

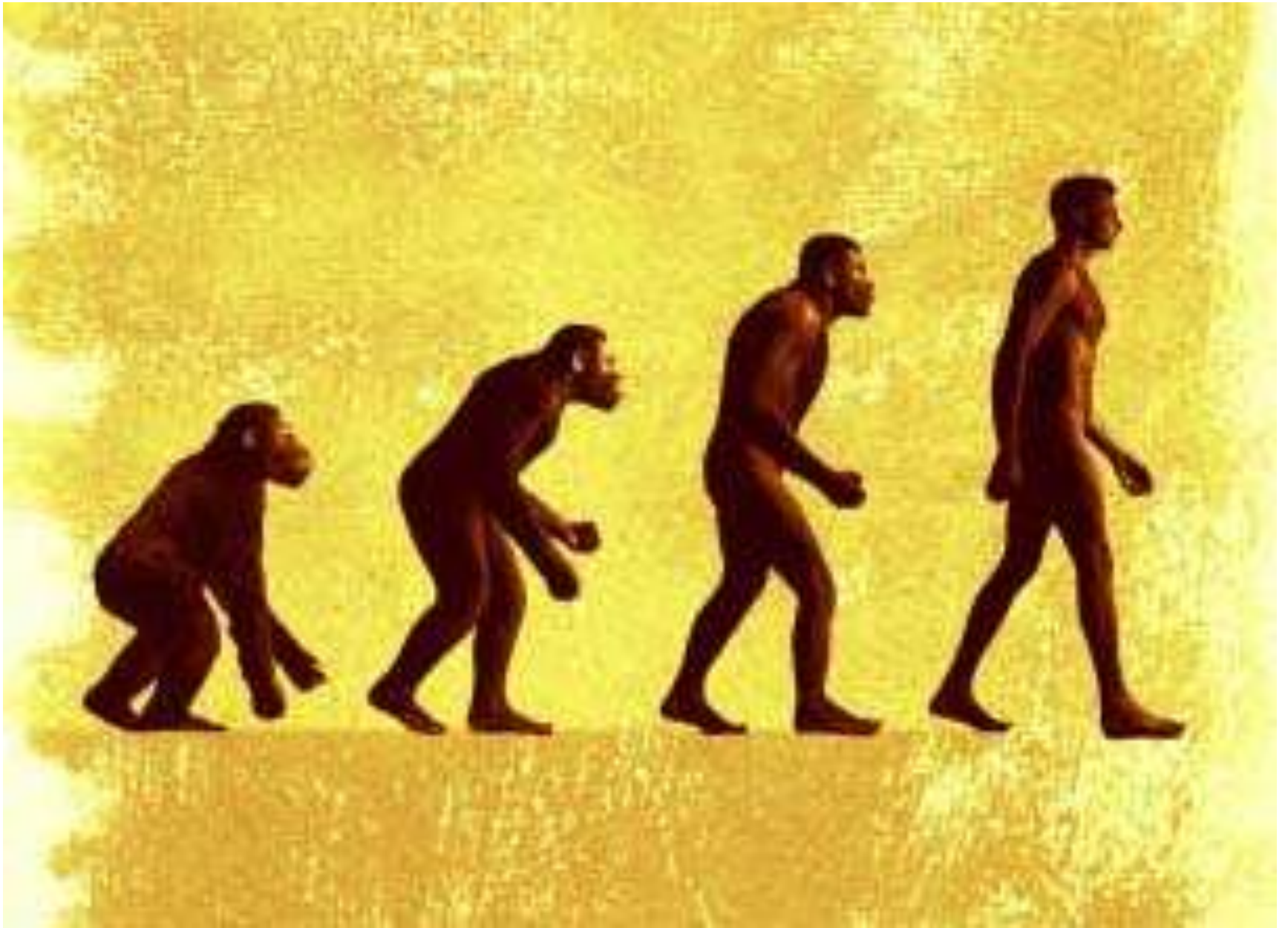
# **THE MUSCLES SYSTEM**



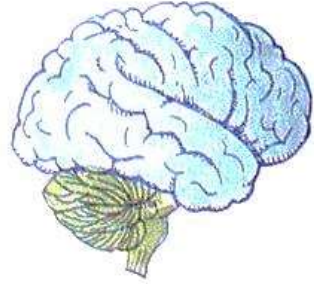
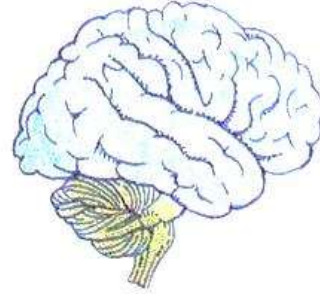
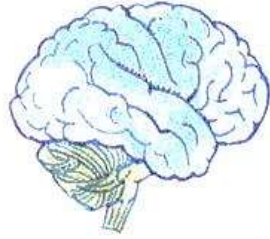
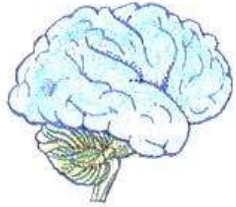
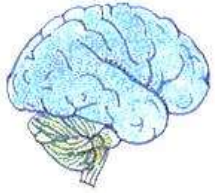
### ГЛАВНЫЕ ГРУППЫ МЫШЦ

- |  |  |   |   |
|--|--|---|---|
|  Мышцы живота     |  Разгибатели рук      |  Сгибатели запястий              |  Икроножные мышцы    |
|  Приводящие мышцы |  Разгибатели запястий |  Мышцы-фиксаторы локтей          |  Мышцы груди         |
|  Мышцы спины      |  Мышцы ягодиц         |  Седловидно-большеберцовые мышцы |  Четырехглазые мышцы |
|  Мышцы плеч       |  Сгибатели рук        |  Мышцы поясницы                  |  Троичные мышцы      |









