



The importance of biosafety in pathological anatomy laboratories¹

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CYNTIA SOUSALENCAR

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SUMMARY

The concept of biosafety and biosafety has been increasingly widespread and valued as the understanding of the professional's responsibility, involved in activities that manipulate biological, chemical, physical and radioactive agents, is not limited only to actions to prevent risks arising from their specific activity, but also of all the people who, directly or indirectly, participate in that activity. In pathological anatomy laboratories, it is very important that professionals understand the distinction between these two terms and put them into practice for greater safety. It was observed, in general, that the existing legislation in force in our country is not very specific for laboratories that work with pathological anatomy (biopsies and cytology). When the focus is on biosafety, in addition to the normal precautions of good laboratory practices, specific procedures are necessary to minimize the risks of personal accidents and environmental contamination. It is up to our country to implement appropriate measures for professionals who deal with histotechnology, offering them legal recognition through qualification courses for technicians. Likewise, it is up to all managers involved in the health sector to guide their professionals regarding awareness of the daily practice of all aspects involved with biosafety and biosafety.

Key words: Biosafety. Laboratories. Pathologic anatomy. Security. Contamination.

ABSTRACT

The concept of biosecurity and biosafety has been increasingly widespread and valued as the understanding of the professional's responsibility, involved in activities that manipulate biological, chemical, physical and radioactive agents, is not limited only to actions to prevent risks derived from its specific activity, but also of all the people who, directly or indirectly, participate in that activity. In pathological anatomy laboratories, it is very important that professionals understand the distinction between these two terms and put them into practice for greater safety. It was observed, in general, that the existing legislation in force in our country is not very specific for laboratories that work with pathological anatomy (biopsies and cytology). When the focus is on biosafety, in addition to the normal care of good laboratory practices, specific procedures are required to minimize the risk of personal accidents and environmental contamination. It is up to our country to implement appropriate measures for professionals who deal with histotechnology, offering them legal recognition through qualification courses for technicians. Likewise, it is up to all managers involved in the health area to guide their professionals regarding the awareness of the daily practice of all aspects involved with biosecurity and biosafety.

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1. INTRODUCTION

Professional scientists perform a wide range of tasks in various environments. Because of this, they often face unidentifiable risks. Some issues related to the safety of these scientists need immediate attention. For example, they may transport, store or handle chemical materials. Professionals can become aggressive to the point of death if safety standards are not considered when operating equipment. Many different pieces of equipment can pose a serious threat to personal safety if proper standards are not followed. To maintain and improve health, employees must work in hygienic and respectful conditions.

Working cleanly with quality processes can greatly benefit this organization, discipline and employee safety. This piece considers the need to consider the biosecurity of healthcare professionals at all times. Those involved must always take precautions to avoid possible future health consequences.

Public health is the science and art of preventing disease, improving physical and mental health, and improving overall efficiency by providing medical care in organized communities through efforts to clean the environment, control infections in the community, organize medical and paramedical professionals to early diagnosis and preventive treatment, improve public social structures that guarantee each person in the community an adequate standard of living to maintain health and determine which environments pose risks to health and quality of life. Today, public health increasingly recognizes specific objectives with specific outcomes related to the biological, physical and social environments that translate into threats to health and quality of life.

They should also always consider the importance of this issue when thinking about public health. This is due to the presence of formaldehyde in almost every aspect of life. Biosafety legislation requires specific safety standards. This is because even small changes to daily routines can be vital.

Over the years, small discussions about biosafety conditions have arisen from the importance and relevance of emerging and unpredictable infectious diseases among laboratory workers. These diseases begin in the laboratory with exposure to volatile substances such as formaldehyde. This causes long-term relevance and importance of this issue, as it affects the health of field workers. People need to understand their professional responsibility in relation to improving work environments and intervening in worker health. This study shows how traditional laboratory safety standards emphasize standard work practices, physical spaces, and containment equipment. It must prove that administrative controls in the workplace minimize the risk of environmental contamination and minimize the possibility of injury or infection to workers.

2. BIBLIOGRAPHIC REVIEW

two Biosafety refers to the procedure and methods used to prevent the presence of any biological risks in a given environment. This included preventing any physical risks, such as ergonomics, chemical and physical stresses. In industries, hospitals, blood centers and universities, for example, biosafety is important because modern technology may not be present. People think of this aspect of safety as safety engineering, occupational medicine, industrial hygiene and infections (PENNA et al., 2020).



The 1970s saw the creation of biosecurity. After a meeting in California, the scientific community met to discuss genetic engineering and its consequences for society. This was the first time that applied research ethics became a formal part of scientific discourse. Over time, biosecurity has changed as the word itself has evolved. The World Health Organization focused its attention on workers' health in the 1970s. This was due to the increased risk of working with pathogens in the workplace (TEIXEIRA; VALLE, 2010).

