



## Main Risks in Dentistry for Violating the Principles of Biosafety

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### Abstract

Dentistry is one of the professions of medical sciences where more biological, chemical, physical and ergonomic risks can be detected in daily practice. Motivated by this approach, an exhaustive literature review was carried out on the main biosecurity standards in dentistry as well as the risks that professionals patients are exposed to when said regulations are violated.

**Keywords:** Biosecurity; Biological Risk; Chemical Risk; Ergonomic Risk

### Introduction

You cannot talk about risks and complications in Stomatology without mentioning biosafety. All the procedures that are carried out, whether surgical or not, within its principles is to comply with the standards and care of biosafety. Despite the fact that many sections of different chapters address this topic, the authors decided to make a section to delve into the general aspects. This is a subject that is studied during our training, and it will accompany us throughout our working lives. The professional must comply with all that is established, and from early on create adequate habits, which over time become a care routine for him and his patients, which does not lead to any other path than the success of the procedure(s). Putting into practice any treatment in Stomatology, leads to the exposure of dissimilar risks to the health of the patients and the people who practice it [1,2].

### Objective

Describe the main biosafety regulations in dentistry.

### Reference search methods

The scientific information was compiled through a search using the following descriptors in English: The Medical Subject Headings (MeSH): "biosafety, dentistry, risks in dentistry.

### Analysis strategy

The search was based solely on working conditions in dentistry.

### Developing

Since the WHO declaration of 1946, on the definition of health as "a state of absolute physical, mental and social well-being and not only the absence of disease", but the concept of health has also varied over time. This ability to produce or work is what makes the difference between a healthy or sick person. It is known that

there is an interrelationship between individuals and the work environment. Said environment can contribute to vary behaviors and customs, appearing a specific injury or illness caused by your work. From the scientific, educational, professional, and human point of view, it is the obligation of health workers, and in this specific case of Stomatology, to ensure compliance with the regulations and principles of biosafety in the institution where they work. And train the new generations with an awareness of the existing danger for patients, students and professionals. The World Labor Organization and the World Health Organization (WHO) have created the so-called "Occupational Medicine", which is based on promoting and maintaining a high level of physical, mental and social well-being of workers of any profession, anticipate that the health of individuals is affected by inadequate working conditions. Currently, the risk at work (labor) is studied based mainly on biosafety standards, which groups the basic parameters of behavior and is conceptualized as the set of preventive measures aimed at maintaining control of occupational risk factors from biological, physical or chemical agents, achieving the prevention of negative impacts, when facing harmful and risk agents [1-3].

Biosafety risk is that agent found in the work environment, capable of causing harm to the health of both the operator and the people who remain in their environment, including patients and staff. Biosafety is conceptualized as the set of preventive measures aimed at controlling occupational risk factors from biological, physical or chemical agents, achieving the prevention of harmful impacts, ensuring that the development or final product of said procedures do not threaten health and the safety of health workers, patients, visitors and the environment. Stomatological practice includes risks of various kinds ranging from blood contamination, adoption of inappropriate postures that cause musculoskeletal injuries, as well as factors such as noise, vibration, ionizing and

non-ionizing radiation, contact with chemical substances: mercury, acids and solvents, among others, which we could classify as: Biological, Physical (Radiological), Ergonomic (Biomechanical), Chemical, Psychosocial. When talking about worker health, and occupational risk factor, it is declared as a situation present in the environment where the activity is carried out in the determined labor process, which is capable of causing harm to the worker's health [1,4].

The different occupational risk factors act in isolation, frequently presenting several of them at the same time or in different areas of the labor process, which surely leads to the appearance of an occupational disease. In the different health institutions, biological risk is considered the most dangerous, both for the professional and for students, patients and companions, which is why it plays a preponderant role, inviolably complying with biosafety measures, and thus avoiding any harm to health and the environment from exposure to disease-causing biological agents [1,4].

