

# Biohazards



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A biohazard is defined as a biological instrument like a micro-organism or a condition that can make up a risk to humans, animals or the environment, especially in a biological study. This risk can be presented directly by infection or indirectly by contamination of the environment (John Burke Sullivan, 2001). Direct infection may occur during handling of such material, especially during transportation and in the laboratory, while contamination of the environment may occur during disposal of such material. Contamination of environment may also occur, when disposal of waste is done on natural resources without proper treatment (Charatan, 1999). This paper will focus on the types of bio-hazardous materials, how they are created, how they cause risk to human and environment and how to prevent such occurrences.

Biological hazardous materials consist of certain kinds of DNA, organisms and viruses contagious to humans, animals or plants (e. g. parasites, viruses, bacteria, fungi,) and biologically active agents (i. e. toxins, allergens, venoms) that may cause disease in other living organisms or cause significant impact to the environment or community (John Burke Sullivan, 2001).

They may also be substances that are infectious or that are known to have pathogens at a reasonably high level, which are micro-organisms, such as those mentioned above that can cause human or animal illness. Some biological substances, such as those obtained from existing organisms for positive use in treatment or prevention of pathological infections may be hazardous if not stored properly. This includes, but not limited, to finished or unfinished manufactured goods, for example vaccines (Health and Safety Executive, 2005).

Augmentation of pathogens so as to increase them and hence increasing their risk of infecting the surrounding should there be an exposure is another source of biohazardous. This is mostly done intentionally and mostly the reason is not for diagnostic and clinical procedures. This increase of pathogens is known as creation of 'cultures or laboratory stock'. The inherent information of micro-organisms may also be altered to produce biohazards (Health and Safety Executive, 2005).

Most of the biohazards, however, are as a result of biotechnology developments. Most of these are not intended at creating a biohazard agent, but rather for other practical useful invention to man. The processes of biotechnology that may generate a biohazard agent are 'isolation of growth medium components, viable and non-viable organisms and suspended solids, in particular cell separation and disruption processes have the potential to produce substantial aerosols. The extraction of intracellular enzymes involves handling large quantities of cell debris and places a high demand on bio-safety. Centrifuges and rotary vacuum filters can also create contaminated aerosols' (John Burke Sullivan, 2001).

Creation of aerosols by processes, such as homogenization, may be a factor for bio-hazards production processes, such as purification by ultra filtration; chromatography and dialysis do not cause creation of aerosols, except in the event of a leakage due to failure in piping or sealing. The people involved with disposal of waste, especially from hospitals or forensic waste may get contaminated, when filling up bas and other containment structures for such waste (Fox, 2002). The extent of risk is influenced by the form of the product or waste, which is concentrated or in powder, liquid or solid form. Products

are more concentrated during purification and packaging processes. Human waste workers may control contamination at the point of discharge by the methods they use to make the discharge (Charatan, 1999).

The people most exposed to biohazard are the biotechnologists, who include biochemists, biologists, chemists, computer scientists, mechanical engineers, chemical engineers, veterinary scientists and doctors. When the biotechnologists have accepted the risk of biohazard in their profession, their staff may not fully appreciate the same. They lack experience in standard aspects of medicine and micro-biology, chemical or even basic laboratory safety guidelines (Charatan, 1999). When being weighed, mixed, dissolved or fermented, raw materials can pose a biohazard resulting from allergic dusts and aerosols by skin contact, spills, sewage pollution and production of gases. During the processes of centrifugation and filtration, separation of biomass may pose a danger in biohazard (John Burke Sullivan, 2001).

According to a survey, the main cause of bio-hazard exposure is a worker in the laboratory. This is usually during operation of equipment, handling of animals and/or cleaning up any spillages. By following of simple laboratory guidelines, most of the illnesses associated with the laboratory could be avoided. This goes to show that laboratory safety and preventative measures should always be adhered to (John Burke Sullivan, 2001). Biohazards are associated with the following characteristics of micro-organisms; 'The ability of a few species to cause sickness, the potential for undetected genotypes or phenotypes to change in an already tested and approved process and ubiquity of organisms that can contaminate the system' (Fox, 2002).

The bio threats related with the aerosols are dependent upon the character of the hazard, the concentrate rate and the size of the particles. This is responsible for determining the amount of time it is suspended in the air, the ability to stay alive and transmit illness inside the body and the allergic response to it. If one has a reaction to concentrated aerosols like moulds and pollens, the large particle aerosols with a big concentration is paramount. On the other hand, airborne aerosols and related illnesses depend upon the small size particles, because of their high probability to be inhaled. Any control measure taken against biohazard contamination should be based on this analogy (John Burke Sullivan, 2001).