These practices are now referred to as preventative measures for working with human pathogens. The WHO added some side effects of working with deadly pathogens, such as radioactive, physical, chemical, and ergonomic risks, to its definition of biosafety in the 1980s. Then, in the 1990s, the definition of safety was completely changed when the WHO added these peripheral risks. Biosafety programs require consideration of ethical, environmental, animal and genetic issues. These topics appear in seminars held at the Pasteur Institute in Paris (TEIXEIRA; VALLE, 2010). Another seminar has a title that says that research, production and service provision activities must consider environmental and human health risks. This idea appears in the occupational environment when people learn the fundamentals of safe handling of biological materials. This vision revolves around creating genetically altered species, rather than focusing attention on occupational environments and environmental quality. As part of their courses, students learn about safe working conditions in universities, hospitals, blood banks and public health laboratories in Brazil (TEIXEIRA; VALLE, 2010). According to Hirata and Filho (2002), this aspect of biosafety involves the prevention of accidents in the workplace. Many people consider biosecurity to be focused on occupational safety rather than recombinant DNA technology. These people believe that biosecurity focuses on eliminating traditional risks such as injury and death rather than dealing with recombinant DNA technologies. People always look at traditional genetic engineering processes and risks when learning about biosafety. This is demonstrated by the definitions currently in force, which focus on different biosafety methods. Including questions about creating secure representations of biosafety in academic discussions would help create broader awareness of its importance. This would also help to reach greater agreement on what biosafety means and how it should be implemented (HIRATA; FILHO, 2002).

Employee safety and security is constantly being raised onto the professional business agenda. By implementing Occupational Health and Safety actions in their organizations, companies can reduce the chance of their employees being harmed. This can increase workers' self-esteem, which can lead to increased productivity and competitiveness.

2.1 PATHOLOGICAL ANATOMY

For Penna et al., (2020) pathologists are specialized in diagnosing diseases based on the examination of cells and tissues. They also screen tissue samples for specific diseases. A specialist doctor specialized in Pathological Anatomy is a pathologist. Along with the doctor, a doctor specializing in Anatomy Pathological can perform military intelligence methods such as histochemistry and immunohistochemistry. This specialist can also sign reports, declare frozen biopsy techniques, perform necropsies and process histopathological samples.

Medical science benefits from the contributions of pathologists. Some work in the autopsy room examining the natural progression of diseases. Many work in diagnostic surgical pathology, studying symptoms of traditional diseases, as well as Cytopathology and Pathobiology. They also fill out reports



and educate medical professionals through immunological techniques and test results (PENNA et al., 2020).

According to ANVISA (RDC nº 50), the pathological anatomy laboratory is a diagnostic support area responsible for developing the following procedures:

- ✓ Receive and record analytical material (sites, smears, fluids, secretions and cadavers);
- ✓ Classify received materials;
- ✓ Preparation and storage of reagents;
- ✓ Carrying out macroscopic inspection and/or technical processing;
- ✓ Microscopic examination of tissue or cytological material obtained by smear, aspirate, biopsy or autopsy;

- ✓ perform an autopsy;
- ✓ Issue a report on the tests carried out;
- ✓ Coding the exams administered;
- ✓ Maintain scientific photographic documents, slides and block files;
- ✓ Ensure operator protection.

Teixeira and Valle (2010) further explain that a surgeon who focuses on diagnosing the pathology of the disease is called a surgical pathologist. This work examines the importance of formaldehyde and discusses the risks of accidents in laboratories. Formaldehyde is an important factor in maintaining a safe environment - not only in Anatomy Pathology laboratories, but also in any other chemical research laboratory. The best methods for handling chemical materials are analyzed and compared with each other. This is because formaldehyde has many important characteristics related to biosafety, which must be taken into consideration when using it.

2.2 THE ACTION OF FORMOL FOR BIOSAFETY IN ANATOMIAPATHOLOGY

Formaldehyde is the most commonly used fixative for light and electron microscopes. Adequate histological preparation requires a properly fixed sample; therefore, formaldehyde is vital to the process. 10% formaldehyde solutions are typically used for light microscopes, and 2% to 6% solutions are used for electron microscopes (CASTRO et al., 2010).