The study and knowledge of new recurring diseases has promoted the strengthening of awareness about biosafety, it has been shown that a high percentage of diseases could be transmitted during the course of dental procedures, the office is one of the environments in which the professional You can acquire diseases if you do not take into consideration the fundamentals for care and protection. There are risks of cross infection due to the type of procedures performed, for example, direct contact with the patient's mouth, exposure to saliva, blood and other fluids, handling of sharp instruments, possible inhalation of airborne microorganisms and direct contact with contaminated surfaces. Stomatology is considered by many to be one of the branches of medical sciences, which exposes the greatest number of infections by different biological agents. Among the most investigated was the Hepatitis B virus. In the 1980s, initially it emerged in isolation and then the infection by Human Immunodeficiency Virus (HIV) was recognized as a pandemic and from that moment it was established. great interest in all health professionals, especially in the field of Stomatology due to all the prejudices that this fatal disease brings with it, that currently good results have already been obtained in different treatments to control it, but, it has not been Success in finding your cure. The world is currently in the midst of the coronavirus disease (COVID-19) pandemic. On December 31, 2019, China reported a cluster of cases of pneumonia of unknown cause that would later be identified as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). On March 11, 2020, the World Health Organization recognized the widespread global transmission of COVID-19 and declared it a pandemic [5-7].

During healthcare work in consultations, there is a great risk of being exposed to SARS-CoV-2 due to the proximity of the professional to the upper aerodigestive tract of the patient, contact with saliva, blood and other body fluids, and handling of instruments.

rotating devices that generate infectious aerosols that expose the dentist to the virus. Many of the stomatological processes and the different related specialties can cause coughing, the patient having the need to expectorate, increased gag reflex, etc. These aspects make them exposed to the disease, through the patient's saliva which contains not only digestive content but also through sudden expectoration can be combined with that detached from the respiratory mucosa. Concepts as expressed in his work by Dr. Díaz Ronquillo, the term biosafety has its idiomatic genesis in the English language, being able to state its definition as safety; free and exempt from all danger, harm or risk; and Bio: biological set of all human beings; life; so then the concept of biosecurity is conceived as the protection of life. Biosecurity is also recognized as "a set of preventive measures aimed at safeguarding the health and safety of personnel, professionals, patients and companions, against the different risks that dental care entails. It has also been conceptualized as a behavior doctrine, aimed at achieving attitudes and behaviors that reduce the health worker's risk of acquiring diseases in the workplace, encompassing all the techniques, measures, and protocols created to achieve health protection. and of the human being, both during medical treatment and in drug manufacturing processes and in any activity that requires protection against pathogenic agents [8,9].

Principles of Biosecurity Universality: it means respecting the established norms, the taking of precautions of the basic measures by all the people who step on the healthcare facilities, because they are considered susceptible to being contaminated, it refers to the protection fundamentally of the skin and mucosa, since an accident where contact with blood and other organic fluids is foreseen. It is to care for all patients with the care that must be taken, if they present with any infectious disease. Use of Barriers: Use of implements that represent obstacles, avoiding direct exposure to blood and other contaminated fluids or dangerous substances due to their potential to cause harm, such as the use of gloves, long-sleeved gowns, glasses or protection shields or masks. Elimination of Toxic Materials: It refers to the disposal of materials, as a product generated in health care [1,4].

It includes attachments and specific procedures, used for their removal, with the least possible risk. Mainly, it is aspired that health workers consciously comply with the regulations in an ethical and responsible manner. Thus guaranteeing, to the extent possible, their health and that of the patient, which represents their responsibility as a fundamental pillar of the care process; because moral values largely govern the behaviors and attitudes of health personnel. Infection mechanisms Infection in dental practice can be produced by the following mechanisms

- Direct contact with the infected substance (lesion, blood, saliva).
- Direct contact with contaminated objects.