The quest for containment and control of biohazards should start with a risk appraisal to establish the kind of hazards present or expected to occur, and the facility, equipment and persons necessary to support the process. The appraisal should include the factors so that a harmless level of containment for the safety of workers is achieved. Quantitative data should be available, and if not, a conventional approach should be implemented. If the existing data is on animals extrapolating, it should be done with concern to humans. The other factor for consideration is the mode of diffusion, which could be done through contact with infected mucus membranes or ingesting contaminated material (Fox, 2002).

The facilities biohazards are used should see to it that safety requirements as outlined for microbiological or/and biomedical laboratories. There should be safe containment structures like the biohazard cabinet, which should be maintained regularly and tested frequently to see that they do not malfunction (U. S. Department of Health and Human Services CDC, 2004).

When pressure suits are recommended, they should function properly without leakage and be able to maintain the pressure. They should always be worn, when going into suit designated areas. It is a simple and common rule that workers and students alike should not eat or drink in the laboratory, but it cannot be emphasized enough time, because people always take it for granted, therefore, posing the danger of exposure to themselves. Personnel must be guided on how to use all safety equipments properly (Fox, 2002).

Preventing accidental exposure to infectious agents by research personnel, who work with human tissues, is of critical importance. Each investigator must agree to assume full responsibility for informing and training all personnel in the dangers of and procedures for safe handling of these and other human tissues. The CDC has prepared a set of guidelines that provide detailed information and procedures for handling human tissues and body fluids used in research (U. S. Department of Health and Human Services CDC, 2004).

Several surveys have come to the conclusion that microbial pack and diversity of organisms from housing waste is different as compared to those from the health care effluent. Although the waste from health care has different types of organisms, the quantity is less than in the residential waste. This means that the residential waste is as dangerous as the health care waste. Some cases of infection have resulted in treatment of waste facilitates due to the processes, in which treatment is done. One such case occurred, because the workers shredded the waste before treating it. Shredding of the waste material might have caused aerosols, which the workers inhaled thus becoming infected (Health and Safety Executive, 2005).

It was, therefore, recommended that the facility should conduct on site sanitization of laboratory waste containing cultures of micro-organisms before release to a waste management company. This is supported by the recommendations made by the CDC. This case outline emphasizes on the need to avoid use of technology or method that can produce aerosols from pathogens of living cultures and stocks. Blood that is unusable and its containers should be well disposed of. A tightly shut container control insignificant blood that cannot be used should not be disposed of with the content. This is because it might open on the environment, therefore, creating a potentially hazardous environment. Blood should be flushed into sinks or poured into the toilet before disposal of the container (U. S. Department of Health and Human Services CDC, 2004).

Biochemical and biological material has been used as weapons of mass destruction. The first example is, as narrated by Ken Alibek in his book "Biohazard," how he was involved in a covert operation to create biohazard weapons. The Soviets, according to Ken, wanted weapons, for which there were no cure. The release of anthrax at Sverdlovsk in March 1979 caused about 66-105 deaths, although some estimate that well over 1000 people died. To cover up their mission, the accident was attributed to military developments (Charatan, 1999).

A biological attack if launched could be the most form of cold war. This is because, it may take some time to decipher the pathogenic mutations present in a biomass. There have been some sources from the American government that there are facilities and institutions in Iran, whose primary objective is to create and multiply pathogens for purposes of war. This has <https://assignbuster.com/biohazards/>

seen to the close regulation of some chemicals and biological agents in both the domestic and international markets in every country. Further precautionary measures of refining policies that are enacted on the control of such material have been taken. Domestic regulation is in the form of banning trade of certain materials or educating the public on the use and disposal of such material (Dana A. Shea, 2004).

In the international circles, however, the most efficient way of preventing biological attack is by diplomatic action including nuclear nonproliferation approach. The countries, which are mostly known for having an interest on the subject on the table, should be called to sign a peace for the world's agreement and be asked politely to destroy their experiments and production of biohazards. The major responsibility for action on biomass intended for war rests on the military force. This is because most countries continue to make cultures of biomass in the name of self defense. They say their research is purely to prepare them incase of an attack and not for retaliatory purposes (Dana A. Shea, 2004).

It should, however, be noted that animals and birds are capable of transporting potentially dangerous biomass during their migration. This has been noted in the coastlines of Hawaii. It is not known, how biomass would be presented in the case of war, but it is known that Iran is capable of deploying weapons of biomass with the same lethal level that has been acquired in military anthrax and unlike nuclear or chemical weapons, biohazards could be true weapons of mass destruction (Cordesman, 2008).