

The Muscular System

**SPECIALIZED TISSUE THAT ENABLE
THE BODY AND ITS PARTS TO MOVE.**

Anterior View



Posterior View



FUNCTIONS OF THE MUSCLES

- **MOVEMENT**
- **MAINTENANCE OF POSTURE AND MUSCLE TONE**
- **HEAT PRODUCTION**
- **PROTECTS THE BONES AND INTERNAL ORGANS.**

MUSCLE CLASSIFICATION

FUNCTIONALLY

- **VOLUNTARILY** — CAN BE MOVED AT WILL
- **INVOLUNTARILY** — CAN'T BE MOVED INTENTIONALLY

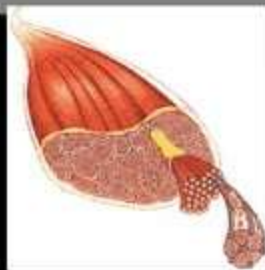
STRUCTURALLY

- **STRIATED** — HAVE STRIPES ACROSS THE FIBER
- **SMOOTH** — NO STRIATIONS

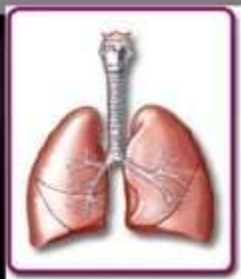
THE 3 TYPES OF MUSCLES

Types of Muscle

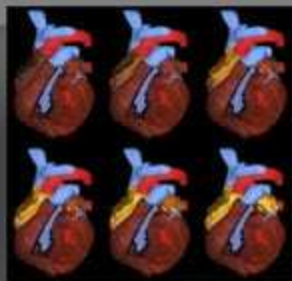
skeletal Muscle



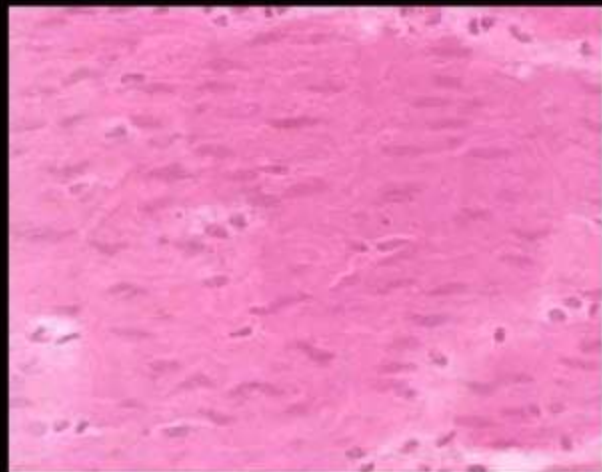
smooth Muscle



cardiac Muscle



SMOOTH MUSCLE



**FIBERS ARE THIN
AND SPINDLE
SHAPED.**

NO STRIATIONS

SINGLE NUCLEI

INVOLUNTARY

**CONTRACTS
SLOWLY**

SMOOTH MUSCLE

THEY FATIGUE... BUT VERY SLOWLY

FOUND IN THE CIRCULATORY SYSTEM

- LINING OF THE BLOOD VESSELS
- HELPS IN THE CIRCULATION OF THE BLOOD

FOUND IN THE DIGESTIVE SYSTEM

- ESOPHAGUS, STOMACH, INTESTINE
- CONTROLS DIGESTION

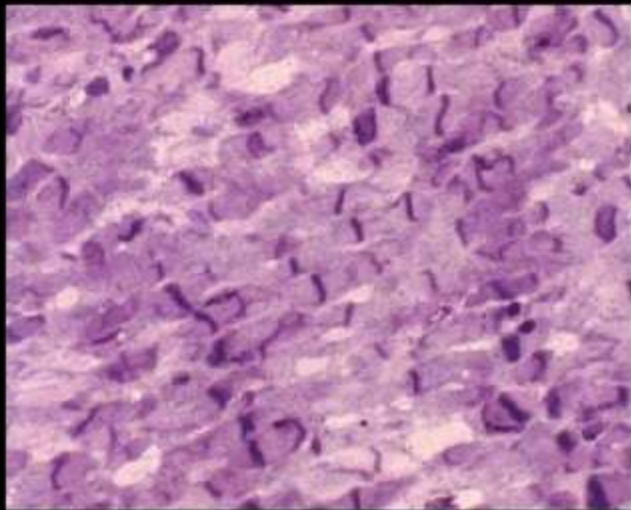
FOUND IN THE RESPIRATORY SYSTEM

- CONTROLS BREATHING

FOUND IN THE URINARY SYSTEM

- URINARY BLADDER
- CONTROLS URINATION

Cardiac Muscle



Cells are branched and appear fused with one another

Has striations

Each cell has a central nuclei

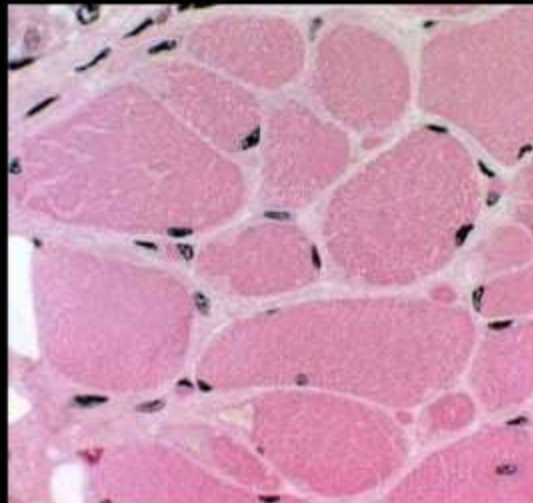
Involuntary

CARDIAC MUSCLE

- Found **ONLY** in the heart