- Splashes of blood or saliva, nasopharyngeal secretions on healthy or eroded skin or mucosa.
- Contamination by infected aerosols [10].

COVID-19 surveillance system. According to MINSAP, the Ministry of Public Health and the Directorate of Medical Care, the National Department of Stomatology and Organization of stomatological services. Havana. October 2020. They recommend this system:

- Before each patient that is treated, think about COVID - 19 and act accordingly.
- Daily monitoring of patients who come to the services as well as all workers (thermometry in dental clinics). Prohibit access to anyone with symptoms.
- Identify through questioning the patient, the possible epidemiological link with travelers, tourism workers or other people at risk of exposure to COVID-19, which will be reflected in the individual Clinical History.

#### Universal protection measures

- Vaccination.
- Protective barriers.
- Hand washing and care.
- Handling of sharp instruments.
- Sterilization or disinfection.
- Cleaning or disinfection of the dental unit and environmental surfaces.
- Disposable instruments.

**Vaccination** It is essential that dentistry professionals comply with vaccination schedules. Said scheme would ideally include protection against diseases such as tetanus, rubella, Hepatitis B, among others. This is modified depending on the health policy, the epidemiological and hygienic characteristics of the region and/or country where the work is done [10-12].

During the dissimilar procedures, different varieties of syringes can be used, where one is not exempt from suffering an accident and involuntarily pricking oneself. Therefore, it is very necessary to protect oneself immunologically against diseases that are transmitted through blood contact. One of these diseases is type "B" Hepatitis, which is why it is required that we have the protection scheme in this regard. Given the current world situation, it is essential to protect yourself with vaccines for COVID 19. protective barriers Use of gloves, masks, eye protectors and professional clothing.

- **Gloves** Non-sterile disposable gloves are recommended for clinical examination. For surgical procedures, sterilized disposables are recommended. Reusable gloves must be thick and are used only for washing instruments. Gloves contaminated with blood or other fluids should be discarded. Washing gloves with antiseptic agents alters the nature of the latex and does not ensure the removal of microorganisms from its surface [1,4,12].

Actions unrelated to patient care should be avoided while wearing gloves. If the treatment is not surgical and must be momentarily interrupted to later continue with the same procedure (taking a bottle, opening a door, answering the phone, making a note, among others), mitts are useful, disposable polyethylene bags superimposed on the Latex glove.

**Masks** The masks mainly protect the nasal mucosa and avoid its contamination by aerosols originated by the rotating instruments of the office. Although the mask protects the nasal and oral routes, the latter is less dangerous because it is the most difficult to transmit pathogenic germs. Among the disposable masks, the material of choice is fiberglass, the mixture of synthetic fibers that filter microbes better than paper ones. It should fit comfortably and properly over the bridge of the nose to prevent fogging of eye shields. The WHO recommends that health professionals use particle-filtering masks in isolated environments and in contact with patients who may possibly expel infectious agents in the form of salivary aerosol, as occurs in the case of patients with COVID-19. This regulation given by the WHO, is very well coupled with the use of surgical N95, FFP2 and FFP3 masks by the dentist and his direct support staff. They must wear it at all times while in the health care facility and only remove it when eating or drinking [1,4,12].

**Eye protectors** They prevent eye injuries caused by particles projected towards the operator's face, while protecting against infections considering that many germs of the normal oral flora are non-opportunistic pathogens. Due to the difficulty in sterilizing them, they must be washed between patients with water, germicidal soap, and antiseptic solutions. After being rinsed they must be dried with towels, paper napkins. The procedure must not damage the surface of the protector. It is recommended to use a face shield with a double mask for the decontamination of glasses and facial protectors.

