

**L14****Thermoregulation & Heat in Medicine****Heat Therapy**

Heat therapy works by increasing the temperature around an area of your body that is hurting — such as a muscle. When the body's temperature rises, it improves blood flow and circulation, so when increase the temperature in a specific area of the body; it is going to increase the circulation in that particular area.

When you have pain coming from one specific muscle — or set of muscles — increasing circulation helps to relax the muscle, ultimately easing pain and discomfort. Since it improves blood flow and circulation, it can be an effective way to heal damaged tissues, as well.

Two therapeutic effects take place in a heated area;

1. primary there is an increase in metabolism resulting in a **relaxation of the capillary system** (vasodilation).
2. There is an **increase in blood flow** as blood moves in the cool to the heated area. The relaxation and increased blood flow are beneficial to damage tissue.

**The physical methods of producing Heat in the body are:**

**1. The conducted and convection method**

There are two different types of heat therapy: dry heat and moist heat. Both types of heat therapy should aim for “warm” as the ideal temperature instead of “hot.”

- Dry heat (or “conducted heat therapy”) includes sources like heating pads, dry heating packs, and even saunas. This heat is easy to apply.
- Moist heat (or “convection heat”) includes sources like steamed towels, **moist heating packs**, or hot baths. Moist heat may be slightly more effective as well as require less application time for the **same results**.

Heat can transfer by conduction, the quantity of heat transfer **depends on the temperature difference, the time of contact, the area of contact, and the thermal conductivity of the materials**. This can be done by several ways such as hot bath, hot packs, and electric heating pad. This can lead to local surface heating and using in the treatment of arthritis, neuritis, strains, sinusitis and back pain

**2. Radiant (IR) heat**

It is used for heating of the body. Wavelengths used between 800 and 40,000nm. The wave penetrate the skin about 3mm and increase the surface temperature. Excessive exposure causes reddening (erythematic) and sometimes swelling (edema). Irradiative heating is generally used for the same conditions as conductive heating , but is considered to be more effective because the heat penetrates deeper.

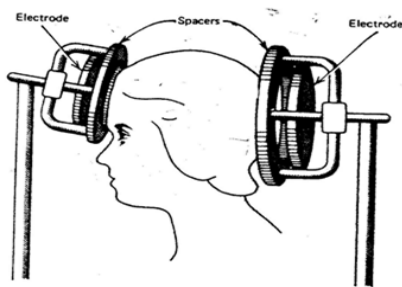
### 3. Alternating electric current (short wave).

Heat from diathermy penetrates deeper into the body than radiant and conductive heat. It is useful for internal heating and has been used in the treatment of inflammation of skeleton, bursitis and neuralgia.

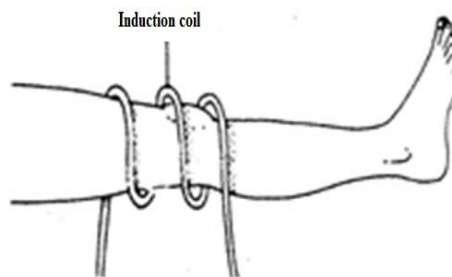
#### Methods of short wave diathermy.

Two different methods are used for transferring the electromagnetic energy into the body in short wave diathermy.

1. In one, the part of the body to be treated is placed between two metal plate-like electrodes energized by the high –frequency voltage. The body tissue between the plates acts like an electrolytic solution. The charged particles are attracted to one plate and the other depending upon the sign of the alternating voltage on the plates: this results in resistive heating (The resistance to electrical flow that exists in the tissue causes the formation of heat; resulting in an increase in temperature of water in tissue .)



Location of capacitor plates for short wavy diathermy



Location of induction coil around knee for short-wave.

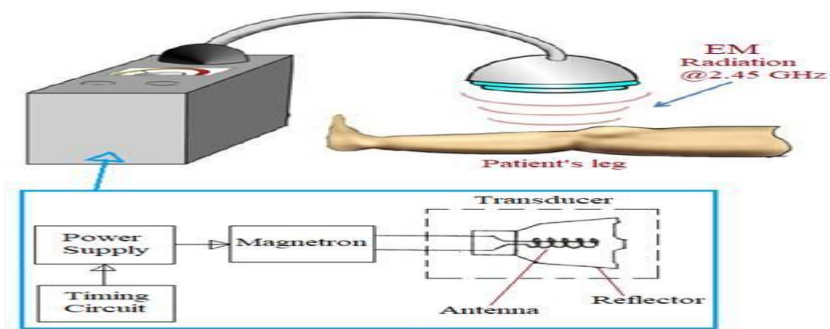
2. The second method of transferring short wave energy into the body is magnetic induction. A coil is placed around the body region to be treated. The alternating current in the coil results in an alternating magnetic field in the tissue, producing joule heating in the body region being treated. It has been used in relieving muscle spasms, pain from protruded intervertebral discs, degenerative joint disease, and bursitis.

### 4. Microwave diathermy

Is usually easier to apply than short wave diathermy. The microwaves are produced in a special tube called a magnetron and are then emitted from the applicator (antenna). The antenna is usually designed so that it can be placed several inches from the region to be treated. Microwaves from antenna penetrate deep into the tissue, causing a temperature rise and deep heating.

The frequency used in microwave diathermy is 2450 MHz, causing more uniform heating around body region.

Microwave is used in the treatment of fractures, sprains and strains, bursitis, injuries to tendons, and arthritis.



## 5. Ultrasound waves

Also used for deep heating of body tissue. These waves are completely different from electromagnetic waves. They produce mechanical motion like audible sound waves except the frequency is much higher (usually near 1MHz).

In ultrasonic diathermy, power levels of several watts per square centimeter are usually used and the sound source is directly in contact with the body.

As the ultrasonic wave move through the body, the practices in the tissues move back and forth. The movement is similar to micro massage and results in heating of the tissues.

Ultrasonic therapy or ultrasonic diathermy products used in physical therapy equipment produce high-frequency sound waves that travel deep into tissue and create gentle therapeutic heat.

Ultrasonic diathermy is intended to generate deep heat within body tissues for the treatment of selected medical conditions such as pain, muscle spasms and joint contractures. Ultrasonic heating has been found useful in relieving the tightness and scarring that often occur in joint disease. It greatly aids joints that have limited motion. It useful for depositing heat in the bones because the absorb ultrasound energy more effectively than does soft tissue, but not for the treatment of malignancies.

Ultrasound and electromagnetic diathermy (both shortwave and microwave) have useful roles in treating sports injuries. Ultrasound can control inflammation, improve collagen elasticity, and deliver medication to selected tissues. Electromagnetic diathermy is an alternative to ultrasound for alleviating muscle or joint contractures, muscle spasm, and pain. Knowing the indications and contraindications of these modalities can help physicians make the best use of these treatment options.