*Australopithecus robustus*

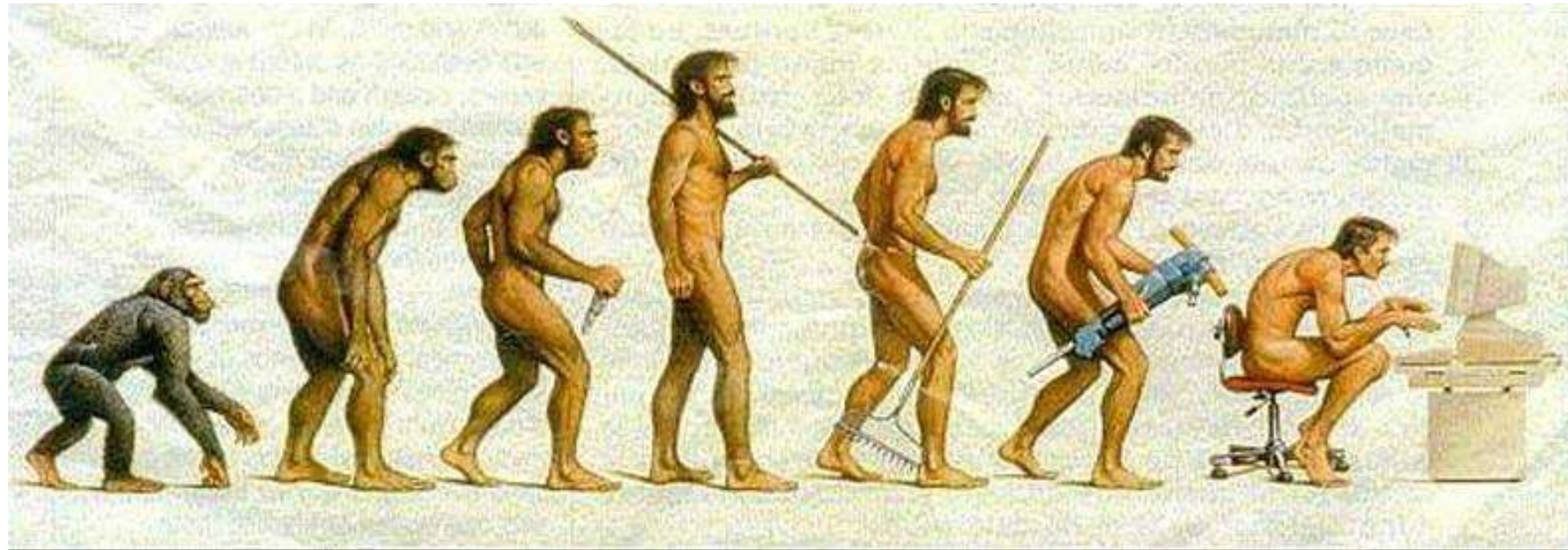
*Homo habilis*

*Homo erectus*

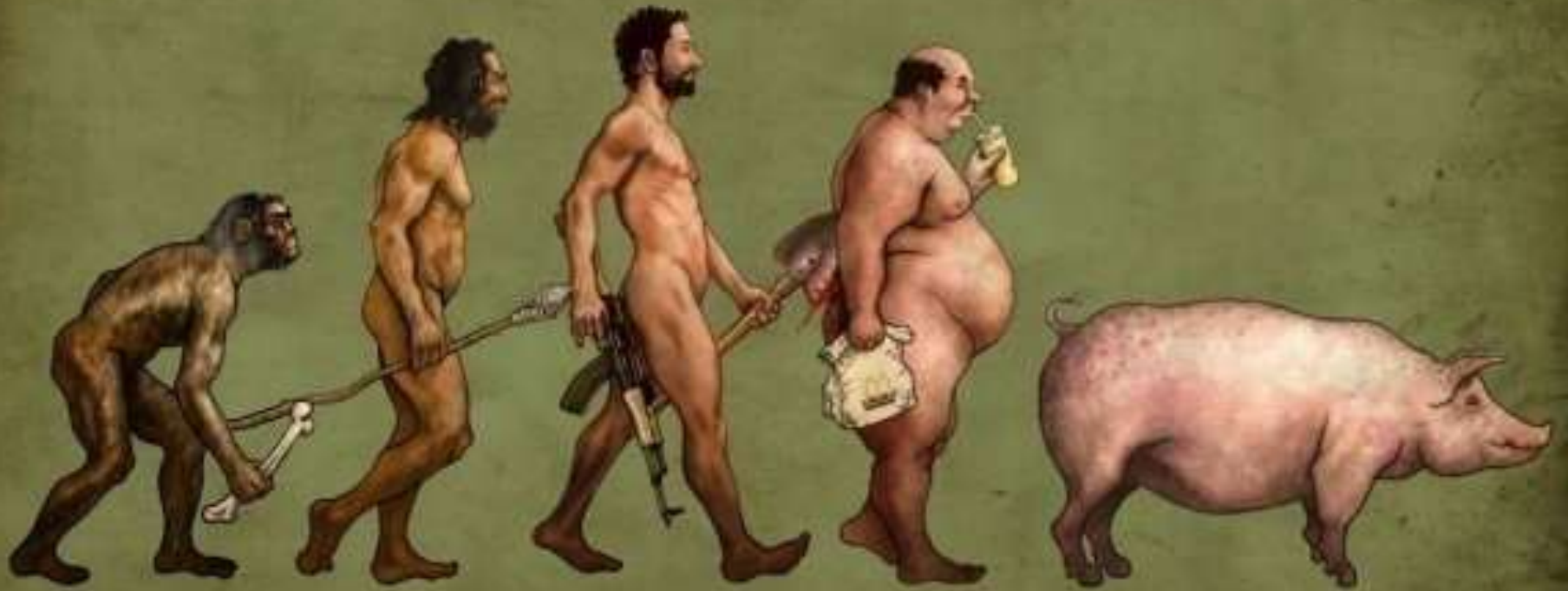
*Homo sapiens neanderthalensis*

*Homo sapiens sapiens*



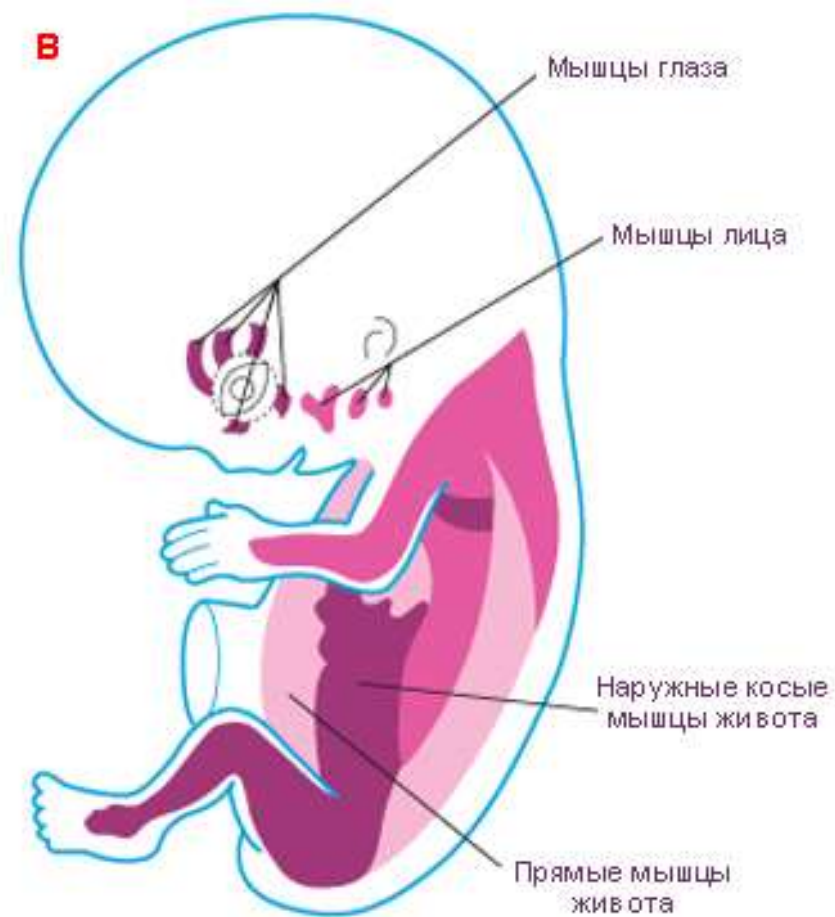
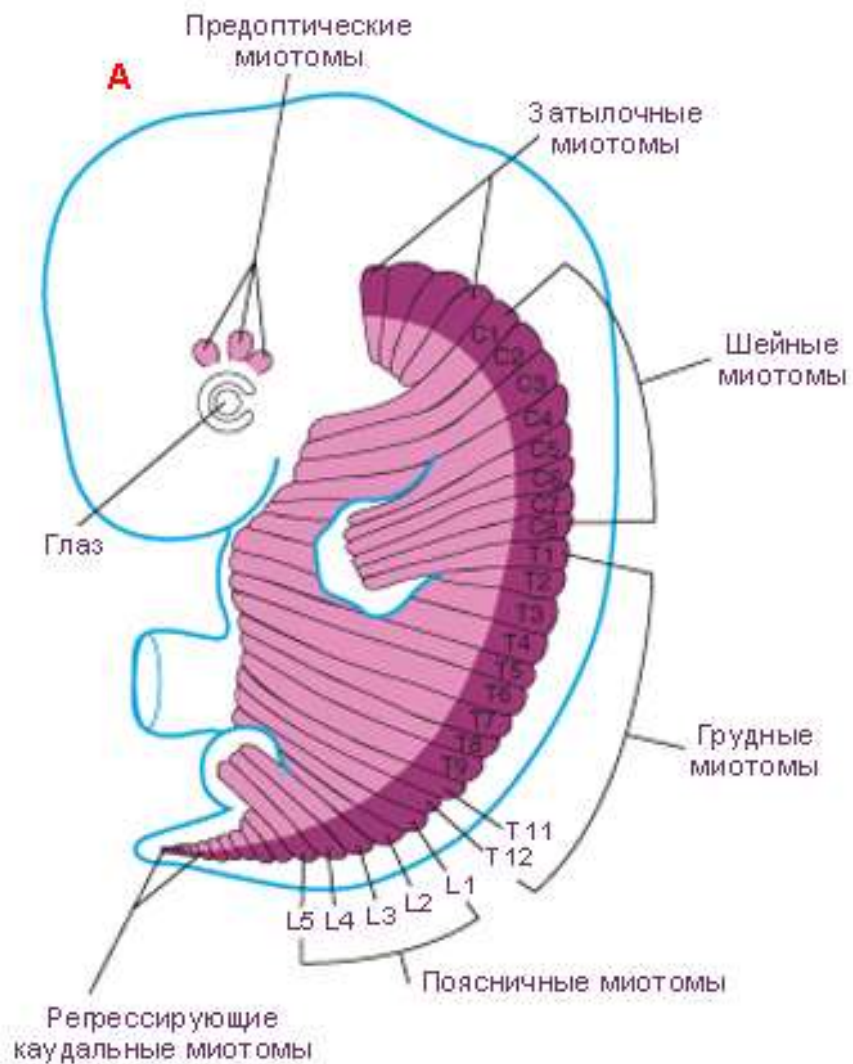