- Decontaminate with sodium hypochlorite diluted to 0.05 % (500ppm). The action time is 5 to 10 minutes.
- Decontamination with hydrogen peroxide can also be carried out. Immerse in a clean tray or container containing a 3 % hydrogen peroxide solution for 10 minutes.
- For the two procedures above, rinse with potable water until the water runs clear. •Proceed to dry with a clean cloth.
- If you have the disinfectants Meliseptol Froam or Meliseptol@ rapid, the disinfection of the glasses can be done by rubbing with a sterile swab with these products. Store wrapped in clean cloth. [1, 4, 12]
- **Professional clothing** Includes apron or sanitary gown, bib and hat. Its purpose is to prevent the introduction of microorganisms into the work area. It also prevents contamination of normal clothing during office care. Aprons must have long sleeves, a high, closed neck. The use of sanitary gowns is a re-

quirement for all members of the health team. These must be changed when they have visible signs of contamination. When performing surgical or invasive procedures, they should be worn over long-sleeved, mid-leg length sterile gowns. Non-disposable clothing must be washed in suitable machines, with detergent and using boiling water or disinfectant. They must be dried and sterilized in separate packages. It is advisable that the uniforms lack pockets as these are a possible reservoir of microorganisms. You should not leave the dental office with the sanitary gown, as this contributes to the transfer of microorganisms. Sanitary gowns should not be washed together with other clothing. Clean boots must be worn during critical procedures. After use, these must be placed in a suitable place for further processing. Hand washing and care constitutes the simplest but most effective process, which is not only useful for the health professional but for everyone, its objective is to use a soapy foaming substance to eliminate contact with pathogenic microorganisms. Its purpose is to eliminate the transitory bacterial flora, reduce the resident one and avoid its transport [1,4,12].

It is the most important measure and must be carried out immediately after contacting blood, saliva, surgical instruments and before contact with any patient. correct and systematic hand washing with soap and water for 20 seconds or rubbing hands with alcohol-based gel is another of the essential measures according to the WHO in the prevention of SARCOV 2 Hand washing and disinfection procedure Hand washing is done

- Before having direct contact with patients.
- After touching the patient's intact skin (when taking pulse or blood pressure, or when lifting the patient).
- After contact with body fluids, mucous membranes, intact skin, and wound dressings so hands are not visibly contaminated.
- If during care the patient goes from a contaminated part of the body to another that is not contaminated.
- After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient.

After removing gloves. How it is performed

- Wash hands with running water and soap. (Energetic rubbing of the hands extending to the forearms, according to the hand washing techniques which will be placed in visible places for all personnel.)
- Rinse hands with clean running water.
- Dry hands, in the case of patients with their own towel, in the case of assistance and support staff, use disposable paper towels located next to the sink for the staff, if there is no appropriate material, do not dry.

- Apply Antiseptic Solution (with 0.1 % sodium hypochlorite or 70 % hydroalcoholic solution) on hands and forearms, rub until dry.
- Given the impossibility of washing hands, carry out disinfection with the use of hydroalcoholic solution for 30 seconds or 0.1 % sodium hypochlorite as long as the hands are clean and free of organic matter [12].

#### Medical staff hygiene

- After physical examination and treatment of patients, hands will be washed with running water and soap, as well as before and after handling Personal Protective Equipment (PPE).
- Comply with the hand drying protocol: do not use towels, if there is no disposable paper, do not dry your hands and use an alcoholic solution or 0.1 % hypochlorite for disinfection.

#### Waste management

- Guarantee the adequate deposits for the segregation of the waste with the plastic bags and the correct identification of the same.
- Ensure that all sharps waste is collected in rigid containers, resistant to punctures or breakage, must be hermetically closed and contain disinfectant substances inside.
- Check that adequate areas are designated for the temporary storage of waste.
- Evacuate the waste in bags applying 0.5 % Hypochlorite inside for decontamination, then tie them. Do not put your hands inside the container, as this can cause work accidents due to cuts, punctures or contact with contaminated material.
- Avoid emptying waste from one container to another. Handling of sharp instruments. Sharp material must be disposable and it must be isolated and previously treated before removing it, with precise movements to avoid handling accidents (punctures or cuts). It is important to classify the instruments according to the risk of contamination in Critical: They are the instruments used to penetrate the soft and bone tissues, that is, they penetrate the subepithelial tissues and reach the vascular system. These must be sterilized before each use. Among them are those used in extraction, chisels, syndesmotomes, instruments for tartrectomy, scalpels and files, among others. Semi-critical: They are those that come into contact with the entire mucosa or with organic secretions such as saliva. They do not penetrate the tissues [11,12].