- Contractions of the heart muscles pump blood throughout the body and account for the heartbeat.

SKELETAL MUSCLE



- **FIBERS ARE LONG AND CYLINDRICAL**
- **HAS MANY NUCLEI**
- **HAS STRIATIONS**
 - HAVE ALTERNATING DARK AND LIGHT BANDS**
- **VOLUNTARY**

FUNCTIONS OF SKELETAL MUSCLE

MAINTENANCE OF POSTURE OR MUSCLE TONE

- WE ARE ABLE TO MAINTAIN OUR BODY POSITION BECAUSE OF TONIC CONTRACTIONS IN OUR SKELETAL MUSCLES. THESE CONTRACTIONS DON'T PRODUCE MOVEMENT YET HOLD OUR MUSCLES IN POSITION.

HEAT PRODUCTION – CONTRACTION OF MUSCLES PRODUCES MOST OF THE HEAT REQUIRED TO MAINTAIN BODY TEMPERATURE.

Structure of Skeletal Muscle

COMPOSED OF STRIATED MUSCLE CELLS (=MUSCLE FIBERS) AND CONNECTIVE TISSUE.

- MOST MUSCLES ATTACH TO 2 BONES THAT HAVE A MOVEABLE JOINT BETWEEN THEM.
 - THE ATTACHMENT TO THE BONE THAT DOES NOT MOVE IS THE ORIGIN.
 - THE ATTACHMENT TO THE BONE THAT MOVES IS THE INSERTION.
- TENDONS ANCHOR MUSCLE FIRMLY TO BONES. TENDONS ARE MADE OF DENSE FIBROUS CONNECTIVE TISSUE.
- LIGAMENTS CONNECT BONE TO BONE AT A JOINT.

STRUCTURE OF SKELETAL MUSCLE

MICROSCOPIC ANATOMY

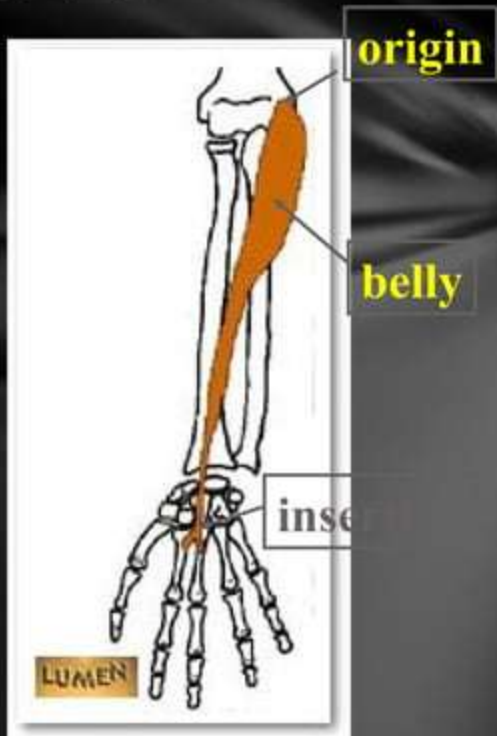
- MUSCLE CELLS (FIBERS) ARE GROUPED IN A HIGHLY ORGANIZED WAY IN THE MUSCLE. THE MEMBRANE THAT SURROUNDS THE MUSCLE CELL IS CALLED THE SARCOLEMMMA.
- MUSCLE CELLS ARE FILLED WITH 2 TYPES OF FINE THREADLIKE PROTEINS CALLED MYOFILAMENTS: MYOSIN (THICK) AND ACTIN (THIN). THESE STRUCTURES SLIDE PAST EACH OTHER CAUSING THE MUSCLE CELL TO CONTRACT OR SHORTEN.
- THE MYOFILAMENTS ARE ARRANGED IN THE CELLS IN SMALL UNITS CALLED SARCOMERES.

