Heat and Cold in Medicine
L15- Cold in Medicine

Use Cold in Medicine

Cryogenics

Cryogenics defined as that branch of physics, which deals with the production of very low temperatures and their effect on matter. It also defined as the science and technology of temperatures below 120 K. The temperature where gases begin to liquefy.

But in the context of biological matter that is made mostly of water, the so-called cryogenic range is below the freezing temperature of water. This position is not an accident or mistake, but is related to the fact that in biological matter there is a continuity of biophysical processes from 273 K to close to 0 K

The study of low temperature effects in biology and medicine called Cryobiology.

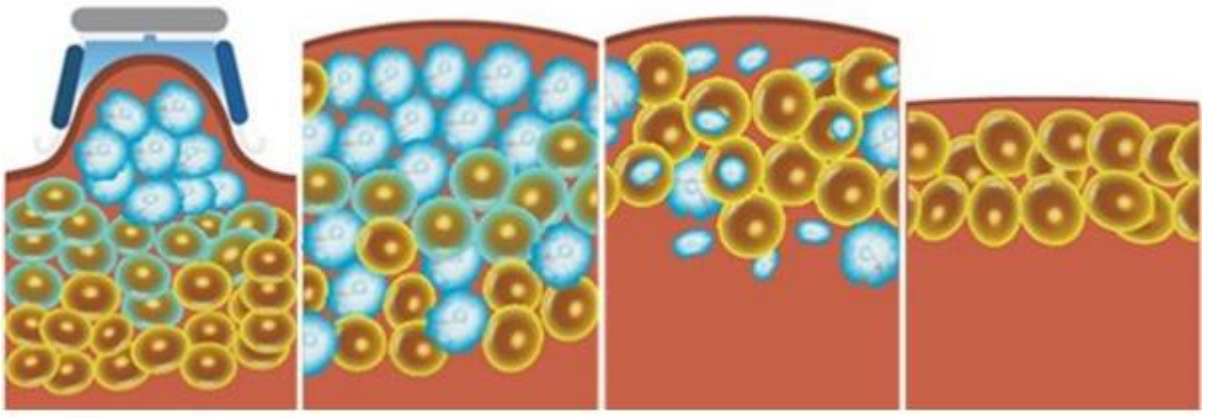
Physical Principles

- **When ice applied to the skin, heat conducted from the skin to the ice in order to melt it.**
- **To change its state, ice requires considerable energy that is known as latent heat of fusion.**

A specific amount of energy required to change the solid form of a particular substance into a liquid, or the liquid into a gas. This energy called Latent Heat and is the energy required to change of state.

Mechanism of action

When the body is vulnerable to extreme cooling, the blood vessels narrowed and make less blood flow to the areas of swelling. Once outside the cryogenic chamber, the vessels expand, and an increased presence of anti-inflammatory proteins, established in the blood. Cryotherapy chamber involves exposing individuals to freezing dry air (below −100 °C) for 2 to 4 minutes.



Cryolipolysisdevice to break up and dissolve fat by cooling

Cryotherapy

Cryotherapy is a treatment where applied extreme cold to freeze and destroy abnormal tissue.

This type of treatment removes damaged or diseased tissue that comes from a variety of medical conditions. Cryotherapy usually done without open surgery. Most people recover quickly from the procedure and with little pain.

During cryotherapy, applies extreme cold to abnormal tissue. Cells can't survive this severe cold and die after treatment.

A few different substances can bee used to create the intense cold used in cryotherapy. These substances can include:

- **Liquid nitrogen.**
- **Liquid nitrous oxide.**
- **Argon gas.**

There are different cryotherapy methods to freeze tissue depends on the location of the abnormal tissue.

External: If the tissue is located on skin, use a spraying device or a cotton swab to apply the freezing agent.

Internal: To treat conditions inside the body, like precancerous cells or a tumor, use an instrument called a cryoprobe. This probe is inserted through a small incision (cut) in the skin.

External cryotherapy causes frozen skin to blister and peel off so that healthy new skin can grow. When abnormal cells freeze and die during internal cryotherapy, your immune system helps clear the tissue out of the body.

Cryosurgery is a minimally invasive treatment. Compared to traditional surgery, it usually has less pain and bleeding and a lower risk of damaging healthy tissue near the abnormal cells.

The risks of cryotherapy are small, but complications can occur. These complications may include:

- **Bleeding, cramping or pain after cryotherapy around the cervix.**
- **Bone fractures.**
- **Nerve damage resulting in loss of feeling.**
- **Swelling, scarring and skin infection.**

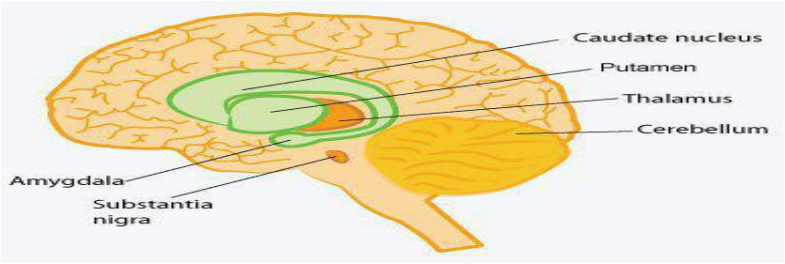
•Cryogenic methods used in medicine. Low temperature have been used for long-term preservation of blood, sperm, bone marrow, and tissues. Studies of their relationship to the hibernation of animals are under way and long term preservation of a person being considered (Cryonics) is the cryopreservation of a person with medical needs that cannot be met by available medicine until resuscitation and healing by future medicine is possible.