We can cite among them the operating instruments and those used in orthodontic and prosthetic treatments. These utensils must be sterilized after use or receive a high level disinfection. Non-critical: They do not come into contact with organic secretions, only

with the entire skin of the patient, or they do not come into contact at all. Here we have the Young's arch, the dam piercing forceps, the spatulas for plasters, among others, in which only an intermediate or low level of disinfection is necessary. Discard containers should be as close as possible to the work area.

Discarders are considered to be the container where all sharp materials are deposited, destined for disposal by incineration. These should not under any circumstances be reused. It must be made of material that is resistant to punctures and compatible with the incineration procedure without affecting the environment. It is recommended that the discarders have a handle for transport and that allows it to be handled away from its opening.

The opening must be wide in such a way that when introducing the discarded material the operator's hand has no risk of accident. Ideally, they should be yellow in color and have the symbol of infective material and an inscription warning to handle it with care. It must have said inscription and symbol, with dimensions not less than one third of the minimum capacity height of the container and with two impressions, in order to easily visualize it from any position. Sterilization or disinfection In order to proceed properly, it is necessary to define some important concepts [11,12].

- Sterilization is nothing more than the elimination of all forms of life from a medium or material. There are various methods of sterilization: Physical methods are achieved by heat or radiation where we have dry heat (dry oven, glass ball sterilizer, flamed), Moist heat (autoclave or steam stove is the most used method in Stomatology), Radiation (ionizing (gamma) and non-ionizing (ultraviolet) Chemical methods are based on the use of liquids (activated glutaraldehyde, formaldehyde) and gases (ethylene oxide in the form of gas, formaldehyde gas, hydrogen peroxide vapor).
- Disinfection: Procedure in which most pathogenic microorganisms are eliminated but non-pathogenic microorganisms or their resistant forms often remain.
- Decontamination of dental sets, surfaces and premises It is the elimination through physical or chemical methods, of infectious-contagious biological agents present in the material or instruments prior to their sanitization. Decontamination eliminates harmful elements and avoids the risk of infection during the handling of instruments and equipment. It is carried out in different ways: Clean and disinfect the surfaces that were in contact with the patient after each procedure, applying the disinfection by friction with alcoholic solution or 0.5 % hypochlorite with a previously moistened cloth to guarantee its purity. With sanitary washing machines, also known as thermo-disinfecting machines, which use water pressure at temperatures between 60 °C and 90 °C for 15 to 20 minutes.

This method combines thermal disinfection with mechanical cleaning. A neutral or enzymatic detergent can be associated. It of-

fers a high level of safety for the patient, the dentist and the auxiliary staff. At the end of each work shift, perform terminal disinfection of the premises with alcoholic solution, 0.5 % hypochlorite or 2 % glutaraldehyde. In addition, there is the immersion in boiling water for 30 min. It is a physical disinfection method that guarantees the inactivation of most pathogens. Washing should be done to facilitate the removal of impregnated particles in the instruments and the arrival of the sterilizing agent. It can be done by manual process or with ultrasound devices. Washing by manual process: the instruments are placed in soapy water for a period of 2 to 20 min (pre-wash) and later washed in running water under intense brushing. Washing in an ultrasound apparatus: it is carried out in a unit made up of piezoelectric oscillators located in a stainless steel apparatus and a tank for immersing the instruments in a descaling solution. It uses high frequency sound waves (40,000 waves/s). It has the advantage of being more efficient in cleaning (16 times more effective than manual cleaning), requiring less work time and having less risk of accidents. dried and lubricated. It can be done with a clean, dry cloth; with a hot or cold air dryer; with a stove (50 °C) [11,12].

