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Disease-causing agents in the environment

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Photo Credit: https://www.neer.eu/news-events/detail/tool-development-for-reporting-environmental-impact-in-agriculture-sector/

Routes of Exposure

Dermal Absorption

Factors affecting dermal absorption include

- The condition of the skin
- The chemical makeup of the substance
- Increasing the concentration of the toxic substance or the exposure time

Inhalation

Factors affecting inhalation include

- Concentration of toxic substance
- Solubility of substance
- Respiration rate
- Length of exposure
- Condition of respiratory tract
- Size of toxic particle

Agency for Toxic Substance and Disease Registry CDC (n.d). *Routes of Exposure*. Available at https://www.atsdr.cdc.gov/training/toxmanual/pdf/module-2.pdf

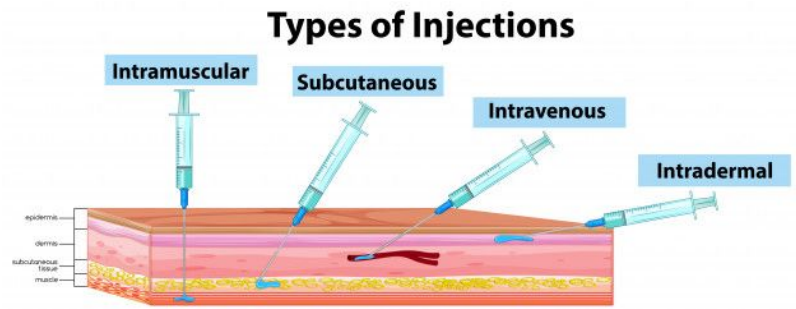
Routes of Exposure

Ingestion

- Once a chemical is absorbed, its effects depend on the characteristics of the chemicals
- A chemical can be quickly distributed throughout the body, and undergo translocation or biotransformation

Others

- The eye is a common point of contact for toxic substances.
- Injections are another common route for exposure



Agency for Toxic Substance and Disease Registry CDC (n.d). *Routes of Exposure*. Available at https://www.atsdr.cdc.gov/training/toxmanual/pdf/module-2.pdf

Transmissions

Direct contact

- Physical transfer and entry of microorganisms occurs through mucous membranes, open wounds, or abraded skin.
- I.e. Rabies, Leptospira spp

Fomite

- Involves inanimate objects contaminated by an infected individual that then comes in contact with a susceptible animal or human.
- I.e. Canine parvovirus

Aerosol (Airborne)

- Encompasses the transfer of pathogens via very small particles or droplet nuclei
- I.e. Bordetella bronchiseptica

American Animal Hospital Association (n.d). *Routes of Transmission*. Available at https://www.aaha.org/aaha-guidelines/infection-control-configuration/routes-of-transmission/

Transmissions

Oral (Ingestion)

- Occur from contaminated food or water as well as by licking or chewing on contaminated objects or surfaces
- I.e. Campylobacter, Salmonella

Vector-borne

- Vectors are living organisms that can transfer pathogenic microorganisms to other animals or locations and include arthropod vectors
- I.e. plague

Zoonotic

- The transfer of these agents can occur by the same five routes of transmission described previously
- I.e. Microsporum

American Animal Hospital Association (n.d). *Routes of Transmission*. Available at https://www.aaha.org/aaha-guidelines/infection-control-configuration/routes-of-transmission/

