ELECTRICITY AND ITS THERAPEUTIC USES

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1. DEFINITION AND TYPES OF ELECTRICITY

1.1 Definition of Electricity

Electricity is a form of energy that results from the movement and interaction of **charged particles**, such as **electrons (negative)** and **ions (positive or negative)**.

It plays a crucial role in everyday life, powering electronic devices, generating heat, and serving various **medical and therapeutic purposes**.

1.2 Types of Electricity

Electricity is classified into two major forms:

1.2.1 Static Electricity

Definition: Static electricity is the **accumulation of electrical charges** on the surface of an object, typically caused by **friction**.

Key Characteristics:

Charges remain in one place (do not flow).

Temporary and usually discharged quickly when contact is made.

Example: Rubbing a balloon on your hair causes the balloon to attract small paper pieces due to the static charge.

1.2.2 Current Electricity

Definition: Current electricity involves the **flow of electrons** through a conductor (like a wire).

Components:

Source (e.g., battery or generator)

Conductor (e.g., copper wire)

Load (e.g., a lamp or therapeutic device)

Types of Current Electricity

Direct Current (DC)

Definition: Electrons flow in **one direction only**.

Source: Batteries, solar cells.

Applications: Used in iontophoresis and galvanic treatments in therapy.

Alternating Current (AC)

Definition: Electrons **change direction periodically**.

Source: Power plants, wall outlets.

Applications: Household appliances, electric heaters, and some medical equipment.

Pulsed Current

Definition: Intermittent delivery of electrical current in the form of **pulses**.

Used in: Electrotherapy (e.g., TENS, NMES).

Benefit: Allows controlled stimulation with rest intervals to reduce fatigue.

Galvanic Current

Definition: A **continuous direct current** used in medical treatments.

Used for: Drug delivery (iontophoresis), tissue healing, and desensitization.

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2. THERAPEUTIC USES OF ELECTRICITY

Electricity is widely used in **physical therapy, rehabilitation, and medicine** for various healing and pain-relief purposes.

2.1 Pain Relief – TENS (Transcutaneous Electrical Nerve Stimulation)

Purpose: Reduce acute or chronic pain.

Mechanism:

Stimulates **sensory nerves**.

Blocks pain signals from reaching the brain via the spinal cord.

Encourages the release of **endorphins** (natural painkillers).

Applications:

Lower back pain.

Osteoarthritis.

Neuropathic pain.

Postoperative pain.

2.2 Muscle Stimulation – NMES (Neuromuscular Electrical Stimulation)

Purpose: Strengthen muscles and improve motor control.

Mechanism:

Delivers electrical impulses to **motor nerves**.

Produces **controlled muscle contractions**.

Applications:

Post-surgical muscle re-education.

Stroke rehabilitation.

Prevention of muscle atrophy in immobile patients.

2.3 Wound Healing

Purpose: Accelerate the **repair and regeneration** of damaged skin and tissue.

Mechanism:

Enhances **circulation** to the wound area.

Stimulates **cell proliferation and migration**.

Increases **oxygen and nutrient supply**.

Applications:

Pressure ulcers.

Diabetic wounds.

Surgical incisions.

2.4 Fracture Healing – Bone Growth Stimulation

Purpose: Support **bone regeneration** and healing of non-union fractures.

Mechanism:

Stimulates **osteoblast activity** (cells responsible for bone formation).

Encourages **calcium deposition**.

Enhances **callus formation**.

Applications:

Delayed or non-healing fractures.

Osteoporotic bone conditions.

Spinal fusion surgeries.

2.5 Iontophoresis

Purpose: Deliver **medications transdermally** (through the skin) using direct current.

Mechanism:

Uses **Galvanic current** to drive **ionized drugs** into the target tissue.

No need for needles or oral intake.

Applications:

Inflammation (e.g., tendonitis).

Scar tissue management.

Localized pain treatment.

Common Drugs Used:

Dexamethasone (anti-inflammatory).

Lidocaine (local anesthetic).

2.6 Edema Reduction

Purpose: Decrease swelling and promote fluid movement.

Mechanism:

Stimulates **muscle contractions** to improve **lymphatic and venous return**.

Reduces **fluid accumulation** in tissues.

Applications:

Post-injury swelling.

Postoperative edema.

Lymphatic drainage in chronic conditions.

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3. SAFETY AND PRECAUTIONS IN ELECTROTHERAPY

3.1 Contraindications

Pacemakers or implanted electronic devices.

Pregnancy (especially in the abdominal or pelvic region).

Epilepsy.

Malignant tumors.

Areas with broken skin (unless treated wounds).

3.2 Precautions

Always check skin integrity before and after treatment.

Use appropriate intensity and duration.
Monitor patient feedback during therapy.
Ensure electrodes are placed correctly.