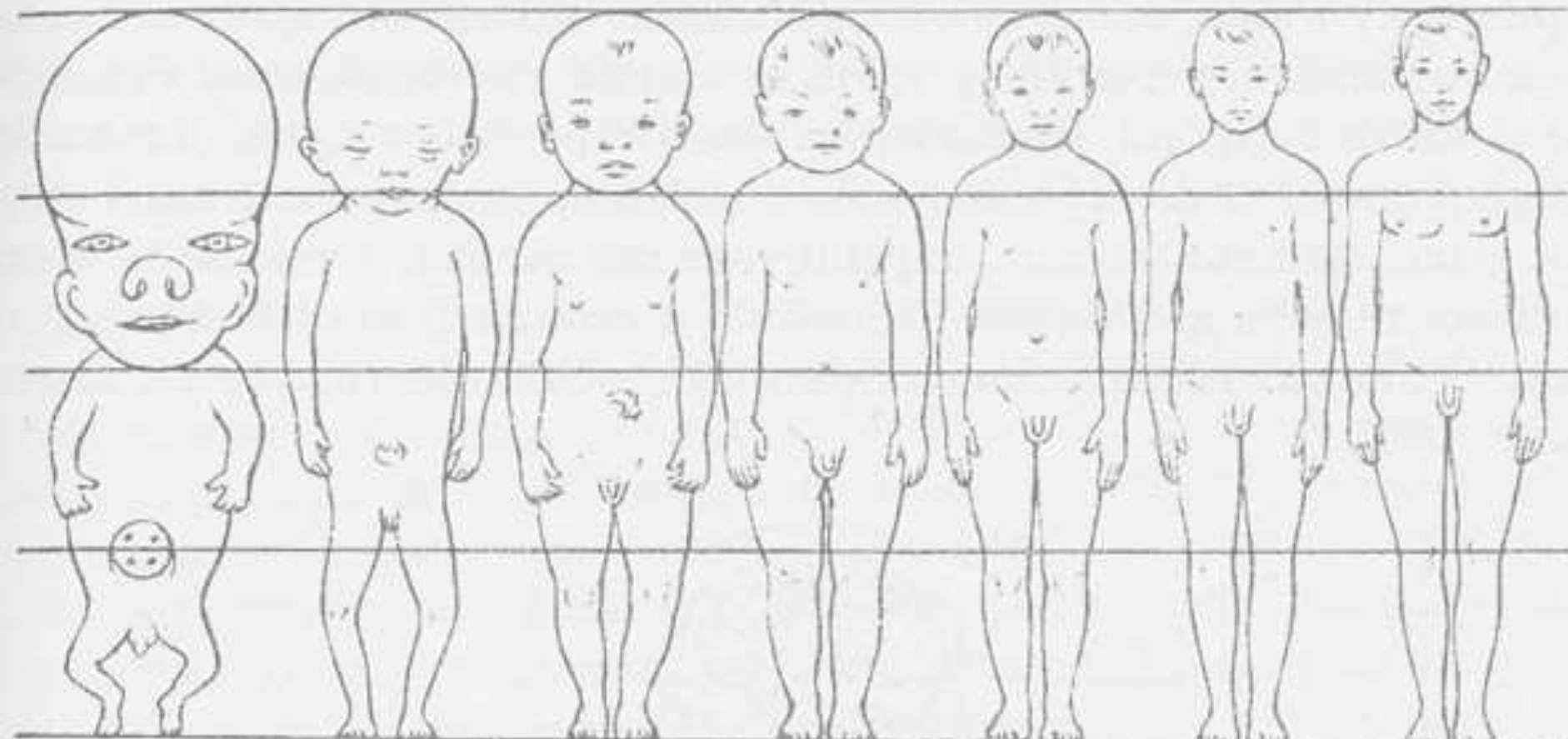




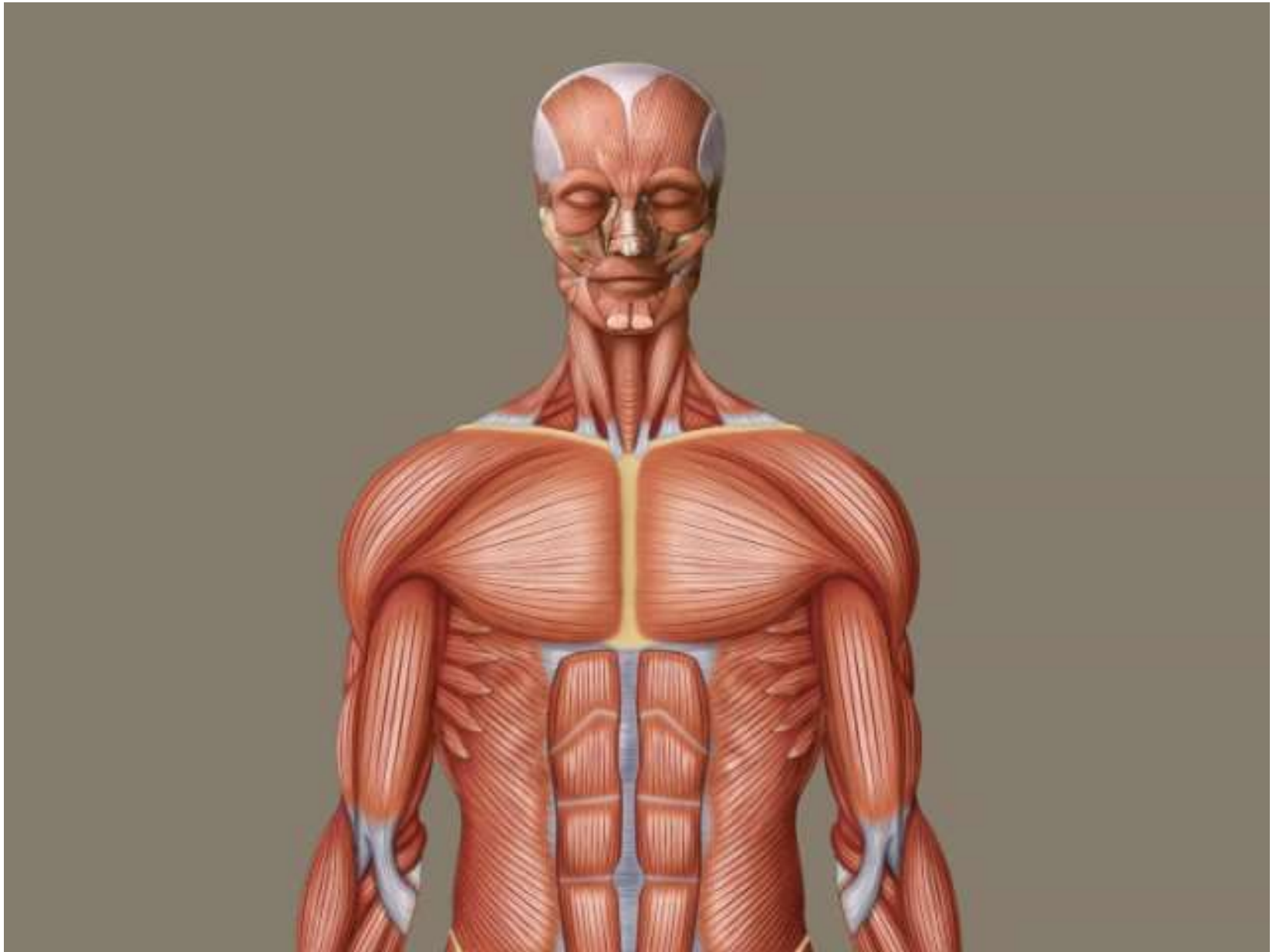




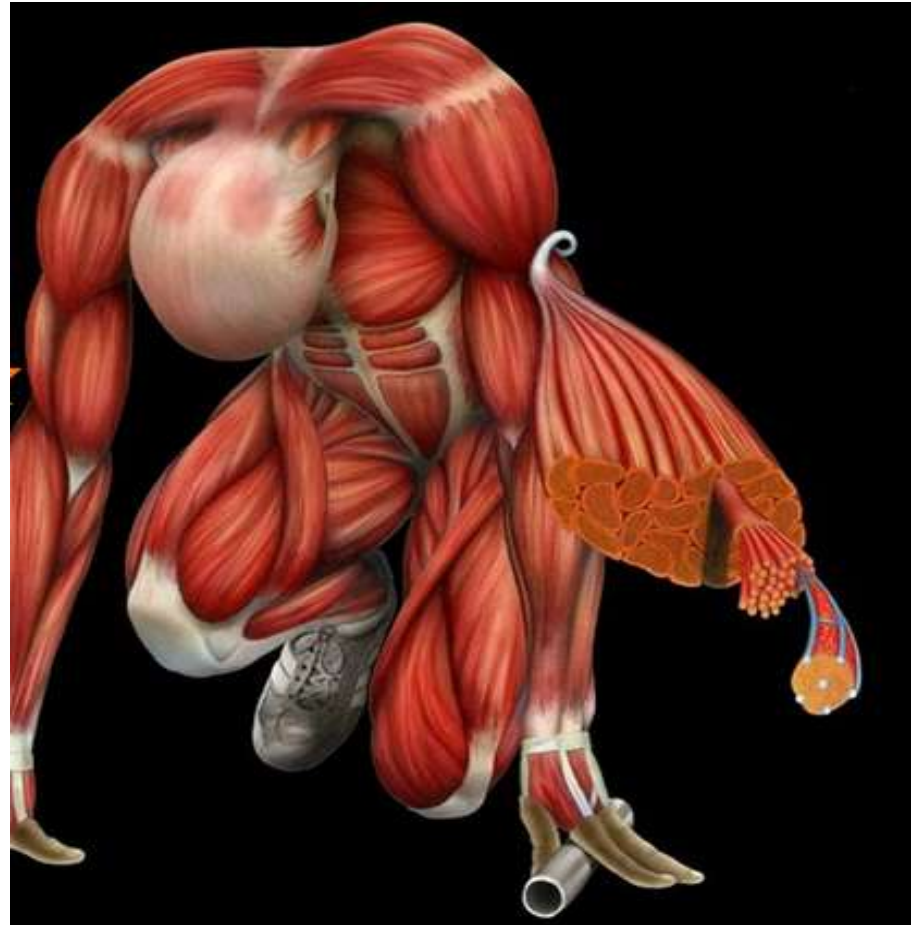




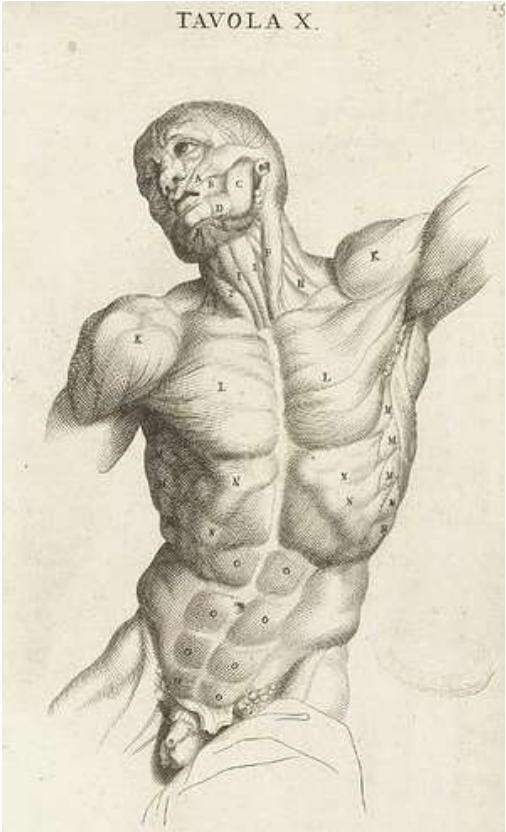
Ембр. 2 міс.    Ембр. 4 міс.    Новонароджений    2 роки    6 років    12 років    25 років

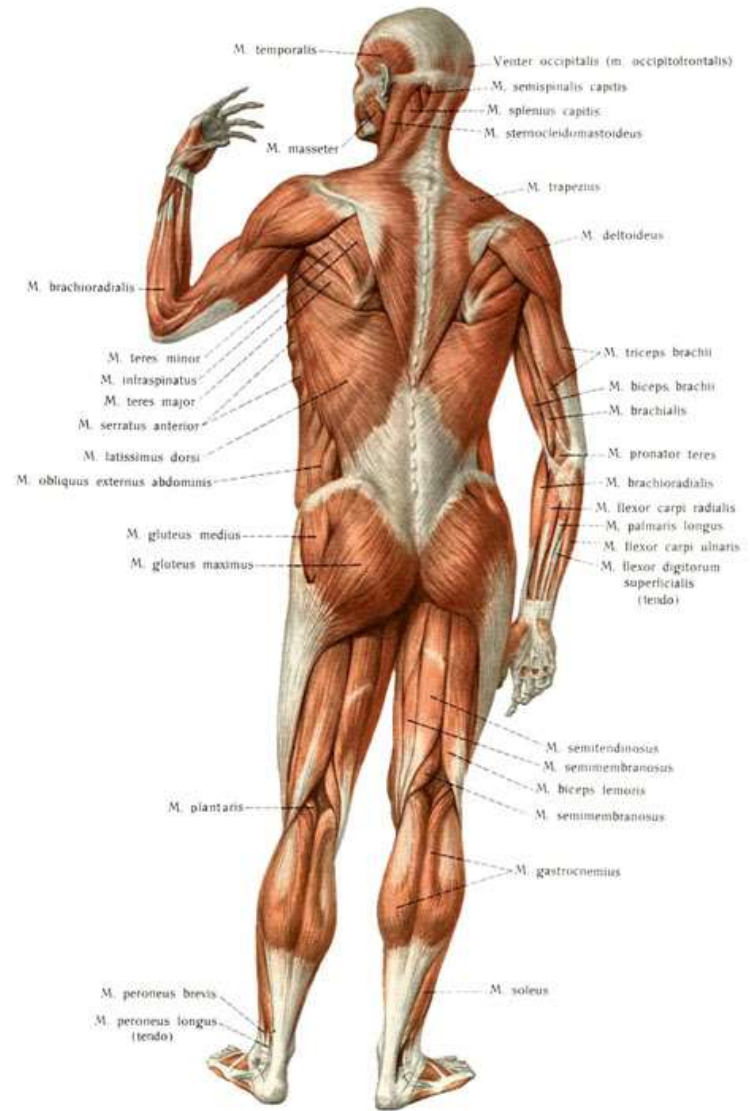
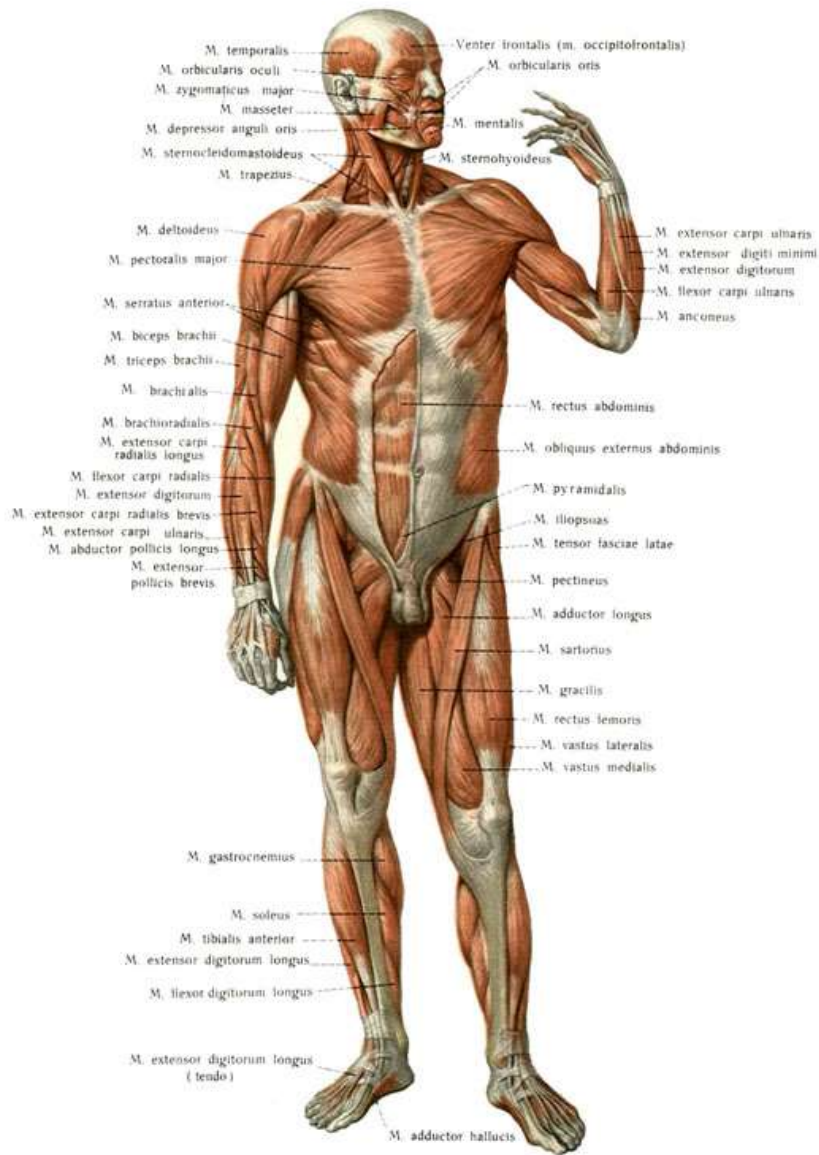






*Saccus caecus retro musculus sternocleidomastoideus seu recessus lateralis Gruberi*