- **Bone cancer.**
- **Cervical cancer, liver cancer or prostate cancer.**
- **Precancerous cells in the cervix (lower end of the uterus).**
- **Precancerous skin conditions and early-stage skin cancers, including squamous cell carcinoma and basal cell carcinoma.**
- **Retinoblastoma (cancer of the retina in children).**

Cryosurgery

Cryosurgery is a treatment that uses extreme cold produced by liquid nitrogen or argon gas to destroy cancer cells and abnormal tissue. It is a local treatment, which means that it directed toward a specific part of your body. Cryosurgery used to treat tumors on the skin, as well as certain tumors inside the body. Cryosurgery freezes tissue, causing cells in the treated area to die.

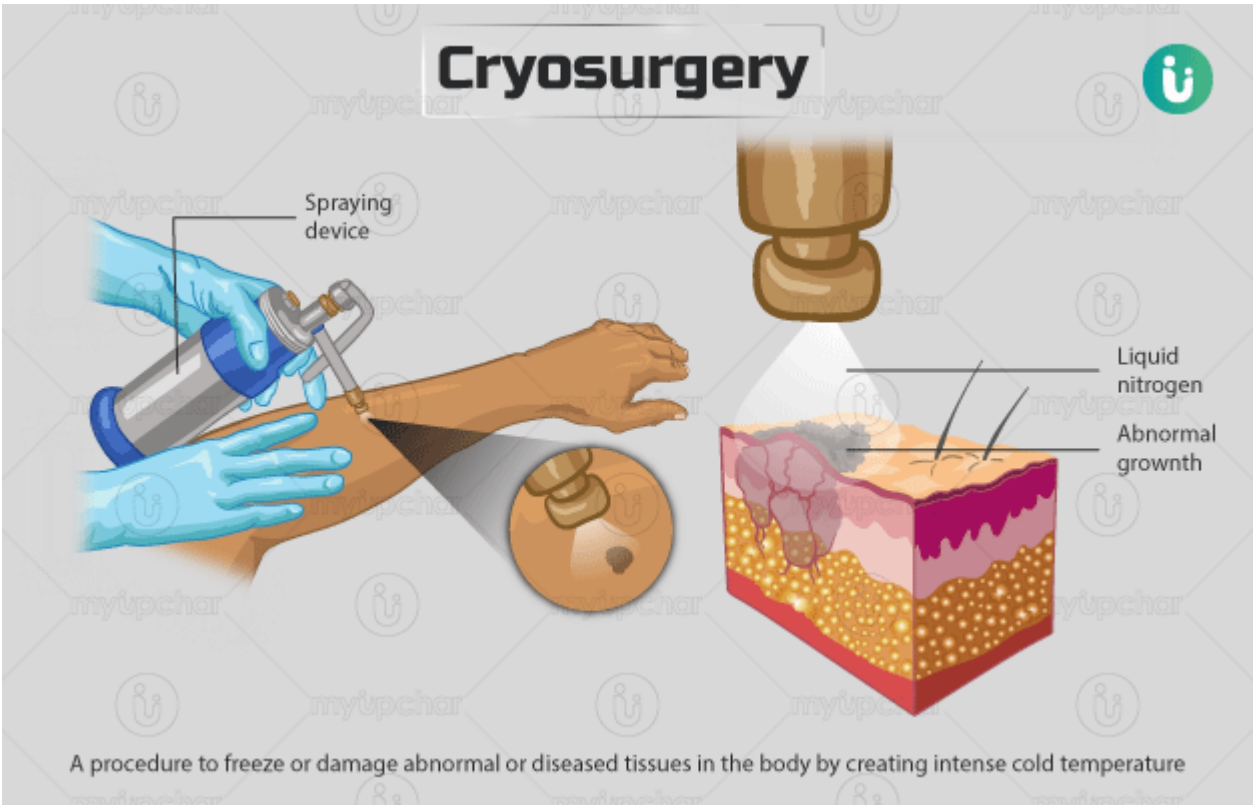
One of uses of cryosurgery was in the treatment of Parkinson's disease. Parkinson's causes uncontrolled tremors in the arms and legs. It is possible to stop the tremors by surgically destroying the part of thalamus in the brain that controls the the transmission of nerve impulses to other parts of the nervous system. One common use of cryosurgery is in the treatment of tumors and warts.



Also use to repair of a detached retina and cataract surgery (the removal of a darkened lens). Perhaps the result of an accident, the retina becomes detached from the wall of eye ball. This produces a blurred spot in the vision because the light rays are not focused at the correct spot. If the a cold tip applied to outside of the eye ball in the vicinity of the detachment, a reaction occurs that acts weld the retina to wall of the eyeball. The technique does not appear to damage the eye. In cryosurgical extraction of the lens, a cold probe is touched to the front surface of the lens. The probe sticks to the lens, making the lens easy to remove.

Cryosurgery has several advantages.

- **For tumors inside the body, only a small cut or puncture is usually needed to insert the cryoprobe through the skin. As a result, pain, bleeding, and other problems that come with surgery are reduced.**
- **Cryosurgery can often be done with local anesthesia and may not require a hospital stay.**
- **Since cryosurgery is a local treatment and doctors can focus treatment on a precise area, damage to nearby healthy tissue can be reduced.**
- **Cryosurgery can be repeated safely and may be used with other cancer treatments.**
- **Cryosurgery may be used when tumors can't be removed with surgery or when people can't have surgery because of their age or other medical problems.**
- **Cryosurgery may be an option when the cancer does not respond to standard treatments.**
- **There is little bleeding in the destroyed area.**
- **The volume of tissue destroyed can be controlled by the temperature of the cryosurgical probe.**
- **There is little pain sensation because low temperatures tend to desensitize the nerves.**


Cryosurgery
Spraying device
Liquid nitrogen
Abnormal grownth
A procedure to freeze or damage abnormal or diseased tissues in the body by creating intense cold temperature