

INFRA-RED RADIATION

By

Yasser Moh. Aneis, PhD, MSc., PT.

Lecturer of Physical Therapy

Basic Sciences Department

Cairo University

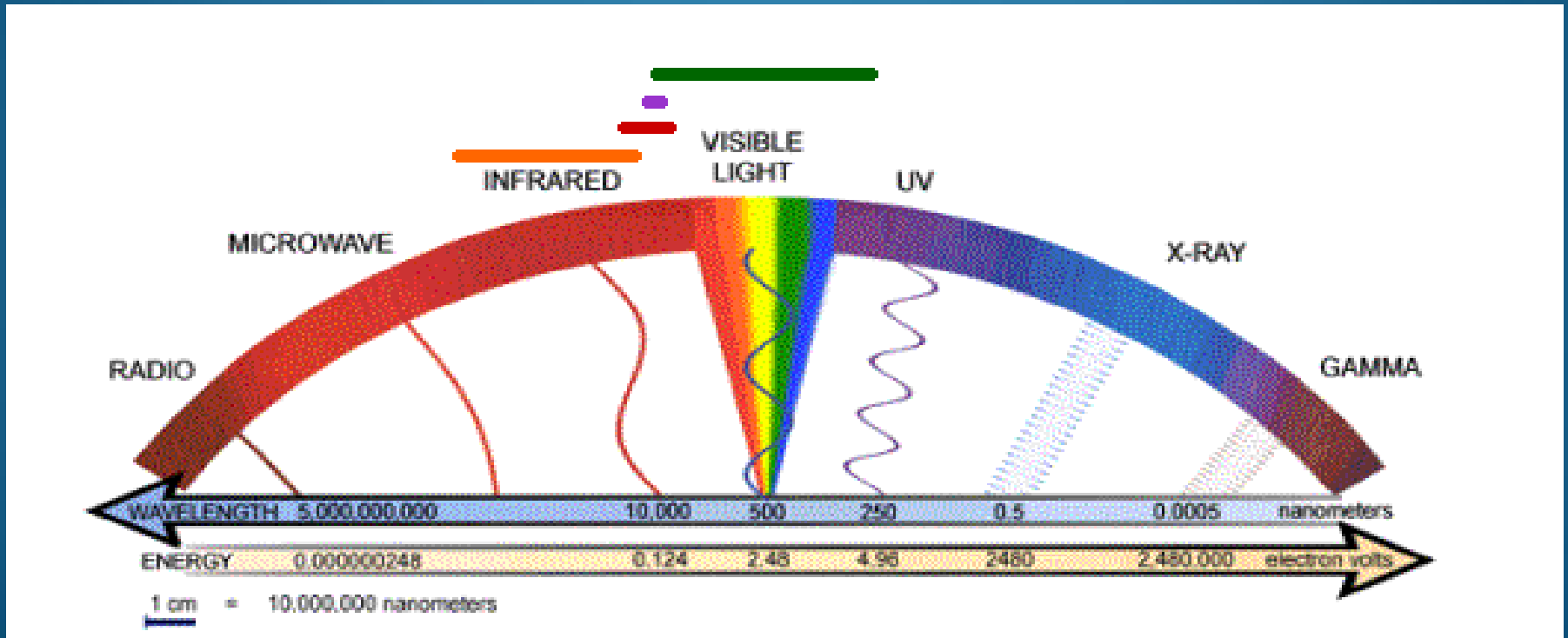
Learning Objectives

By the end of this lecture each student should be able to;

- Define Infrared radiations (IRR).
- Distinguish between different types of (IRR).
- Describe production of (IRR).
- Mention source of (IRR).
- Recognize physiological effects of (IRR).
- Describe indication and contraindication of (IRR).
- Apply (IRR) to patients.

Infrared Radiations

- ✓ Electromagnetic radiation that lies within that part of the electromagnetic spectrum between visible light and microwave radiation.



wavelength from 760nm to 1 mm

Infrared Radiations

- ✓ IRR can be subdivided into 3 regions (A,B &C) according to their absorption and their effect upon the tissue.

Type	Wavelength	Penetration
IRA (short or near IR)	760 - 1400 nm	5 mm reach to dermis
IRB (long or far IR)	1400 – 3000 nm	Up to 1 mm to epidermis
IRC	3000nm – 1 mm	Not used therapeutically

- ✓ Superficial heat emitted from any heated body, with consideration that the higher the temperature of the body the more the frequency of the emitted IRR.

Production of IR Radiation

- ✓ Infrared radiations are produced as a result of molecular motion within heated materials.
- ✓ An increase in temperature above absolute zero results in the vibration or rotation of molecules within the material.
- ✓ The wavelength of the emitted IR is dependent on the temperature of the material.
- ✓ The higher the temperature of the body, the higher the frequency, and the shorter the wavelength.