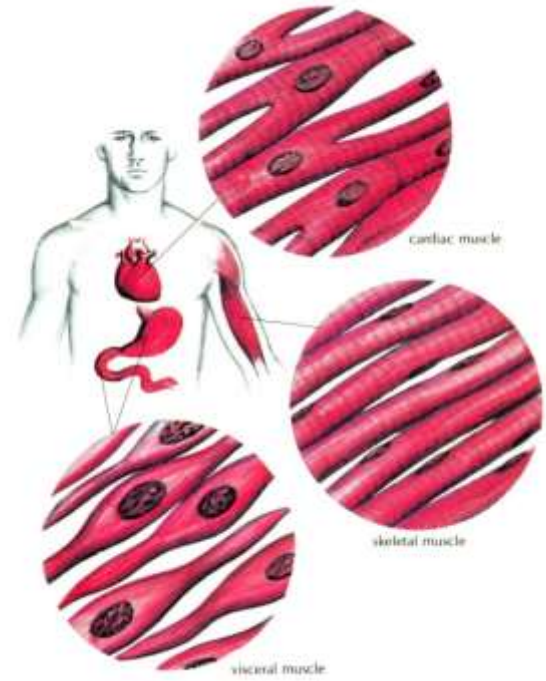
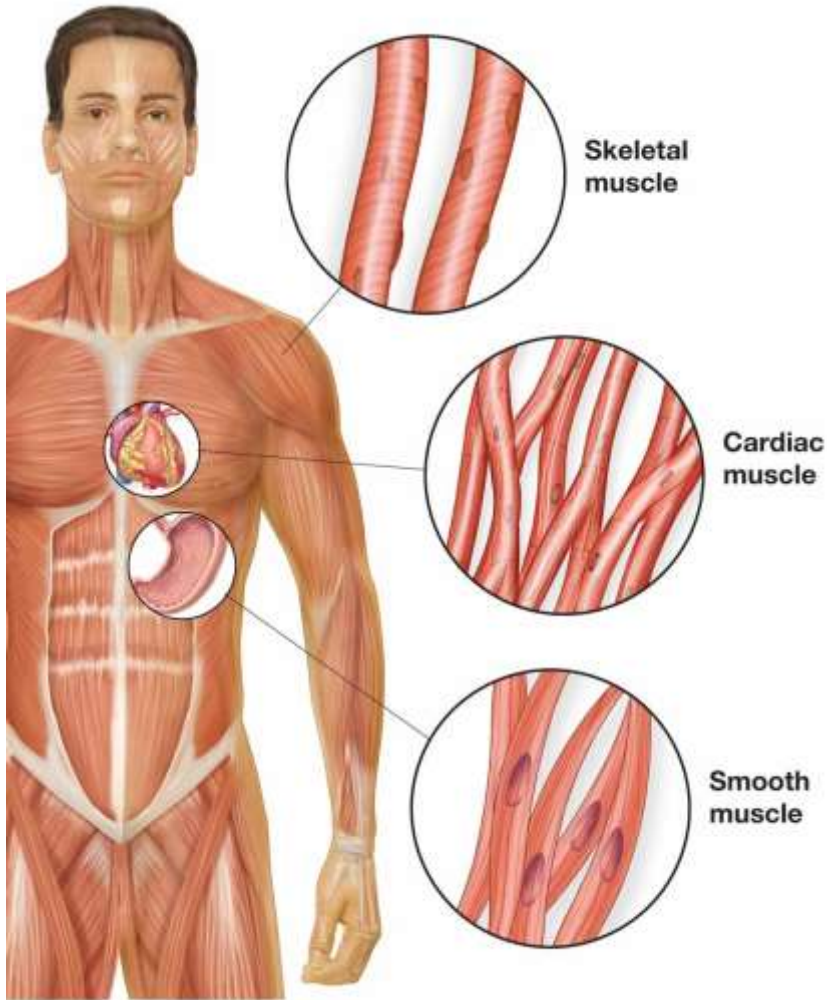