To do this, you need to take some mandatory precautions:

- The collected materials must be quickly immersed in the fixing solution;
- The volume of the fastener must be at least ten times (10X) greater than the volume of the collection section. The main objectives of the correction are:
 - Inhibit or interrupt tissue autolysis;
 - Coagulate or harden tissues and make insoluble substances diffuse;
 - Protection of soft tissues by hardening during handling and subsequent technical procedures;
 - Preservation of various cellular and tissue components;
 - Increased optical differentiation of tissues;



- Facilitate subsequent staining.

Formaldehyde is an important and common aldehyde in the environment. It is colorless, insoluble in water and has an irritating odor. It is also very soluble in the body, with high chemical reactivity. Formaldehyde is well known to have negative effects on most people: irritation of the eyes and upper respiratory tract, nausea, drowsiness, allergic skin reactions at concentrations greater than 0.1 ppm and less than 0.05 ppm, and pain. head (CASTRO et al., 2010).

According to Franklin et al., (2009) formaldehyde is known to be more irritating to people with concentrations below 0.05 ppm. Formaldehyde is a harmful chemical that causes mutations and cancers. It is also a teratogen, which means it can cause birth defects. Formaldehyde is a common indoor air pollutant due to its presence in furniture manufacturing, cigarette smoke, disinfectants, and construction materials.

When monitoring the concentration of formaldehyde in a given environment, high concentrations of up to 0.5 ppm have been reported. This includes monitoring in hospital environments – such as ICU, surgical center and emergency room – in order to collect data for toxicological studies related to exposure to this substance.

Formaldehyde is extremely toxic to the body when ingested, inhaled or applied to the skin. It is also poisonous if injected intravenously, intraperitoneally, or subcutaneously. Formaldehyde can cause eye irritation at concentrations of 20 parts per million in air. As a gas, it is more dangerous than vapor (FRANKLIN et al., 2009).

The US National Institute for Occupational Safety and Health recommends that workers wear protective masks and gloves when handling products. These masks must have organic vapor filters so that they can remove harmful vapors from the air. AASSO states that the maximum concentration of a product should not exceed 10 ppm, while 5 ppm is the maximum limit allowed for continuous exposure. Formaldehyde, a compound suspected of causing cancer in humans, must be handled with care (FRANKLIN et al., 2009). It should be stored at room temperature, but not below 15 Co (60F), and should be kept out of sunlight and tightly closed to avoid contact with the atmosphere and the moon. Remove all contaminated clothing and place it in a container for decontamination. If there is skin contact with furniture, wash the affected area with soap and water. Additionally, use absorbent paper to remove any spilled liquid before it spreads (FRANKLIN et al., 2009).

According to Erdtmann (2004), formaldehyde is a very reactive chemical with significant reducing capacity. It does not mix well with alkalis, ammonia, potassium and iron sulfides, preparations based on iodine, silver or casein. Formaldehyde does not mix well with casein, agar agar or albumin. If mixed with alkali or ammonia, it creates insoluble compounds. Reacts violently with peroxides, manganese carbonate, oxides and nitromethane. When exposed to low temperatures, it can turn into a cloud.

3 METHODOLOGY

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Research is conceptualized as the development of methodically demarcated activities, through systematic investigation that requires careful planning, which will be elaborated according to the nature, spatial and temporal situation and conditions of access to the data necessary to understand a given object or phenomenon to be known (RODRIGUES et al., 2007).

In this sense, the methodological design is fundamental to achieving the proposed objectives and responding to the research problem. Defined as the study of methods and also as “[...] a discipline that



consists of studying, understanding and evaluating the various methods available for carrying out academic research” (PRODANOV; FREITAS, 2009, p. 09).

For Mattar and Ramos (2021), the bibliographic review is the basis of any and all academically scientific research and can comprise one of the main stages of planning a scientific study. This reality is due to the fact that this type of methodology aims to present the main contributions of academic authors on all the points covered in the research that will be developed.

Due to their unique condition, that is, each individual used as an object of study presents a different answer, it is necessary for these data to be analyzed individually, as each of them presents a different perspective for the same or similar reality. Concluding thus, with the process of analysis and presentation of the results obtained with each of the human contributions to the qualitative research of academic production, its importance being highly associated with the practical part of the theories presented in the research that is formulated (PATIAS; HOHENDORFF, 2019) .

Initially, the study is an integrative review on the topic, where the search period for the selection of academic materials is between 2000 and 2022, with only published research being considered, so that the research sources have greater breadth in their contribution, since consist of more complex data. The sources for data collection are SciELO and Google Scholar, where articles and academic research that could contribute to solving the research problem presented were searched, collected, analyzed and selected.

The research language is Portuguese and English as they are the author's native language. The exclusion criteria include studies that are not complete scientific works and with restricted access, publications outside the selected research period and publications in languages other than Portuguese and English. The articles were identified, analyzed and selected for the construction of the study presented here.