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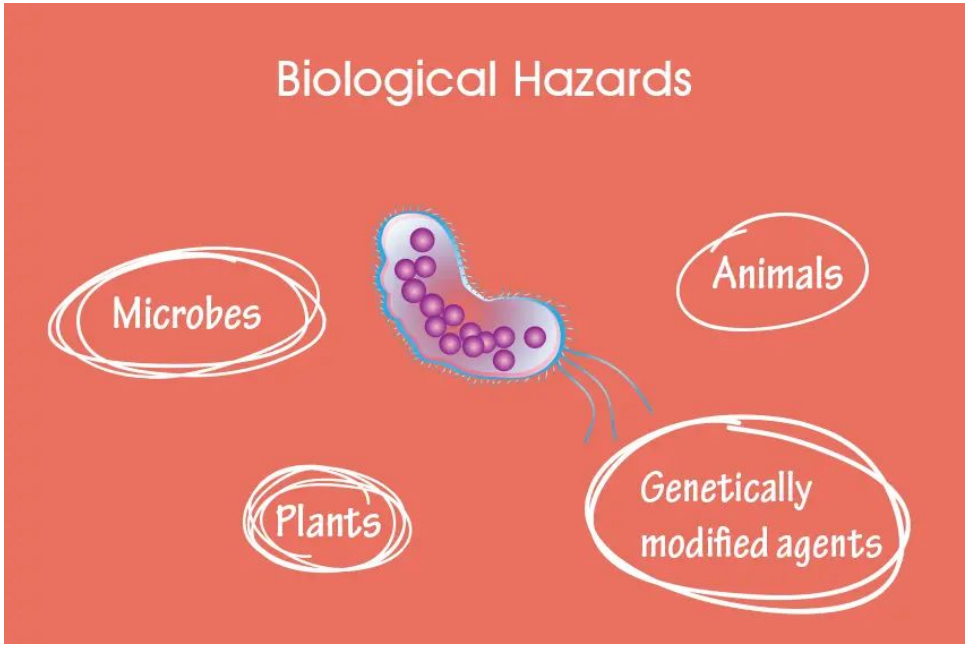
Biological Agents

Biological agent is a term used to describe microorganisms that are biological in nature and origin, to which exposure in sufficient quantities and duration may result in illness or injury to human health.



WorkSafeNB (n.d). *Legislative Interpretations*. Available at: https://www.worksafenb.ca/docs/Biological-Physical-and-Chemical-Agents.pdf
InterFocus (n.d). *Working in a Laboratory: The Hazards and Risks*. Available at: https://www.mynewlab.com/blog/working-in-a-laboratory-the-hazards-and-risks/

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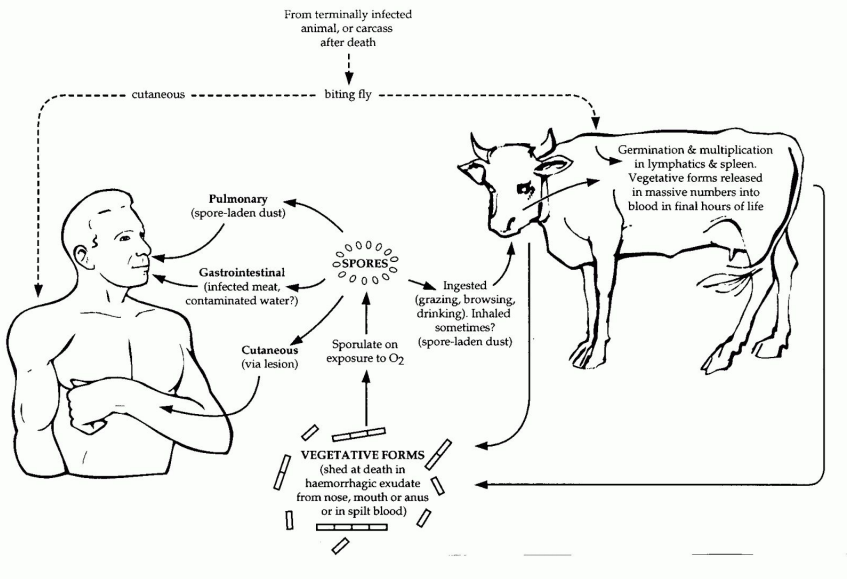
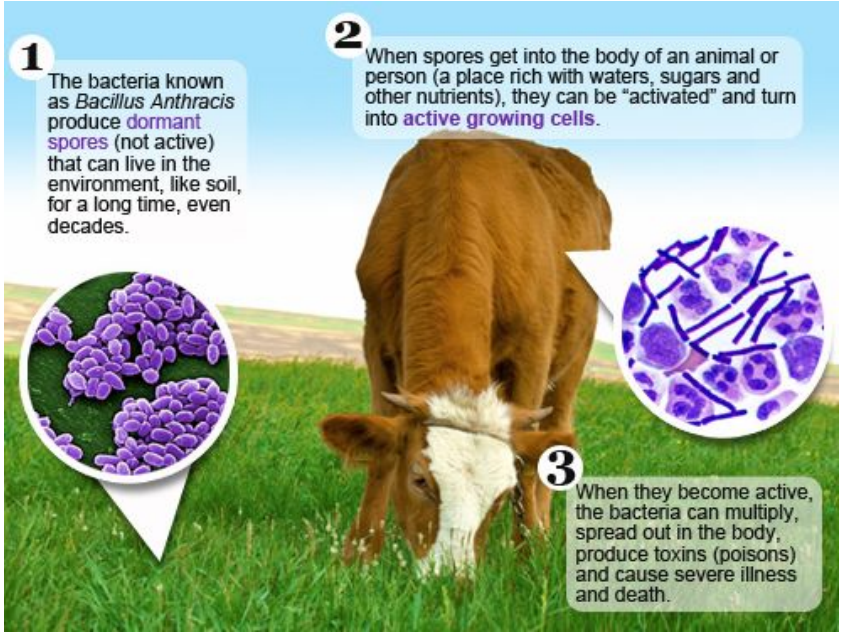
Characteristics of Biological Agents