MOVEMENT OF MUSCLES

ORIGIN: THE ATTACHMENT OF THE MUSCLE TO THE BONE THAT REMAINS STATIONARY

INSERTION: THE ATTACHMENT OF THE MUSCLE TO THE BONE THAT MOVES

BELLY: THE FLESHY PART OF THE MUSCLE BETWEEN THE TENDONS OF ORIGIN AND/OR INSERTION



MOVEMENT OF SKELETAL MUSCLE

-THESE MUSCLES MOVE WHEN THE BRAIN SENDS MESSAGES TO THE MUSCLE

•ALWAYS WORK IN PAIRS

2 MOVEMENTS OF SKELETAL MUSCLE

•CONTRACTION (SHORTEN)

•EXTENSION (LENGTHEN)

CATEGORIES OF SKELETAL MUSCLE ACTIONS

CATEGORIES

ACTIONS

EXTENSOR
JOINT

INCREASES THE ANGLE AT A

FLEXOR

DECREASES THE ANGLE AT A JOINT

ABDUCTOR
BODY

MOVES LIMB AWAY FROM MIDLINE OF

ADDUCTOR
BODY

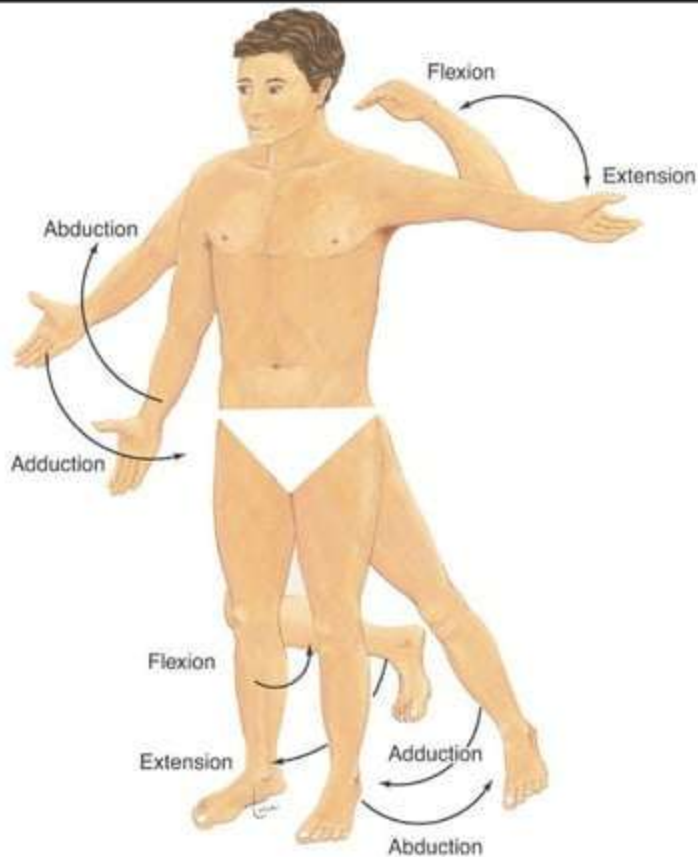
MOVES LIMB TOWARD MIDLINE OF

ROTATOR

ROTATES A BONE ALONG ITS AXIS

SPHINCTER

CONSTRICTS AN OPENING



PRACTICE THESE MOVEMENTS

1. BEND ARM

- BICEPS → CONTRACT
- TRICEPS → EXTEND

2. STRAIGHTEN ARM

- BICEPS → EXTEND
- TRICEPS → CONTRACT

3. BEND KNEE

- QUADRICEPS → EXTEND
- HAMSTRINGS → CONTRACT

MORE MOVEMENTS

4. STRAIGHTEN KNEE

- QUADRICEPS → CONTRACT
- HAMSTRINGS → EXTEND

5. CRUNCHES

- ABDOMEN → CONTRACT
- BACK MUSCLES → EXTEND

6. POINT TOES

- CALF MUSCLE → CONTRACT
- SHIN MUSCLE → EXTEND

MUSCLES NAMED BY LOCATION

EPICRANIUS

(AROUND CRANIUM)

TIBIALIS ANTERIOR

(FRONT OF TIBIA)



MUSCLES

SHAPE:

- DELTOID (TRIANGLE)
- TRAPEZIUS (TRAPEZOID, 2 PARALLEL SIDES)
- SERRATUS (SAW-TOOTHED)
- RHOMBOIDEUS (RHOMBOID, 4 PARALLEL SIDES)
- ORBICULARIS AND SPHINCTERS (CIRCULAR)

TRAPEZIUS

DELTOID



SERRATUS ANTERIOR



RHOMBOIDEUS
MAJOR

MUSCLES NAMED BY SIZE

MAXIMUS (LARGEST)

MINIMIS (SMALLEST)

LONGUS (LONGEST)

BREVIS (SHORT)

MAJOR (LARGE)

MINOR (SMALL)

PSOAS
MINOR

PSOAS
MAJOR



MUSCLES NAMED BY DIRECTION OF FIBERS

RECTUS
(STRAIGHT)

-PARALLEL TO
LONG AXIS

TRANSVERSE

OBLIQUE



RECTUS
ABDOMINIS



MUSCLES NAMED FOR NUMBER OF ORIGINS

BICEPS (2)

TRICEPS (3)

**QUADRICEPS
(4)**

**BICEPS
BRACHII**



MUSCLES NAMED FOR ACTION

**FLEXOR CARPI RADIALIS
(EXTENSOR CARPI RADIALIS)**

— FLEXES WRIST

**ABDUCTOR POLLICIS BREVIS
(ADDUCTOR POLLICIS)**

— FLEXES THUMB

ABDUCTOR MAGNUS

— ABDUCTS THIGH

EXTENSOR DIGITORUM

— EXTENDS FINGERS



MUSCULAR SYSTEM DISEASES AND DISORDERS

FIBROMYALGIA

CHRONIC, WIDESPREAD PAIN IN SPECIFIC MUSCLE SITES.

SYMPTOMS:

1. MUSCLE STIFFNESS
2. NUMBNESS OR TINGLING IN THE ARMS OR LEGS
3. FATIGUE
4. SLEEP DISTURBANCES
5. HEADACHES
6. DEPRESSION

MUSCULAR DYSTROPHY

GROUP OF INHERITED DISEASES

LEADS TO A CHRONIC PROGRESSIVE MUSCLE ATROPHY (MUSCLES SHRINK IN SIZE AND LOSE STRENGTH)

USUALLY APPEARS IN EARLY CHILDHOOD

MOST TYPES RESULT IN TOTAL DISABILITY AND EARLY DEATH

MYASTHENIA GRAVIS

CHRONIC CONDITION IN WHICH NERVE IMPULSES
ARE NOT TRANSMITTED PROPERLY TO THE MUSCLES

LEADS TO PROGRESSIVE MUSCULAR WEAKNESS AND
PARALYSIS

FATAL WHEN IT AFFECTS RESPIRATORY MUSCLES

MUSCLE CRAMPS

**SUDDEN, PAINFUL, INVOLUNTARY CONTRACTIONS
OF MUSCLES**

USUALLY OCCUR IN LEGS OR FEET

**MAY RESULT FROM OVEREXERTION, LOW
ELECTROLYTE LEVELS, OR POOR CIRCULATION**

STRAIN

OVERSTRETCHING OR INJURY TO A MUSCLE AND/OR TENDONS

FREQUENT SITES INCLUDE THE BACK, ARMS, AND LEGS

PROLONGED OR SUDDEN MUSCLE EXERTION IS USUALLY CAUSE

TRIVIA!

How many muscles are there in the human body?

- Answer: 640 Muscles
- The muscles make up about 40 % of the body mass.

What is the longest muscle in the body?

- Answer: *The Sartorius*
- The *Sartorius* runs from the outside of the hip, down and across to the inside of the knee. It twists and pulls the thigh outwards.

What is the smallest muscle in the body?

- Answer: *The Stapedius*
- The *Stapedius* is located deep in the ear. It is only 5mm long and thinner than cotton thread. It is involved in hearing.

What is the biggest muscle in the body?

- Answer: *The Gluteus Maximus*
- The *Gluteus Maximus* is located in the buttock. It pulls the leg backwards powerfully for walking and running.

- There are muscles in your root hair that give you goose bumps.
- The hardest working muscle is in the eye. It approximately move more than 100,000 times a day.
- Contrary to what people say, muscles do not push, but can only pull.
- Masseters or chewing muscles are the strongest muscle in the body.
- As the body gets cold, heat is generated due to shivering which causes rapid muscle contractions.
- Muscles can tear in similar manner like you tear your ligaments or break your bones, and over a period of time with minimal help, they can mend themselves.



There are about 60 muscles in the face.

*Smiling is easier than
frowning.*



*Smile and make someone
happy.*