BIOCHEMISTRY LABORATORY MANAGEMENT

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Abstract: High-quality biochemical testing is essential for proper diagnosis and management of patients with different diseases. The main topics of managing biochemistry laboratory are acquisition, inventory and tracking, storage in stockrooms and laboratories, recycling of chemicals and laboratory materials and transfer/transport of chemicals. Managing the laboratory chemical inventory is one of the most important and critical process of lab chemical inventory; management focuses specifically on controlling the activities involved with chemicals and biochemical kits used.Most biochemical work is performed in purpose-built laboratory rooms whose ergonomic design is important for efficient work and management in the laboratory. Biochemistry laboratories are most effectively designed with large centrally site areas for housing either heavy general equipment or stores, wash-up and supportive administrative facilities. Specialized laboratories for weighing, spectrophotometry or various forms of chromatography may also be found in larger departments. All laboratories are potentially dangerous places to work and therefore eating, drinking, smoking care forbidden.Despite even the most stringent attention to good safety practice, accidents occur and it is very important to have available qualified first-aiders to deal with emergencies. The disposal of unused chemicals, radioactive isotopes and infected material should be subject to clear procedural guidelines and detailed records kept of such disposals.

Keywords: management, biochemistry laboratory, chemicals, procedural guidelines, inventory.

Introduction

The laboratory plays a central role in health care. The purpose of the laboratory is to provide physicians and other health care professionals with information to: detect disease or predisposition to disease, confirm or reject a diagnosis, establish prognosis, guide patient management and monitoring efficacy of therapy (Richard A. McPherson, 2011). High-quality biochemical testing is essential for proper diagnosis and management of patients with different diseases. Research within Clinical Biochemistry is at a crossroads. Our specialty is distinctive in many ways: it occupies a unique position in medicine at the interface between laboratory testing and clinical diagnosis; we have a closer understanding of the concepts and limitations of diagnostic testing than most others in medicine; we have a history of being at the forefront of using information technology within healthcare; we are also probably a self-selected group whose abilities include being able to rigorously evaluate complex sets of data and then to draw conclusions (Kilpatrick ES., 2010). The main topics of managing biochemistry laboratory are acquisition, inventory and tracking, storage in stockrooms and laboratories, recycling of chemicals and laboratory materials and transfer/transport of chemicals.

Virtually all experiments conducted in a biochemistry laboratory present a potential risk to the wellbeing of the investigator. In planning any experiment it is essential that careful thought be given to all aspects of safety before the experimental design is finalized. Health hazards come from a variety of sources.

Potential risk

Chemical. All chemicals are to varying extents, capable to causing damage to the body. First, they may be irritants and cause a short-term effect on exposure. Secondly, they may be corrosive and cause severe and often irreversible damage to the skin. Thirdly, they may be toxic once they have gained access to the body by ingestion, inhalation or absorption across the skin. The risks associated with chemicals must be well understood prior to their use in an experiment. The risk of toxic effects is related to both the extent of exposure and the

inherent toxicity of a chemical. Extent of exposure is determined by the dose, the duration and frequency of exposure, and the route of exposure. The duration and frequency of exposure are also critical factors in determining whether a chemical will produce harmful effects. A single exposure to some chemicals is sufficient to produce an adverse health effect; for other chemicals repeated exposure is required to produce toxic effects. For most substances, the route of exposure (through the skin, the eyes, the gastrointestinal tract, or the respiratory tract) is also an important consideration in risk assessment. All laboratory personnel must understand certain basic principles of toxicology and recognize the major classes of toxic and corrosive chemicals.

Biological. Examples include human body fluids that may carry infections such as the human immunodeficiency (HIV), laboratory animals that may cause allergic reactions or transmit certain diseases, pathogenic animal, pathogenic and potential pathogenic bacteria and fungal species, cell tissue, and all microorganisms including genetically engineered forms (Wilson K., 2010). Molecular methods are being developed and incorporated by microbiology laboratories into resistance detection algorithms for rapid, sensitive assessment of carriage states of epidemiologically and clinically important pathogens, often directly from clinical specimens (saliva, pharyngeal excreta, sputum, urine, fecal, specimens) (Jenkins SG., 2012).