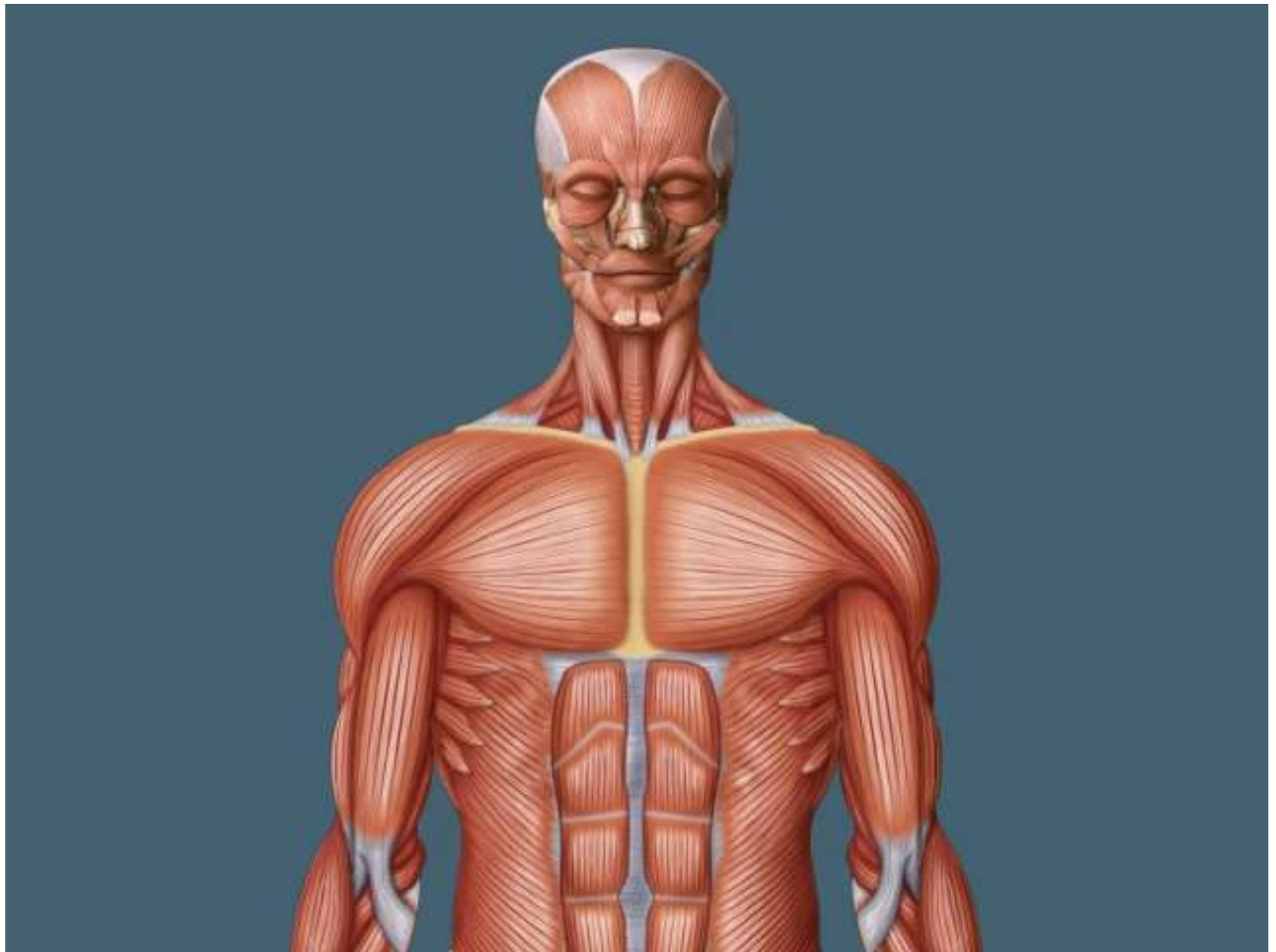




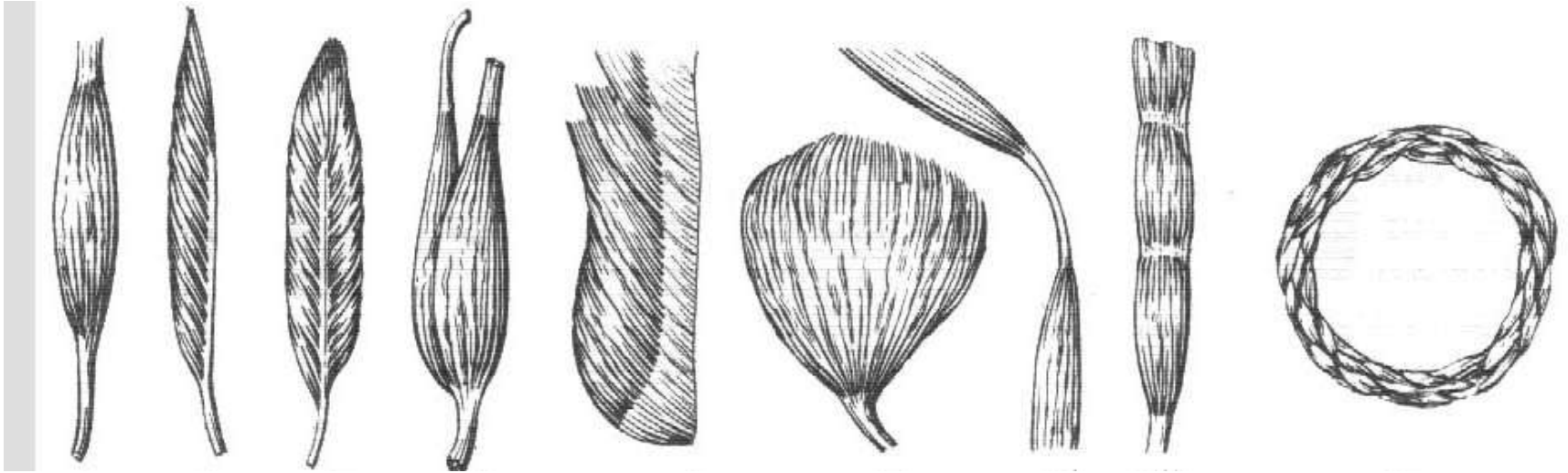


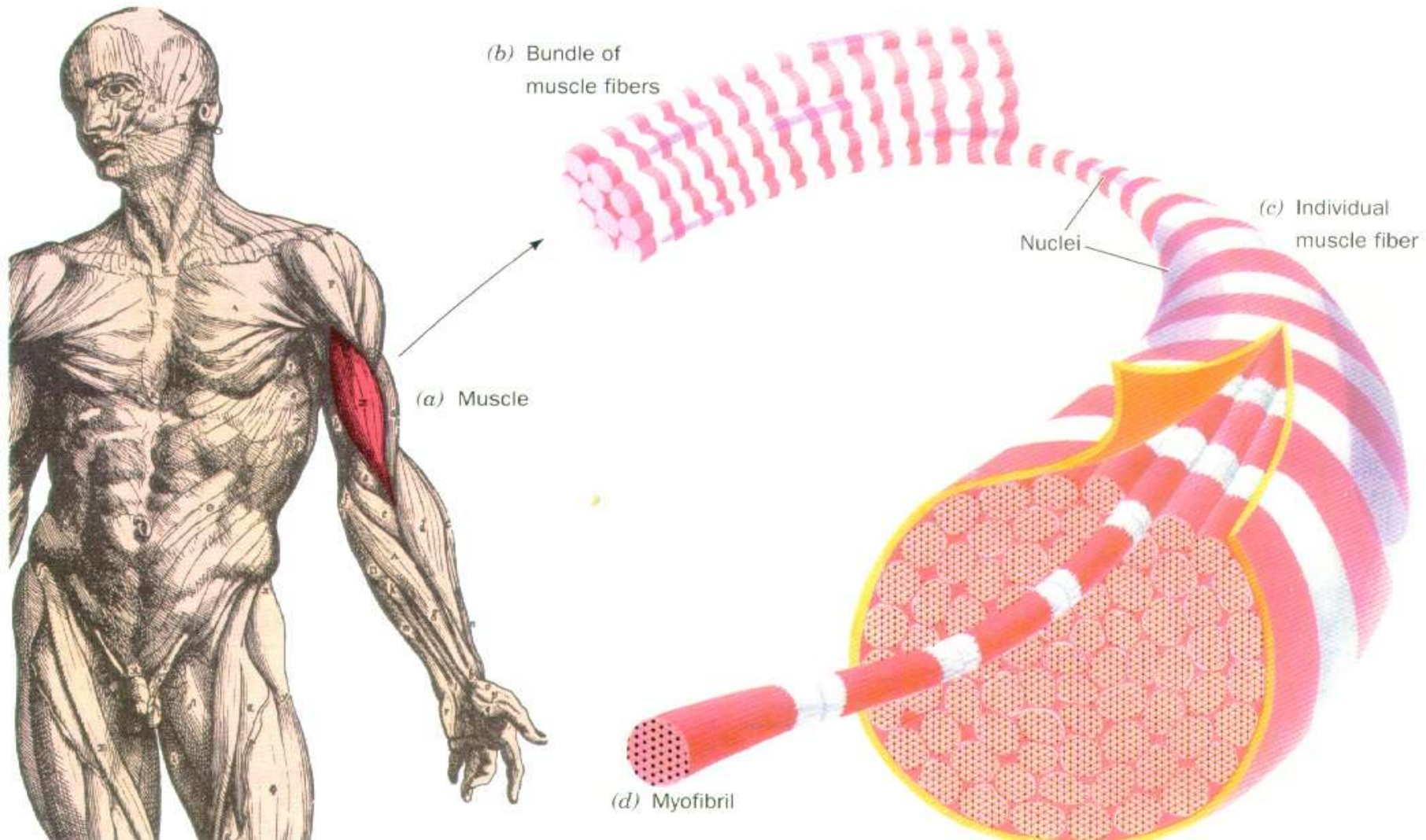


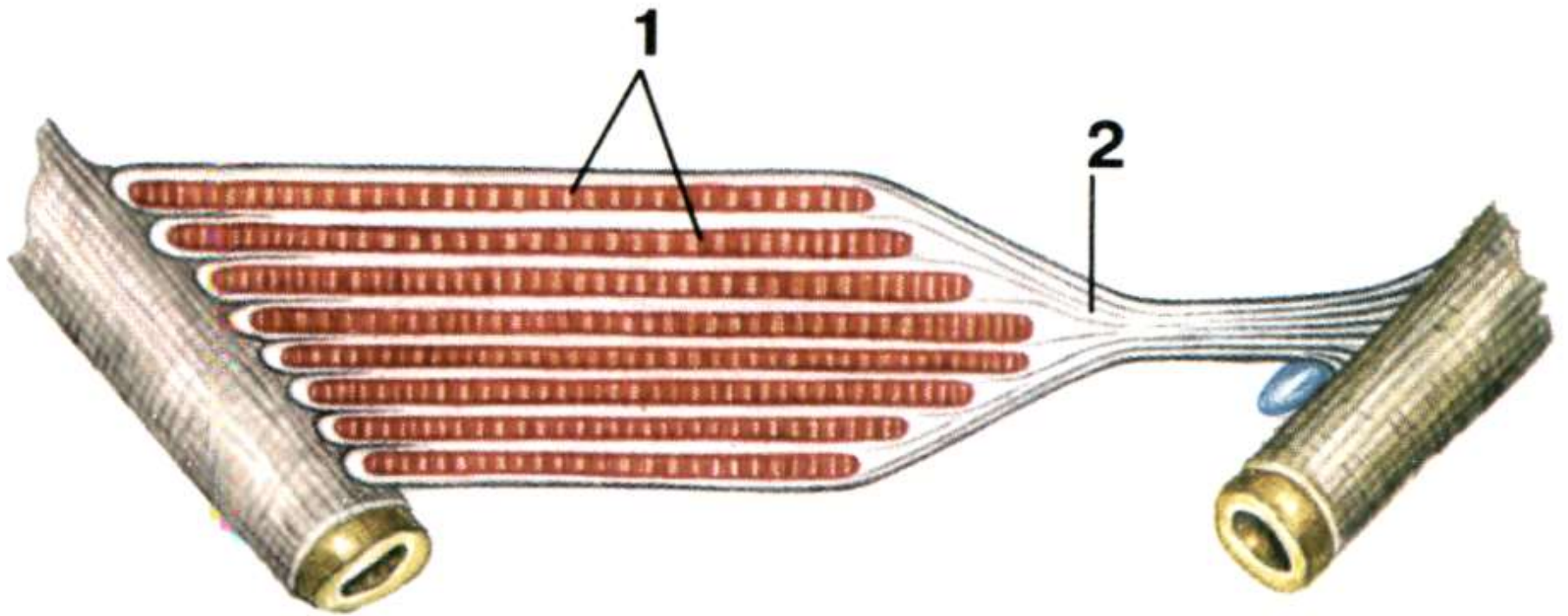












MUSCULOSKELETAL ANATOMY TIPS



CONNECT  
MUSCLE TO BONE

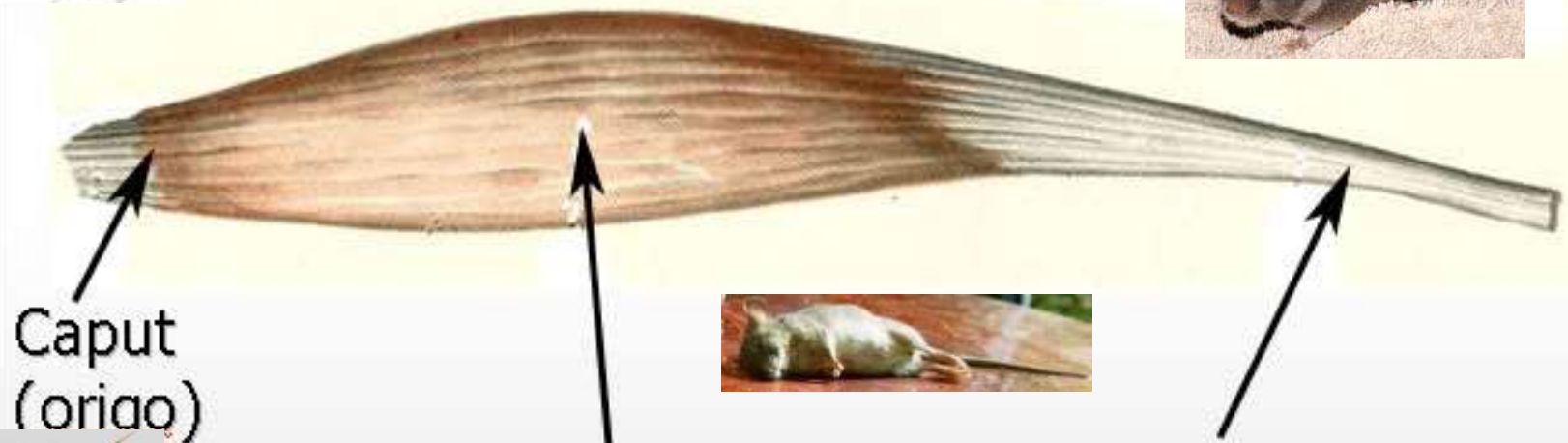


CONNECT  
BONE TO BONE



# Схема довгого скелетного м'яза.

musculus (мишеня)

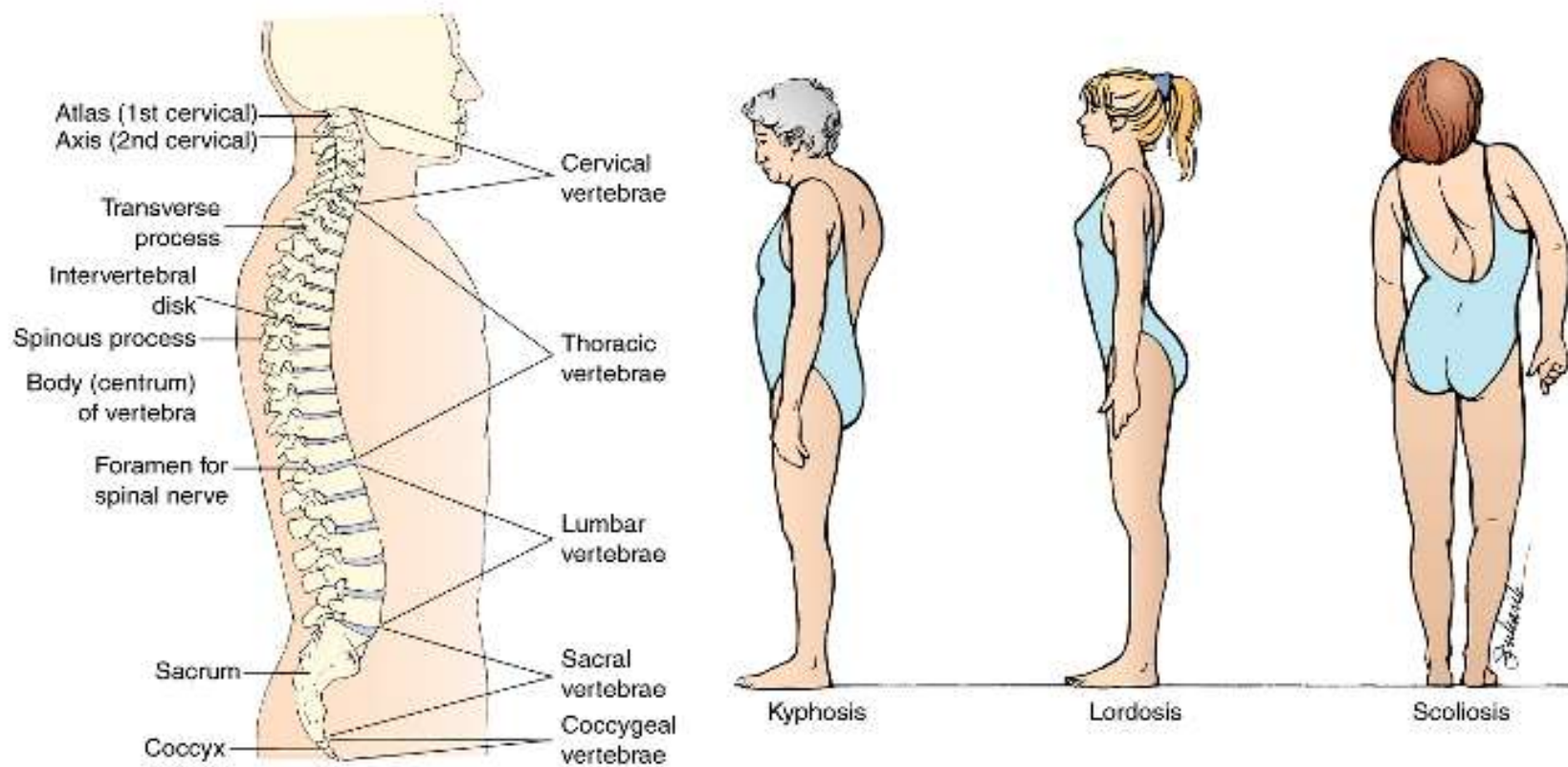


Caput  
(origo)

venter  
(черевце)

cauda  
(insertio)





**Figure 66-3** A normal spine and three abnormalities. (A) Kyphosis: an increased convexity or roundness of the spine's thoracic curve. (B) Lordosis: swayback, exaggeration of the lumbar spine curve. (C) Scoliosis: a lateral curvature of the spine.