### Packaging

Different materials such as fabrics and craft paper can be used. The package should be double wrapped and labeled with the name of its contents and the date of sterilization. Instruments that are packaged together must be wrapped in such a way that they are separated, to avoid galvanic currents that favor loss of cutting and changes in the temper of the steel. Files, endodontic probes, or small-sized materials are placed inside labeled, paper-lined, non-airtight glass jars. Sterilization can be done by physical or chemical methods. Purge the handpiece and the syringe of air and water for 20 or 30 seconds in the spittoon, then final disinfection of the spittoon with 0.5 % hypochlorite. The disinfection process of the handpiece and air and water syringe is carried out as usual. For disinfection of surfaces, rub with fiber cloths immersed in solutions based on 0.5 % sodium hypochlorite, 70 % ethanol or 1 % hydrogen peroxide, for one minute. Hygiene of the premises

- Maintain adequate natural ventilation through doors and windows in the rooms. Limit the use of fan.
- If the artificial ventilation is through air conditioners, the cleaning and disinfection of the dust filters and the equipment in general will be systematically controlled, increasing its demand in the premises used for meetings, classrooms, closed rooms and other similar ones.
- The existence and operation of sinks with good hygienic conditions will be guaranteed in rooms, medical consultations, dining rooms and kitchen.
- The existence of lockers will be guaranteed, in good hygienic conditions [11,12].
- Proper cleaning and hygiene in all areas. Do not use the same blanket in all areas, differentiating them into areas of greater or lesser risk.

- The existence of soap and disinfectant substances will be required for frequent hand hygiene, before and after caring for each patient in consultations and rooms.
- The total cleaning with water, detergent substances and chlorine of walls, floors, etc. will be controlled frequently. Use of disposable instruments Disposable instruments such as cleaning and prophylaxis cups and brushes and others should be used only once (individually for each patient) and disposed of; they should never be cleaned or disinfected for a new use [11,12].

### Transfer of biopsy specimens

In general, each biopsy specimen should be placed in a strong container to prevent breakage or leakage during transit. Care must be taken to avoid contamination outside the container. If contamination is visible on the outside of the bottle, it must be cleaned, disinfected and deposited in an impermeable bag. Use of extracted teeth in stomatology teaching Extracted teeth to be used in teaching stomatology students must be considered infectious because they contain blood and any person who transports them must take the same care as indicated for biopsies. The universal concerns to manipulate extracted teeth must be followed by students, since preclinical teachings must simulate clinical experiences, as an educational program in health centers.

Prior to any teaching manipulation by students, the extracted teeth must be brushed with detergent and water, or with an ultrasonic cleaner; later they will be submerged in a fresh solution of sodium hypochlorite at 1:10 or another germicidal liquid; Persons performing these manipulations should always wear gloves and take all known and presented measures to avoid contamination. It is essential to maintain an active management of air quality in dental offices [3-5].

As well as controlling the temperatures in the surgical rooms, which should ideally be maintained between 20 and 24 °C (68 -75 degrees Fahrenheit) and a humidity of 20 to 60 %, not greater than 70 %. Have effective ventilation systems. There are mandatory and inviolable standards that make health institutions trustworthy and safe places. So that care has a high quality. Biosafety is a complex and extensive subject, in this chapter we wanted to give a general outline so that the reader can be oriented, we recommend those interested in delving deeper into this subject, to go to the multiple existing bibliographies today [11,12].

### Conclusion

The dentist in his daily practice is exposed to multiple biological, chemical, physical, mechanical, and ergonomic risks. Patients and companions can also be affected in such an environment. So the universal principles of biosecurity fit all individuals and are inviolable.

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