Sources of IR Radiation

- **Natural sources: The sun**
- **Artificial sources:**
 - I. **Luminous sources**
 - II. **Non-luminous sources**

Luminous sources

- Radiant generators made of tungsten filament within a glass bulb which contain an inert gas at low pressure.
- Part of the glass bulb is silvered to provide a reflector.
- Luminous sources emit mainly:
 - Short or near IR (IRA)
 - Visible light
 - Ultraviolet

Non-luminous sources

- Non-luminous sources are those which produce infrared radiation from a non-glowing source, such as moist heat packs and non-luminous IR lamps.
- Non-luminous infrared lamp consists of a coiled resistance wire embedded within a ceramic insulating material.
- Non - luminous sources emit mainly long or far IR radiation in addition to visible light.

Absorption and penetration of IRR

- IRR is strongly absorbed near the skin surface and the heat is carried to deeper tissues by conduction and by the circulating fluids.
- *The pattern of IRR absorption and penetration is variable according to:*
 - Skin structure.
 - Vascularity.
 - Pigmentation of the skin.
 - Wavelength of the radiation.

Physiological Effects of Infrared

Physiological changes are dependent upon several factors, including:

- Extent of the temperature rise.
- Rate at which energy is being added to the tissue.
- Volume of tissue exposed.
- Composition of the absorbing tissue.
- Capacity of the tissue to dissipate heat .

Physiological Effects of Infrared

✓IRR is considered as superficial heating modality.

- Cutaneous vasodilatation
- Increase in metabolism
- Increase in tissue extensibility
- Pain control

Cutaneous vasodilatation

✓ **Vasodilatation occurs as a result of three factors;**

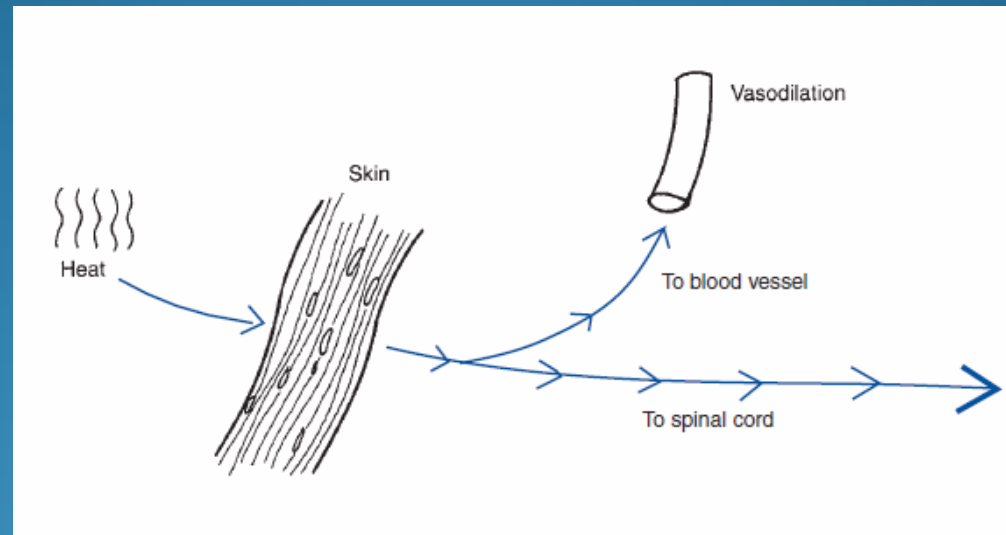
-An axon reflex.

-Release of chemical mediators.

- Local spinal cord reflexes.

Axon Reflex Mechanism

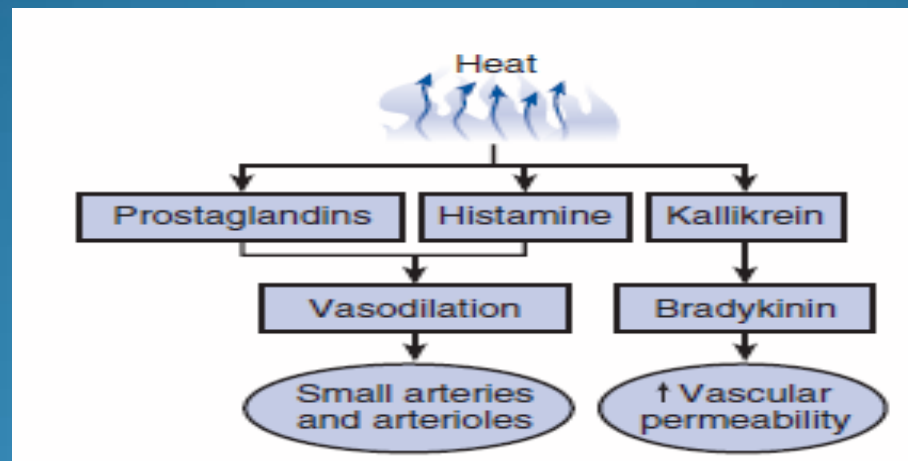
Cutaneous thermoreceptors stimulation carry afferents impulses to the spinal cord..



Some of these impulses are carried antidromically toward skin blood vessels, and a vasoactive mediator is released.