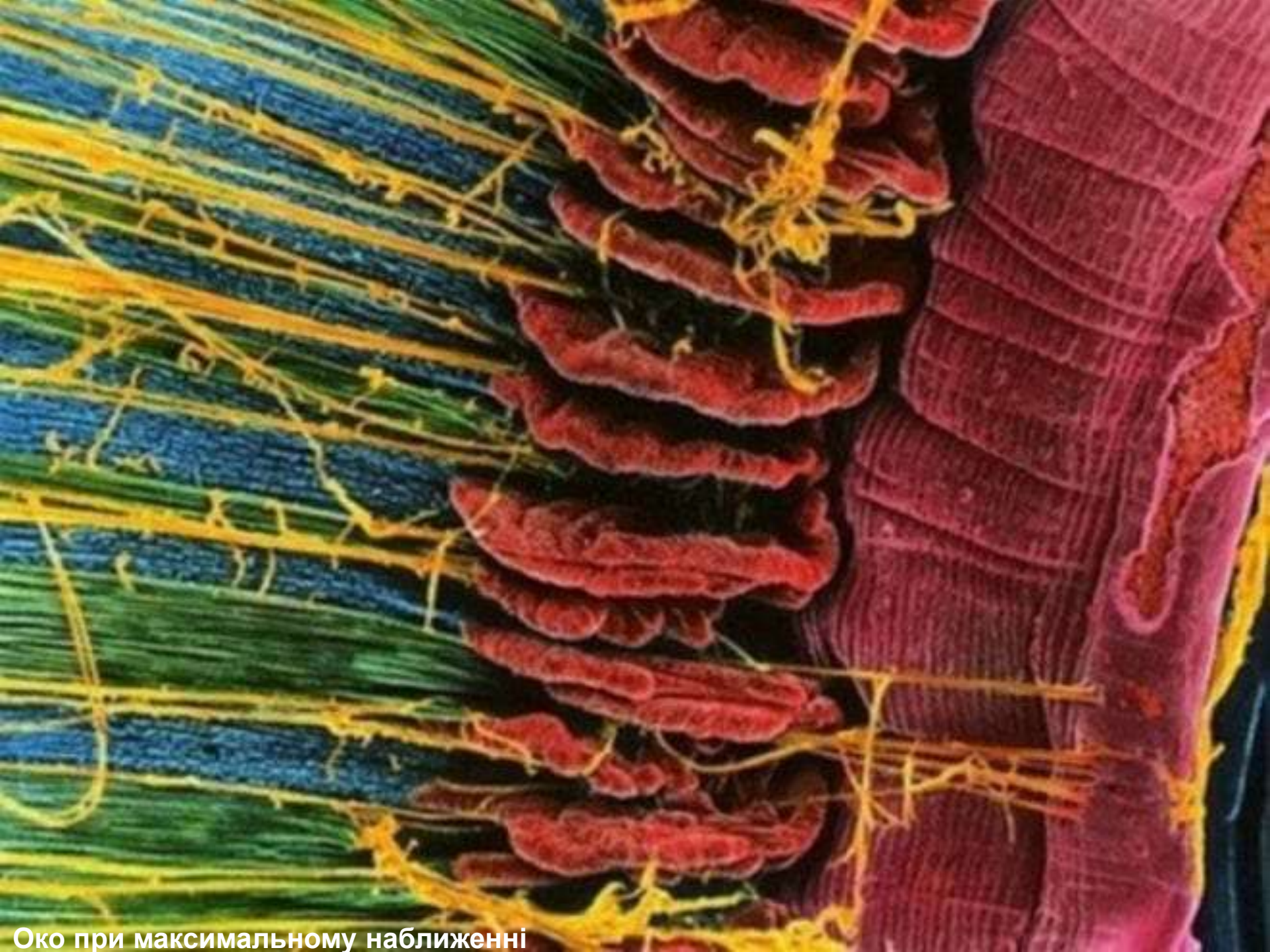
NE DISCERE CESSA

*Не припняй навчатися*









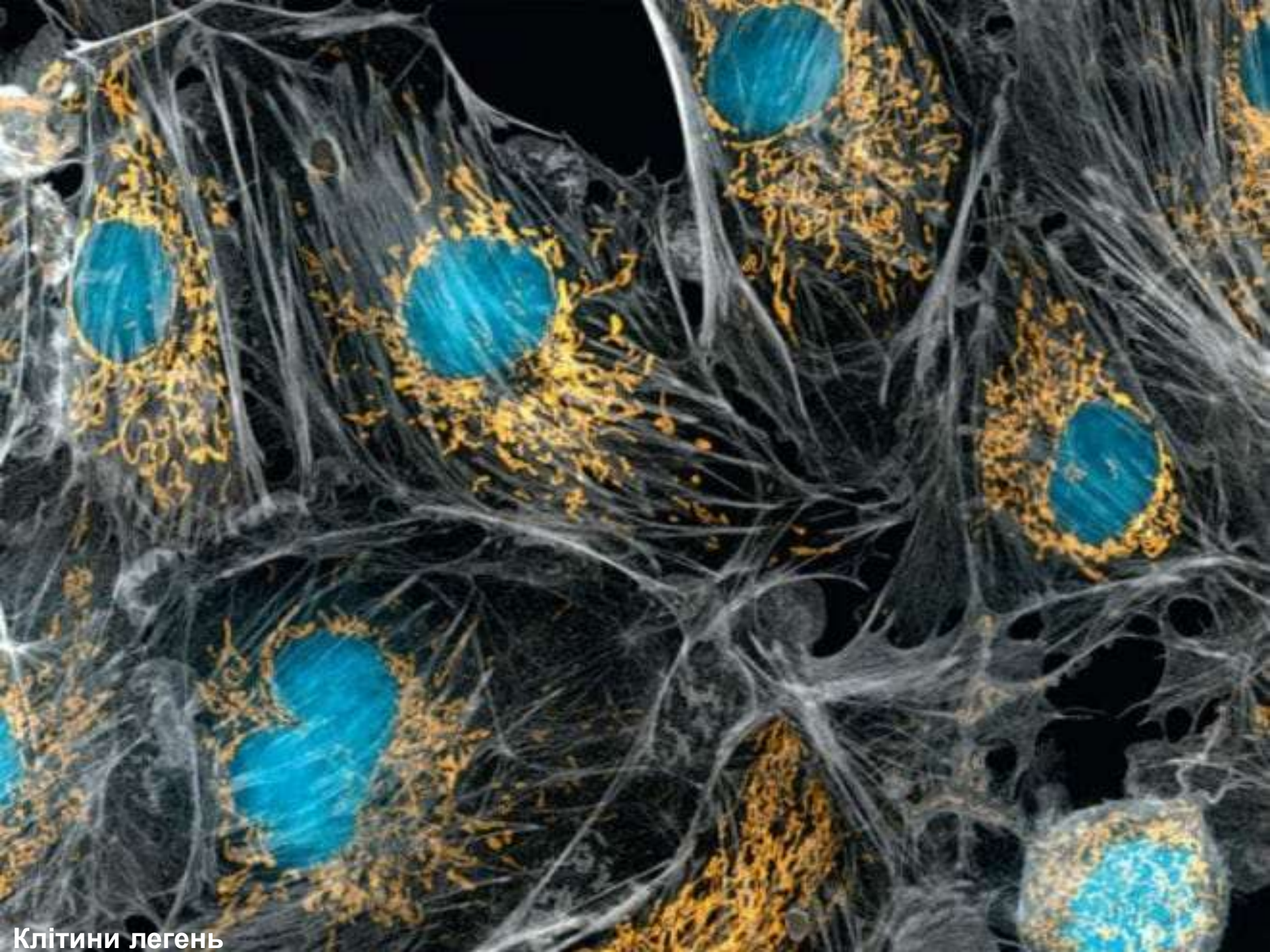
Око при максимальному наближенні





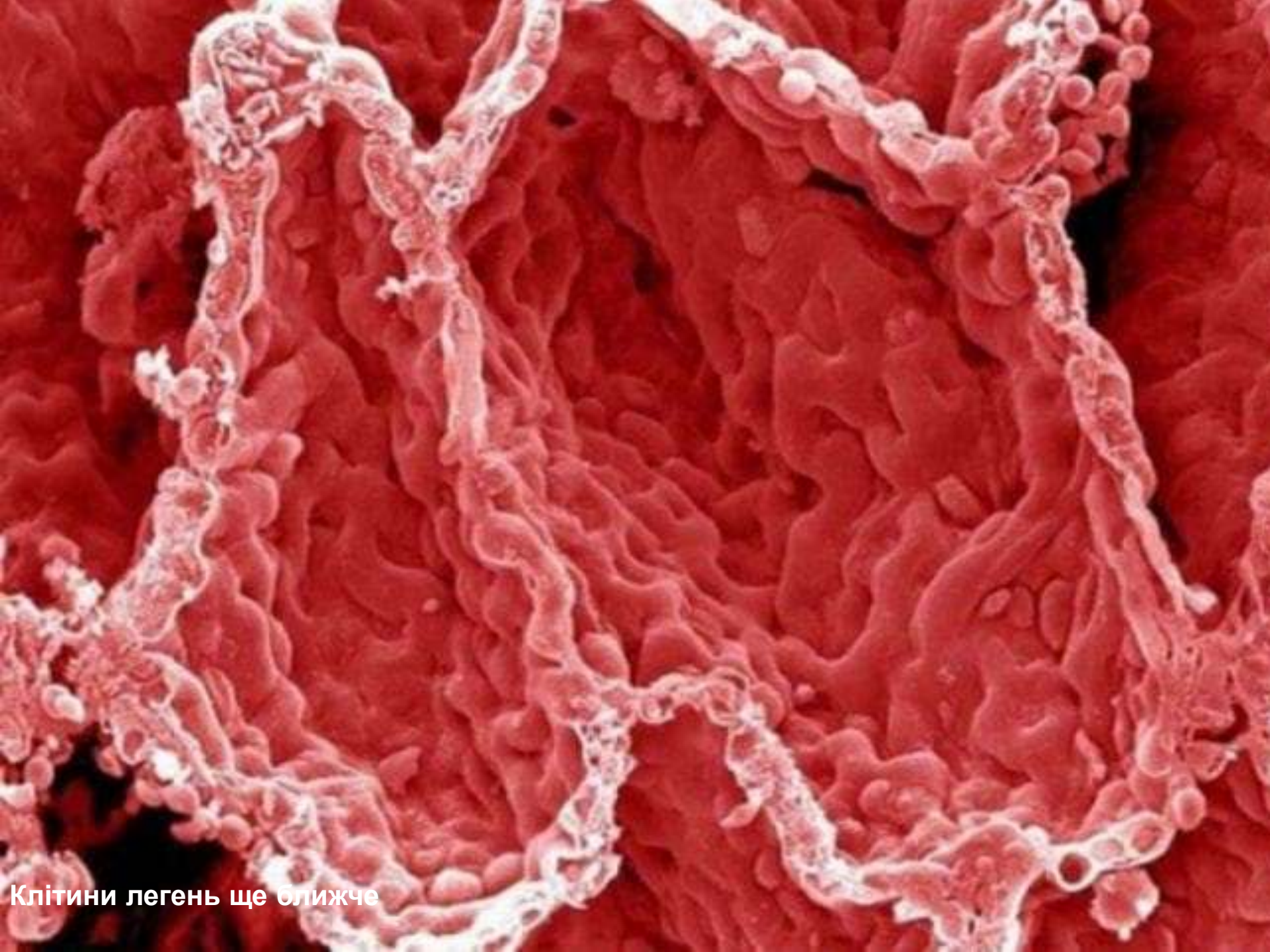
Основа нігтя





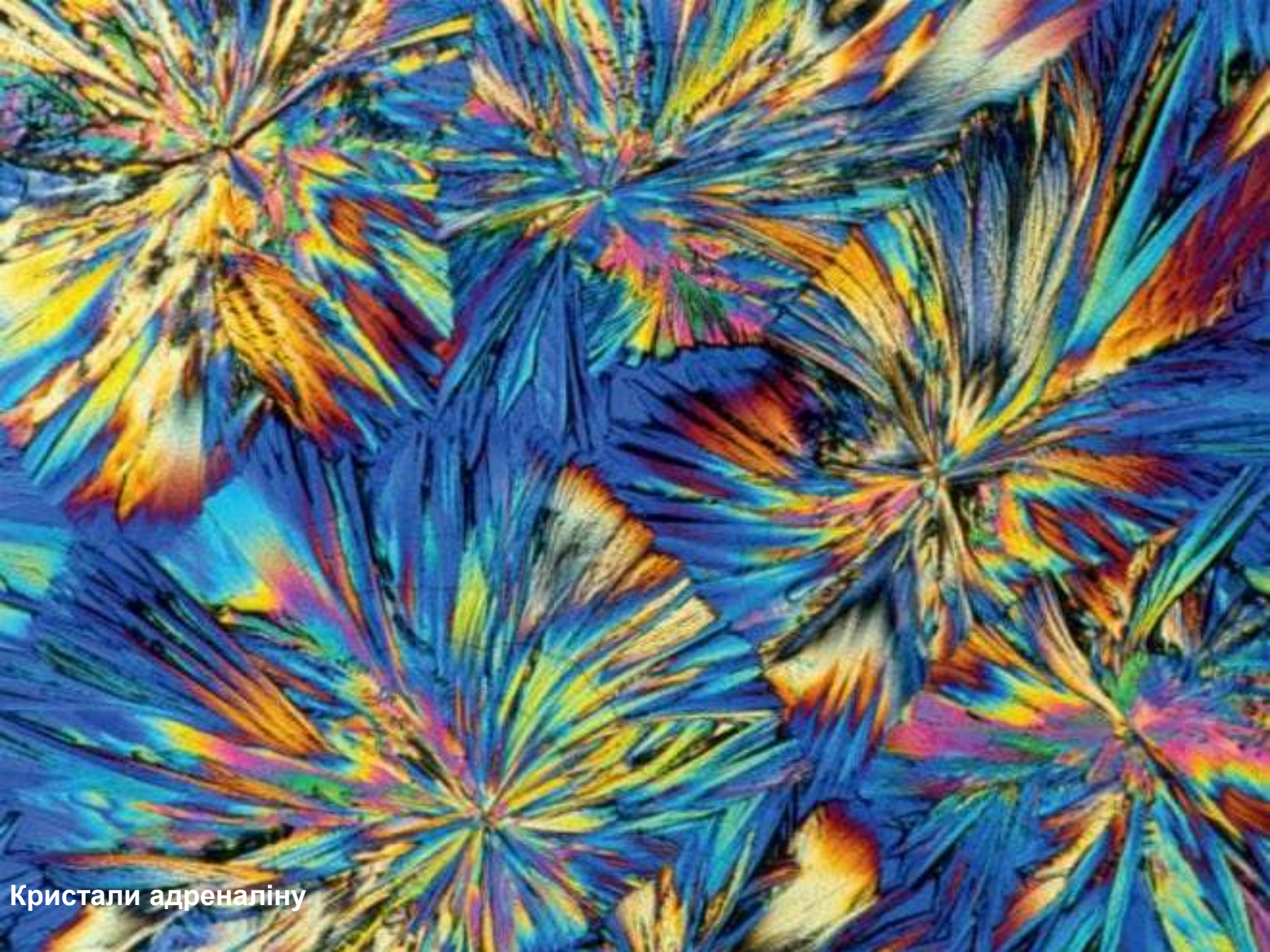
Клітини легень





Клітини легень ще ближче