- Infectivity
- Lethality
- Virulence
- Toxicity
- Incubation period
- Pathogenicity

Diseases Examples (Anthrax)





CDC (2015). *Anthrax* [online]. Available at: https://www.cdc.gov/anthrax/basics/index.html

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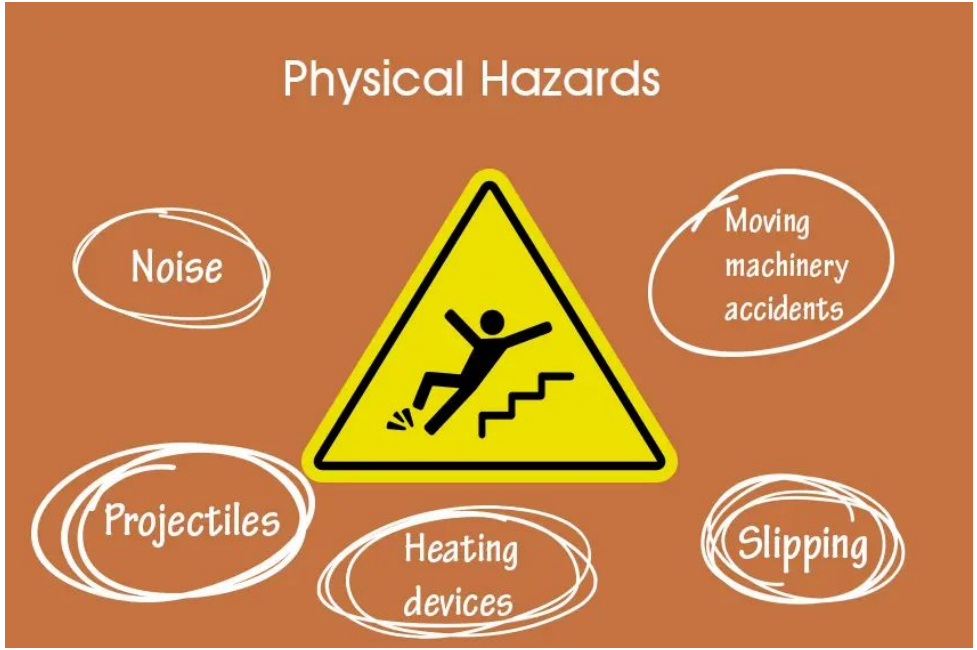
Physical Agents

Physical agent is a term used to describe energies, the exposures to which in sufficient quantities and duration may result in illness or injury to human health.