4 RESULTS ANALYSIS

Some biological materials, such as saliva, feces, semen, breast milk and other fluids, are considered potentially contaminated by disease-transmitting microorganisms. This is why we consider patient care or support activities in healthcare as potential sources of germs. People who work in these areas frequently come into contact with blood, urine, vomit, and other secretions or excretions. Due to the lack of data on the presence of germs in this equipment, we consider it to be contaminated. This requires our constant awareness of the need to protect ourselves when handling materials, waste or environmental contamination by blood and secretions (ERDTMANN, 2004).

Proper handwashing is the most important step in preventing the spread of germs. It is imperative that people wash their hands with soap and water when wearing gloves. In addition to removing dirt, this action eliminates any microbes that may be present on a person's skin, even when

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she can't see them. Before starting any new activity, we must wash our hands. We must also wash your hands immediately after finishing an activity. We should do this because we do this in our everyday lives – before and after eating or going to the bathroom (ERDTMANN, 2004).

By washing our hands, we can reduce the amount of germs we pick up. Additionally, we shouldn't wear finger rings to reduce the amount of germs that remain on our hands. Blood, saliva, mucus and other secretions should not be transferred to the eyes, nose or mouth. Instruments and materials contaminated with these substances must be handled in a way to avoid contamination of other patients, environments



and skin. Appropriate methods must be used when reprocessing reused instruments. Before using a medical professional or patient again, make sure your equipment is properly cleaned or disinfected. Dispose of single-use supplies properly and ensure appropriate disposal sites. To avoid personal injury, always take care when handling, cleaning and transporting sharp instruments such as needles, razor blades, scissors and other sharp tools (ERDTMANN, 2004). For Gomes (2019), these instruments pierce the skin and must be discarded in protective boxes that are difficult to penetrate and waterproof. Dispose of these instruments as close as possible to where they are used. Do not touch used needles after removing them from a disposable syringe. Also, don't remove them by hand and definitely don't break or bend them. When reusing anesthetic syringes or cartridges, close the lid by pressing it against the wall of the clinical tray. Be careful not to use your hands when doing this. Instead, place the syringe back in its box or tray before transporting it to a sterilization and cleaning area in a stainless steel box or tray. Healthcare organizations must enforce regular cleaning and sterilization routines for equipment and surrounding surfaces. Working with their supervisors, these organizations should regularly confirm that they are following these guidelines.

By using barriers such as plastic film, aluminum foil or other material, direct contact with surfaces such as equipment handles, mice, keyboards and monitors can be avoided. This helps prevent dirt from sticking to the surface - so you only need to disinfect the entry barriers before changing them for another patient. Additionally, changing these barriers does not require cleaning the equipment — in fact, it is only necessary to disinfect these barriers before dispensing a new batch of patients. When transporting dirty clothes, be careful to transport them in plastic bags (GOMES, 2019).

Healthcare services that use reusable curtains and sheets must have their own or outsourced laundry system. This washing system must guarantee the disinfection of the clothes. All healthcare professionals must be vaccinated against hepatitis B and tetanus to increase their protection. This is easily accessible through the public health system (SANGIONI et al., 2013). Vaccines provide specific protection against diseases. It is important to participate in all health department campaigns that promote vaccination.

FINAL CONSIDERATIONS

The symptoms that consistent occupational exposure to formaldehyde produces in the workplace reflect those presented by research. These include sore throat, sinus irritation, watery eyes, headaches and nausea. Additionally, exposure to this material may cause coughing, nose and throat irritation, and other symptoms indicative of inhaling the gas. Employees must have individual and collective protective equipment. This is because it is the responsibility of employers to provide their employees with this equipment in suitable working conditions with trained personnel. Additionally, careless handling of toxic waste has been observed in general laboratory settings.

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Without taking into account the significant consequences this would have on the environment, this negligence it was unquestionable. Chemicals are not only released into the air through industrial pollution. Many people mistakenly believe that using chemical agents as if they were harmless is also a way to spread them. This leads many people to develop health problems over time due to exposure.

The degree to which people develop these health problems will depend on many different factors, including the type of chemical agent, concentration, frequency and duration of exposure, health practices and habits.



work and individual susceptibility. People can avoid these problems by taking steps to reduce their exposure to chemicals over time.

People must understand the dangers of working with chemicals to prevent exposure from causing harm. That is why it is important to implement Biosafety. Helps workers reduce the risk of exposure to harmful chemicals. Working with Biosafety in mind also makes employees more confident and competitive. This also gives companies a competitive advantage, as employees don't have to worry about their health or the environment. And it helps build a responsible image among companies — which is important in today's world.

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