Кристали адреналіну





Балансуючі камінчики (пісок) у внутрішньому вусі



Еритроцити в артерії





Еритроцити в артерії





**Згусток крові**



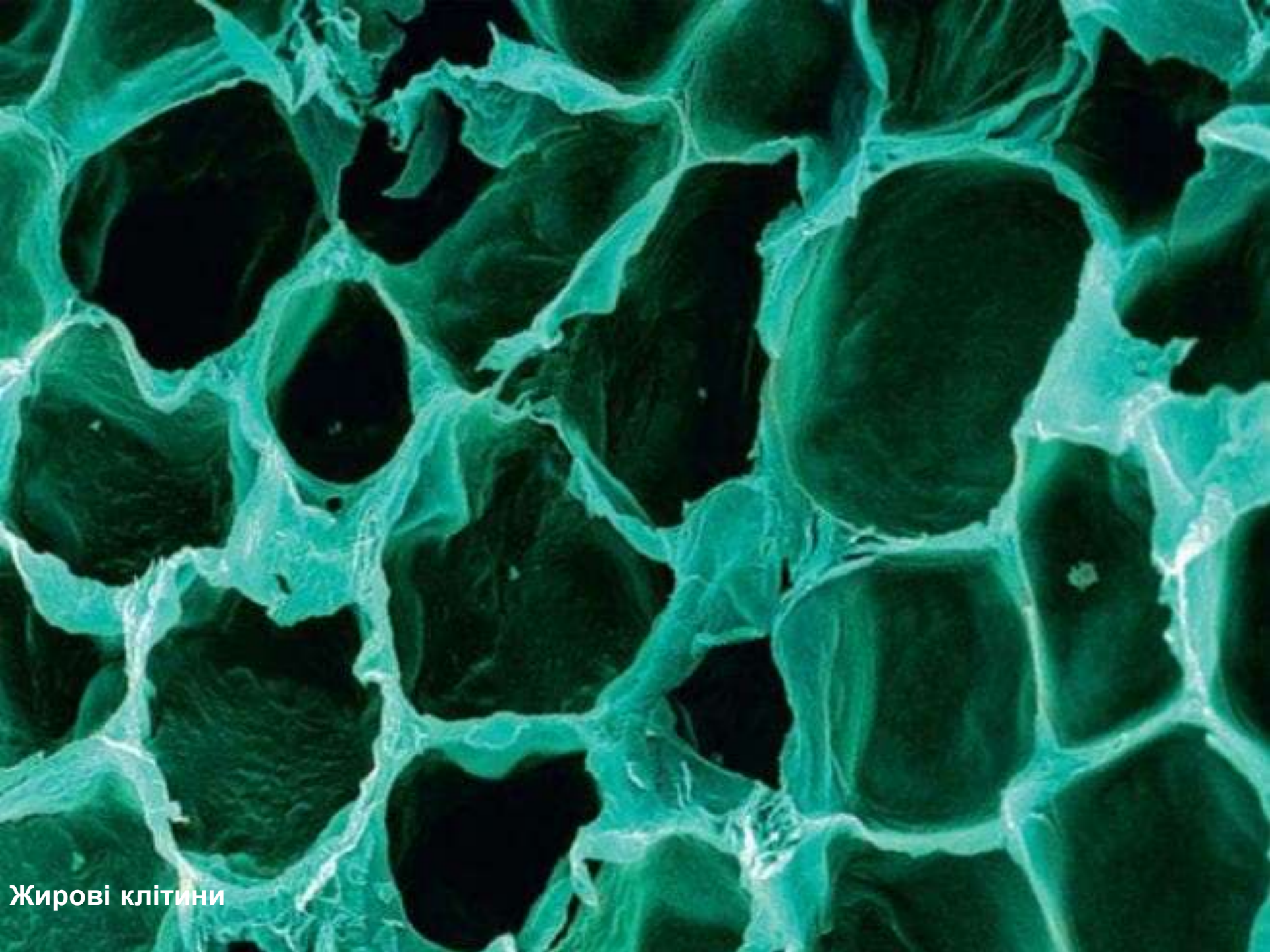


Еритроцит зруйнованого капіляра



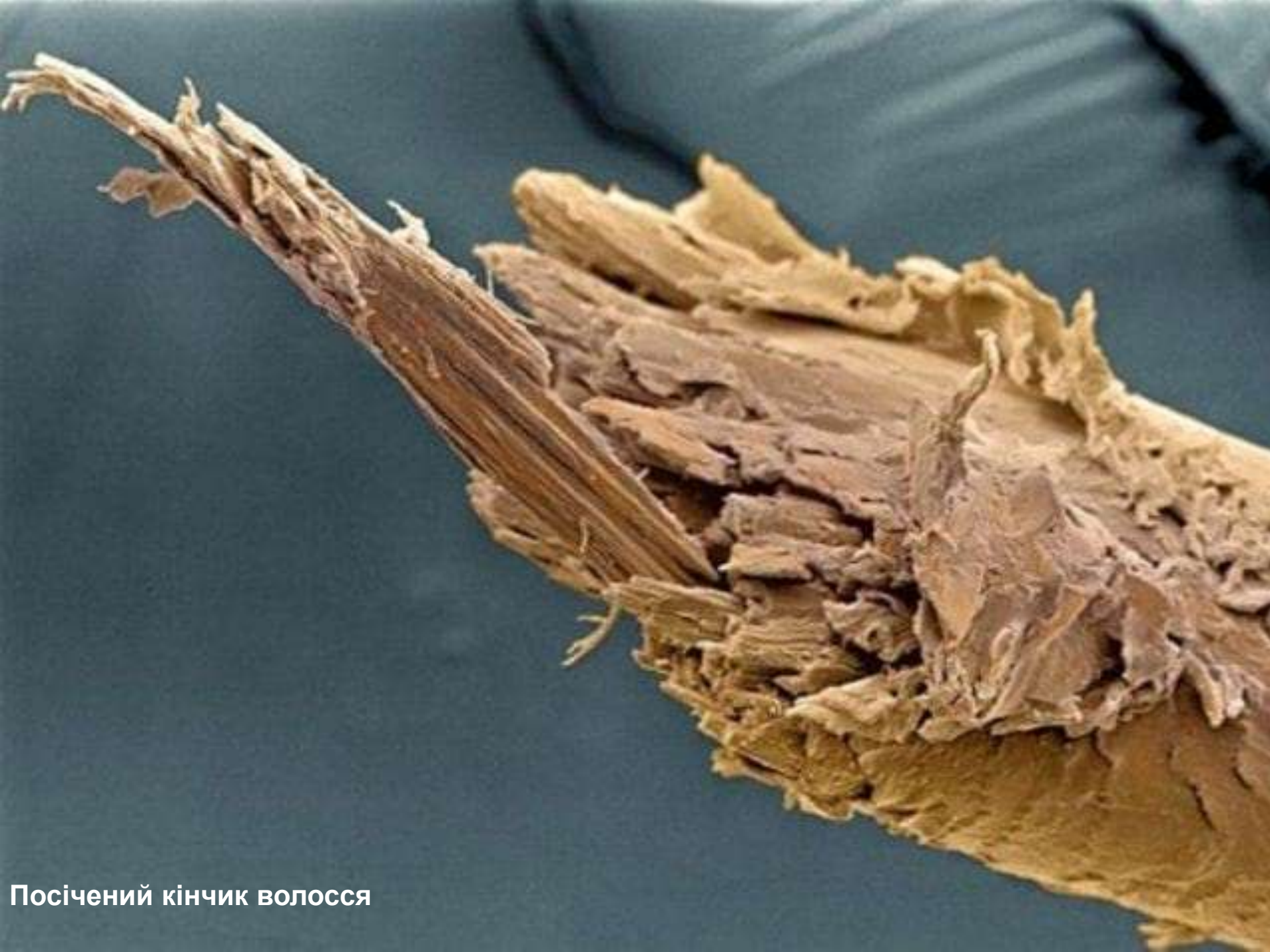
Початок «критичних днів»