Electrical. The electrocution risks of electrically powered instruments, tools, and other equipment are almost eliminated by taking reasonable precautions, and the presence of electrically powered equipment in the laboratory need not pose a significant risk.

General laboratory. Solutions of chemicals are often transferred in syringes, which for many uses are fitted with sharp needles. The risk of inadvertent injection is significant, and vigilance is required to avoid an injury. Use special care when handling solutions of chemicals in syringes with needles. When accompanied by a cap, syringe needles should be placed onto syringes with the cap in place and remain capped until use.

Flammability, explosively, and reactivity. In addition to the hazards due to the toxic effects of chemicals, hazards due to flammability, explosivity, and reactivity need to be considered in risk assessment. Flammable substances, those that readily catch fire and burn in air may be solid, liquid, or gaseous. The most common fire hazard in the laboratory is a flammable liquid or the vapor produced from such a liquid. An additional hazard is that a compound cans enflame so rapidly that it produces an explosion. For a fire to occur, three conditions must exist simultaneously: an atmosphere containing oxygen, usually air; a fuel, such as a concentration of flammable gas or vapor that is within the flammable limits of the substance; and a source of ignition. When the vapors of a flammable liquid cannot always be controlled, strict control of ignition sources is the principal approach to reduce the risk of flammability. Water-reactive materials are those that react violently with water. Alkali metals (e.g., lithium, sodium, and potassium), many organometallic compounds, and some hydrides react with water to produce heat and flammable hydrogen gas, which ignites or combines explosively with atmospheric oxygen. Some anhydrous metal halides (e.g., aluminum bromide), oxides (e.g., calcium oxide), and nonmetal oxides (e.g., sulfur trioxide), and halides (e.g., phosphorus pentachloride) react exothermically with water, resulting in a violent reaction if there is insufficient coolant water to dissipate the heat produced.

Acquisition

Each person has an important role to play in a chemical's life cycle at an institution, and each one of them should be aware that the wise management of that life cycle not only minimizes risks to humans and to the environment but also decreases costs.

Traditionally, chemists have chosen reagents and materials to meet scientific criteria without always giving careful consideration to waste minimization or environmental objectives. In synthetic procedures, overall yield and purity of the desired product are important factors, because better yield implies lower cost.

Authority to place orders for chemicals may be centralized in one purchasing office or may be dispersed to varying degrees throughout the institution. The advent of highly computerized purchasing systems, and even online ordering, has made it feasible to allow ordering at the departmental or research group level. Some institutions include in their annual contracts with suppliers a requirement to report on a monthly, a quarterly, or an annual basis the quantity of each type of chemical purchased and the location to which it was delivered. This information can be helpful in preparing the various annual reports on chemical use (The Committee of Prudent Practices in the Laboratory, 2011).

Deliveries of chemicals should be confined to areas that are equipped to handle them, usually a loading dock, receiving room, or laboratory. Chemical deliveries should not be made to departmental offices because, in general, offices are unlikely to be equipped to receive these packages.

Inventory and tracking

Prudent management of chemicals in any laboratory is greatly facilitated by keeping an accurate inventory of the chemicals stored. An inventory is a record (usually a database) that lists the chemicals in the laboratory, along with information essential for their proper management. Chemical inventories are also a vital tool, and in some cases are required, for maintaining regulatory compliance. A well-managed inventory system promotes economical use of chemicals by making it possible to determine immediately what chemicals are on hand. An inventory is not limited to materials obtained from commercial sources but includes chemicals synthesized in a laboratory. Chemical inventory challenges have not changed since the first use of index card files. The initial challenge is ensuring that every laboratory chemical gets entered into the inventory. This task often requires the concerted effort of many staff members. The second challenge is keeping the inventory current. Meeting this challenge usually requires designating one or more responsible individuals to enter new materials into the system; these individuals are the only personnel who should have write/edit access to the inventory. Facility procedures must make sure that notice of all new materials is presented to these designated individuals for entry into the inventory. A third challenge is making sure that consumed chemicals, that is, empty containers, are removed from the active inventory.

Conclusion

Despite even the most stringent attention to good safety practice, accidents occur and it is very important to have available qualified first-aiders to deal with emergencies. The disposal of unused chemicals, radioactive isotopes and infected material should be subject to clear procedural guidelines and detailed records kept of such disposals.

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