protection facilities in laboratories include medical kits, eye washing devices, emergency sprinkler devices, etc. Medical alcohol, iodophor, hydrogen peroxide, medical cotton swab, band aid, medical gloves, gas mask, etc. shall be provided in the medical box, and a list of items shall be made and pasted on the surface of the medical box. Place the medical kit in the designated location in the laboratory. In case of an emergency, use the items in the kit as soon as possible to provide initial first aid to the injured person to avoid causing greater harm. Each floor needs to be equipped with a spray eye wash device. In the event of a safety accident, the injured person should be immediately flushed before proceeding with the next step of treatment to minimize the degree of injury. In addition, emergency training should also be provided for laboratory technicians to scientifically and promptly handle sudden accidents in the laboratory, minimizing the occurrence of casualties.

2.4 Management of laboratory chemical reagents, test samples, and biosafety

Laboratory chemical reagent management. (1) Must be purchased through qualified and legitimate commercial channels; (2) It should be stored in an explosion-proof and ventilated reagent cabinet; (3) Reagents that are unstable and prone to decomposition should be stored in dark and opaque bottles in a dark and light resistant manner; (4) Reagents that are radioactive, corrosive, highly toxic, flammable, and explosive should be stored in specially designed explosion-proof cabinets or drug cabinets, and should be kept by dedicated personnel at different levels; (5) Reagents and drugs that generally require low-temperature storage should be stored in a refrigerator; (6) The reagent solution prepared by the laboratory personnel should indicate the name, time, storage method, etc; (7) The remaining reagents should be promptly recovered.

Laboratory testing sample management. (1) Determine the type of experimental test sample; (2) Does the laboratory have conditions for safe testing and storage; (3) Indicate the detailed information of the test sample, generally including name, specification, nature, status, etc; (4) Perform registration testing and place it in the repository.

Laboratory biosafety management. (1) Implement the laboratory biosafety management system, clarify job responsibilities, and establish an effective laboratory biosafety supervision mechanism; (2) Biosafety cabinets require corresponding biosafety levels.(3) There is a record ledger for the use of biosafety management, which generally includes the name, nature, purchase,

preservation, use, breeding, dissection, destruction, location, and ethical review of the organism; (4) For biological experimental waste, yellow specialized plastic bags need to be used for classification, collection, packaging, and labeling. Waste disposal can be traced back to its source, and waste cannot be mixed into household waste bins.

2.5 Strengthen safety education for teachers and students

Laboratory safety education and training are the most effective methods to establish laboratory safety awareness, standardize experimental operations, and enhance emergency response capabilities. Laboratory safety education should be incorporated into the laboratory safety work system, and carefully organized based on the characteristics of each laboratory. The introduction of a laboratory safety examination system requires each staff member entering the laboratory to pass the laboratory safety theory and operation exams before entering. Each additional operation must undergo an assessment, and only after passing the assessment can they enter the practical operation stage. Stick the operating specifications of the instrument next to it and operate according to regulations. If there are any non-standard operations, the experiment will be suspended and entry into the laboratory will not be allowed for a certain period of time. Include safety education lectures as regular training content, invite relevant professionals from the fire department and school security department as keynote speakers, and set up interactive sessions for the lectures. Teachers and students are invited to share their experiences and lessons learned in daily experiments. Through the above measures, the safety awareness and safety operation level of laboratory staff can be greatly improved.

2.6 Increase funding for laboratories and improve safety protection facilities

Based on our own actual situation, we will increase investment in laboratory biosafety construction, establish a special infrastructure maintenance fund, promptly investigate and repair safety hazards caused by water and electricity renovation and aging during the laboratory renovation process, and arrange for safety inspectors to inspect and record on a monthly basis. Improve the hardware protection facilities of the laboratory, such as ventilation equipment, sprinkler equipment, fire exits, fire-fighting equipment, and protective equipment, to effectively ensure the development of safety construction work and improve the level of laboratory safety management. Build laboratory safety warning devices to enable managers to receive alarm information at the early stages of accidents, And can handle it quickly, effectively preventing safety accidents related to water, electricity, fire, and gas, ensuring the personal safety of personnel operating in the laboratory. Establish a special fund for the maintenance of large-scale instruments and equipment, regularly maintain and maintain laboratory large-scale instruments and equipment, and maximize the good operation of instruments and equipment. Detect and repair problematic facilities.

3. CONCLUSION

In summary, there is a long way to go to improve the standardized management of laboratories. We should establish a sound laboratory management system based on our own actual situation and development needs in order to ensure the smooth progress of experiments and promote the faster and better development of laboratory safety work.

REFERENCES

[1] Cui Changhuan, Li Jun, Chen Yanjun, et al Construction of Laboratory Safety System in Higher Medical Colleges [J] Basic Medical Education, 2019, 21 (5):370-374.
[2] Hou Xiaoxia, Wang Chunyan, Yu Qing, etc Research and Exploration on Safety Management of Key Chemical Laboratories [J] Laboratory Research and Exploration, 2019, 38(3): 269-272.
[3] Yang Xue, Liu Deming, Ding Ruoying The problems and countermeasures of fire safety management in university laboratories [J] Laboratory Research and Exploration, 2018, 37(11): 307-310.
[4] Xu Jialing, Chen Yunfeng, Long Zhao, et al Security Management of Centrifuges in Large Experimental Equipment Sharing Platform [J] Laboratory Science, 2019, 22 (3): 190-192
[5] Shao Huayue, Meng Qingwen On the Safety and Management of Chemical Laboratories in Universities: Taking Chaoyang Normal College as an Example [J] Journal of Liaoning Teachers' College, 2019, 21 (1): 46-48