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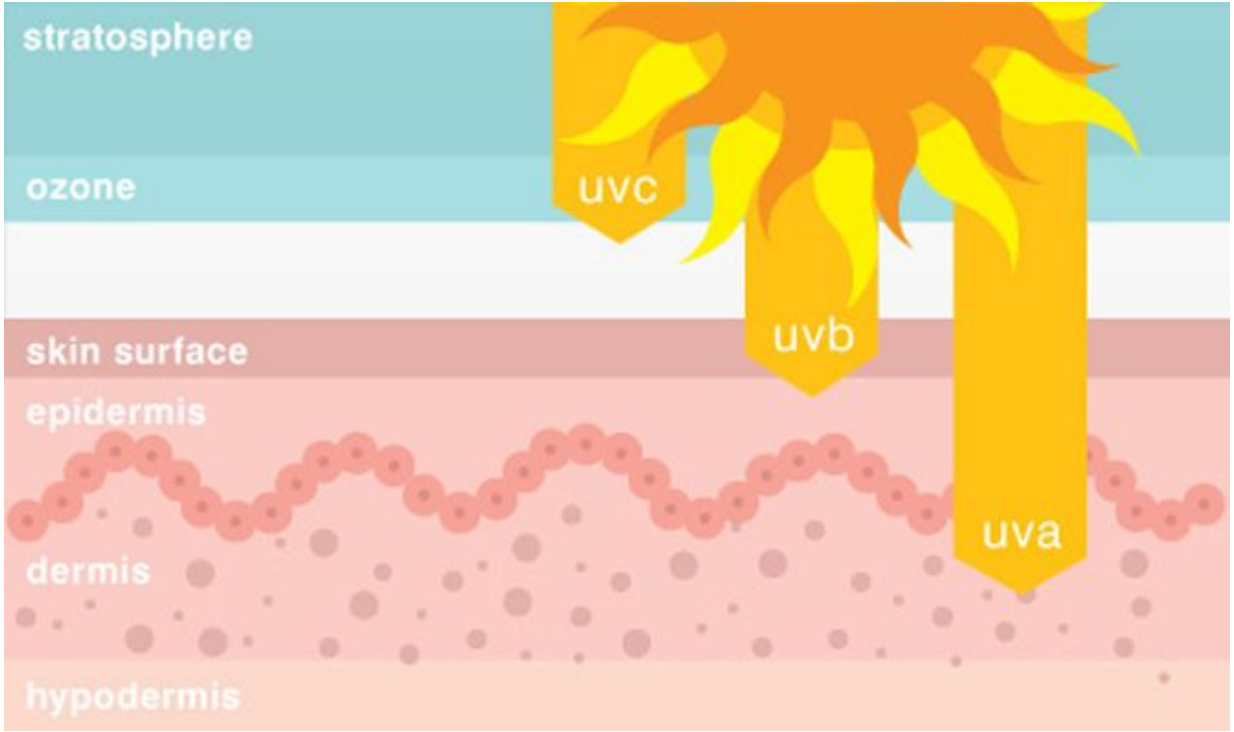
Disease Example (Ultraviolet)

Ultraviolet (UV) rays are a part of sunlight that is an invisible form of radiation.



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Chemical Agents

Chemical agent is a term used to describe all chemical elements and compounds in a natural state or in a processed state and their byproducts, the exposure to which in sufficient quantities and duration may result in illness or injury to human health.

WorkSafeNB (n.d). *Legislative Interpretations*. Available at: https://www.worksafenb.ca/docs/Biological-Physical-and-Chemical-Agents.pdf
InterFocus (n.d). *Working in a Laboratory: The Hazards and Risks*. Available at: https://www.mynewlab.com/blog/working-in-a-laboratory-the-hazards-and-risks/

Classification Based on Principal Intended Effect

Harassing Agents

- People who are exposed are acutely aware of discomfort caused by the agent, but usually remain capable of removing themselves from exposure

Incapacitating Agents

- People exposed to it may not be aware of their predicament or may be rendered unable to function or move away from the exposed environment

Lethal Agents

- Causes the death of those exposed

WHO (n.d). *Biological and Chemical Agents*. Available at https://www.who.int/csr/delibepidemics/chapter3.pdf?ua=1

Disease Example (Itai-Itai)

- Itai-itai disease is caused by cadmium (Cd) exposure, produced as a result of human activities related to industrialisation
- This condition was first recognised in Japan in the 1960s

Patient suffering from prolonged exposure to cadmium (http://2009.igem.org/Team:Cornell/Project/Background)

Nishijo M, Nakagawa H, Suwazono Y, et al. *Causes of death in patients with Itaiitai disease suffering from severe chronic cadmium poisoning: a nested case–control analysis of a follow-up study in Japan.* BMJ Open 2017;7:e015694. doi:10.1136/ bmjopen-2016-015694. Availabe at https://bmjopen.bmj.com/content/bmjopen/7/7/e015694.full.pdf