Release of Chemical Mediators

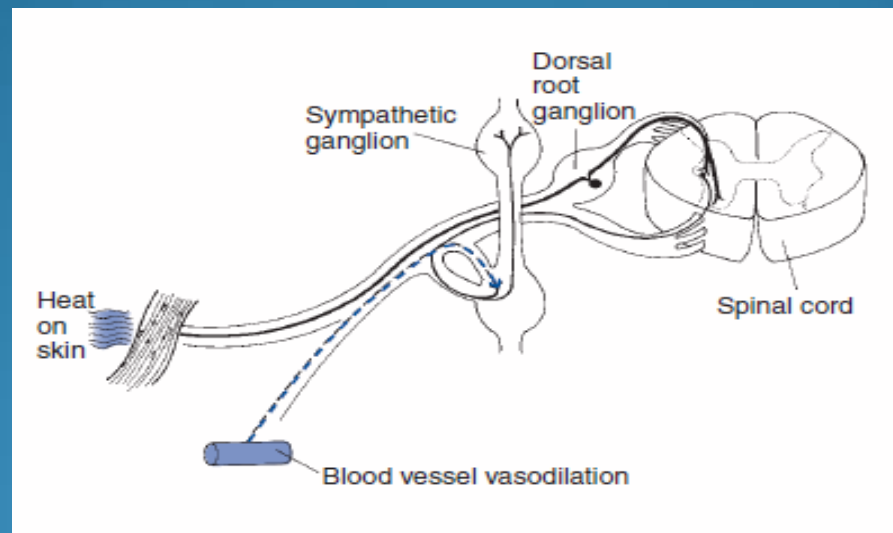
Chemical mediators of inflammation are released and act on vessels to cause vasodilatation.



The enzyme kallikrein released from the sweat glands acts to release bradykinin that increase the capillary and venule permeability.

Local Spinal Cord Reflexes

-Cutaneous afferent stimulation leads to decrease in postganglionic sympathetic adrenergic nerve activity to the smooth muscles of blood vessels.



-This reflex response leads to a Vasodilatory effects in areas remote from the application site.

Increase in Metabolism

- Cell activity and metabolic rate increases two to three times for each 10°C increase.
- Increase in oxygen uptake by tissues.
- More nutrients will be available to promote tissue healing.
- Increase metabolic activities lead to improve overall cell function.

Increase in Tissue Extensibility

✓IRR leads to increase the extensibility of connective tissue through,

- Increased elasticity.
- Decreased viscosity.
- Decreased joint stiffness.
- Increased muscle flexibility

✓infrared should be used in conjunction with stretching and ROM exercises.

Pain Control

IRR leads to relief of pain by through;

- Stimulation of sensory nerves leads to inhibition of pain at the spinal level.
- Decreased activity of muscle spindle leads to decrease muscle spasm.
- Increased pain threshold.
- Removal of waste products as a result of improving circulation and increase venous return.

Indications of IRR

- Painful conditions.
- Muscle spasm.
- Acceleration of healing.
- Sub-acute and chronic inflammation.
- Prior to stretching and mobilization exercises.
- Some skin conditions as fungal infection.

Contra-Indications of IRR

- Acute inflammation.
- Acute infection.
- Open wounds.
- Impaired sensation.
- Impaired circulation.
- Over pregnant uterus.
- Over malignant tissue.
- Eyes.
- Unreliable patients.
- Following deep X-ray therapy.

Clinical Application of IRR



Preparation of the Patient

- Check the patient for any contra-indication.
- Apply a sensory test (Thermal sensation).
- Explain the procedure to the patient.
- Put the patient in a suitable and comfortable position.
- Explain to the patient the sensation experienced (mild to moderate warmth).

Preparation of the Device

- Choose the appropriate generator;
 - I. Luminous: produce more heat and deeper penetration.
 - II. Non-luminous: less heat, more superficial penetration.
- The lamp should be 50-75 cm from the skin.
- Ensure that the rays fall perpendicular to the skin.
- Check the heat by the back of your hand.

Technique of Application

- The lamp should be turned on 5-15 min before application depending on its type. (Luminous: 5min and non-luminous: 15 min).
- Remove any superficial metal or tight clothes.
- Position the lamp so that the rays fall perpendicular to the skin.
- Turn on the lamp, and check the temperature on the patient's skin.
- The patient should feel mild comfortable warmth, more heat might cause burn

Technique of Application

- Session's duration is 15-20 minutes, 3 times/week.
- Intensity depends on the distance from the skin.
- Instruct the patient not to look to the lamp, move or touch the lamp and to report any discomfort.
- During the session, regularly dry the skin to avoid burning.
- At the end check the skin for erythema, usually there is mottled erythema without any discomfort.

DANGERS

Burns: Due to impaired sensation and circulation.

Dehydration: Due to excess sweating caused by prolonged application over large area of the body.

Lowered blood pressure: Due to excess sweating, and marked vasodilatation especially in elderly.

Eye damage: Occurs when the patient looks directly into the lamp(dryness or irritation).



THANK YOU