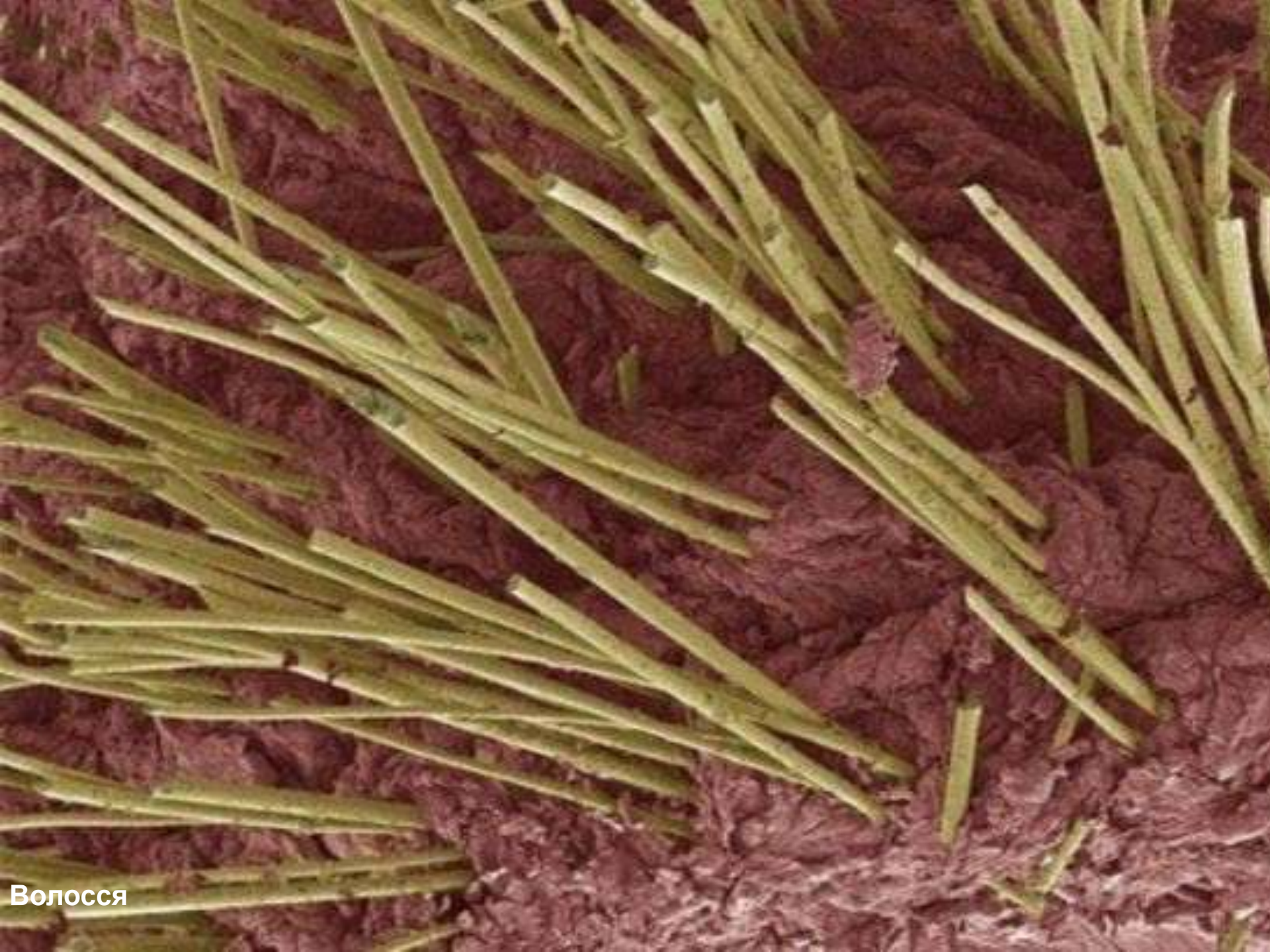
Жирові клітини





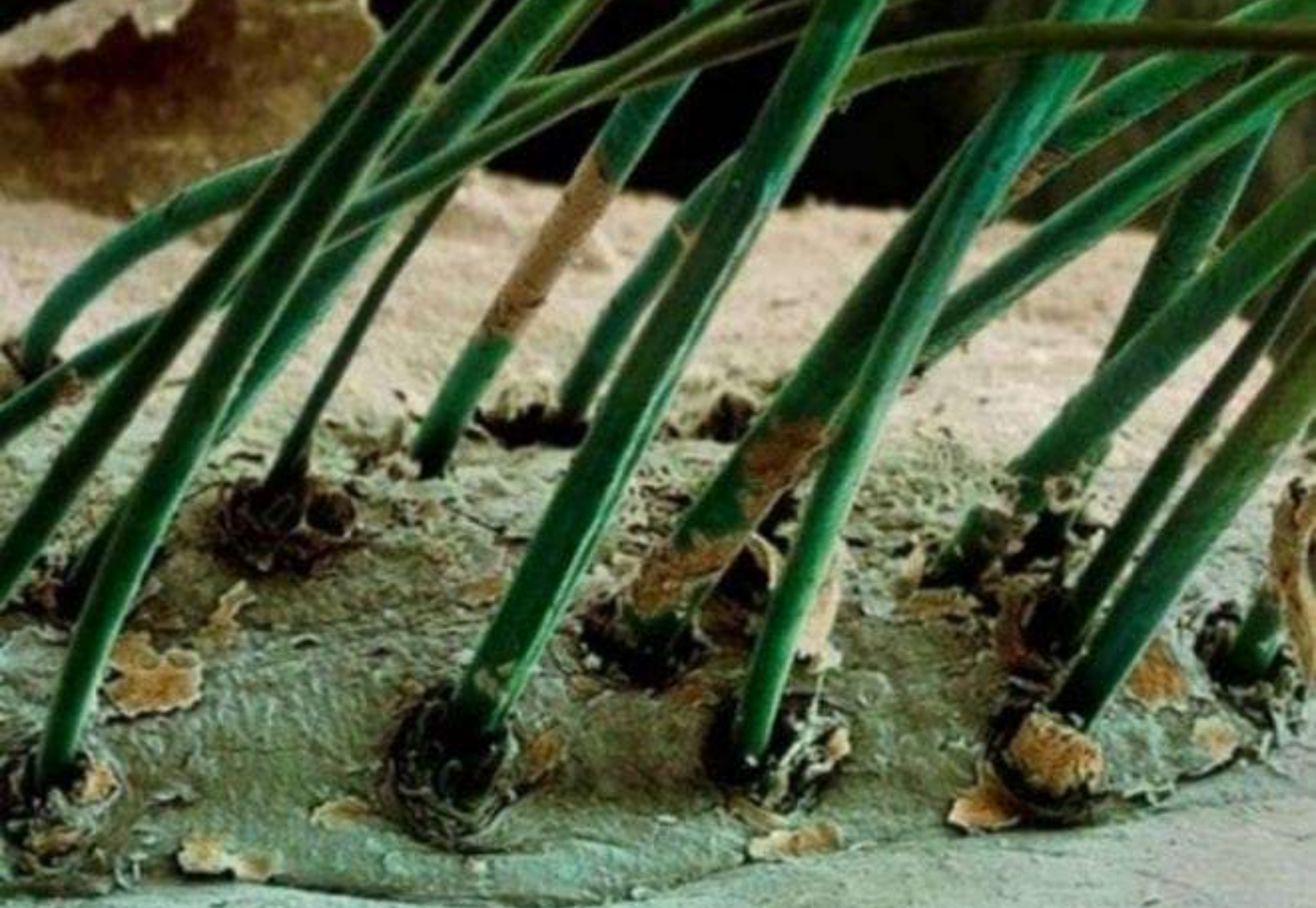
Посічений кінчик волосся





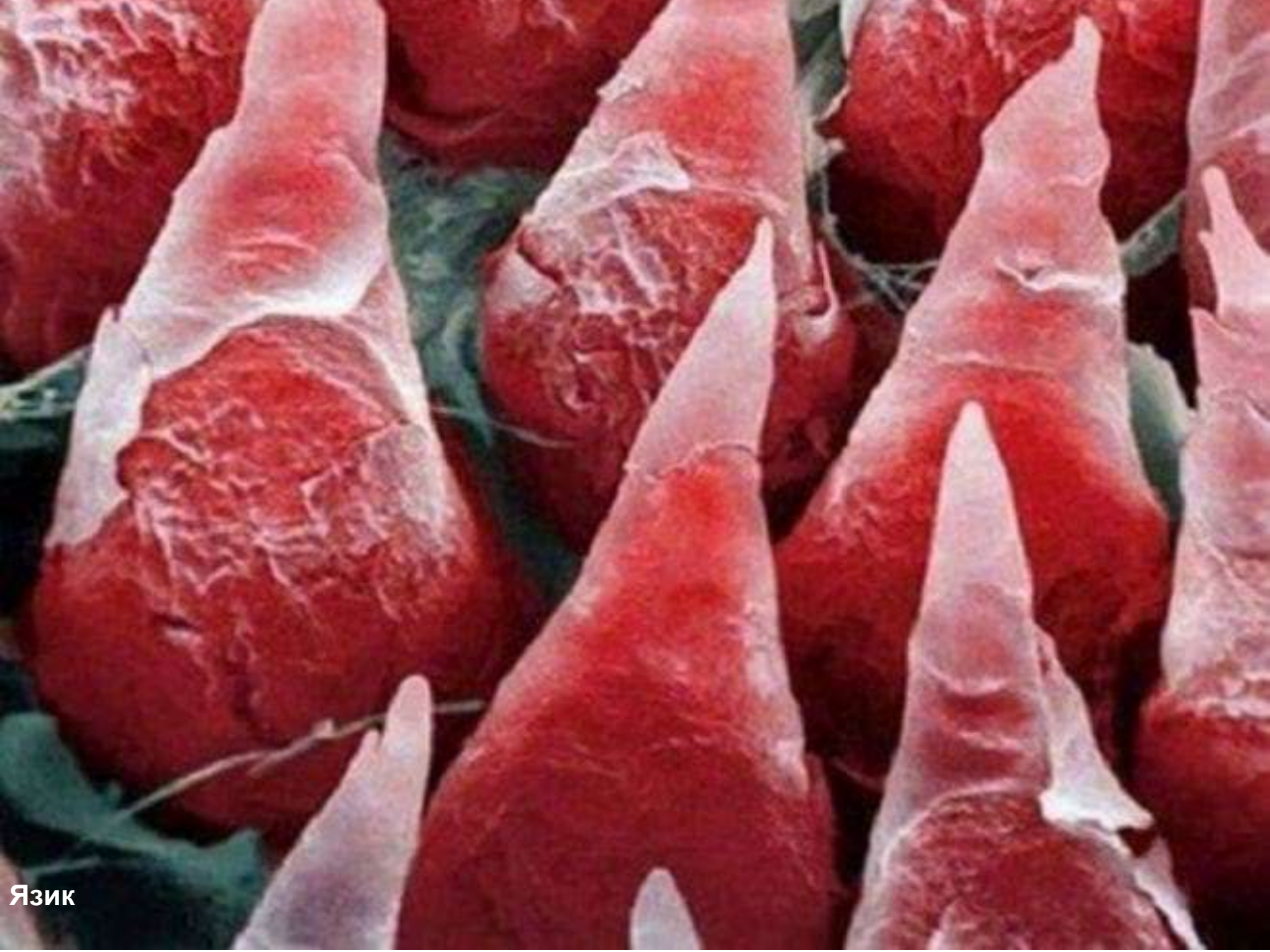
Волосся





Bii





Язык





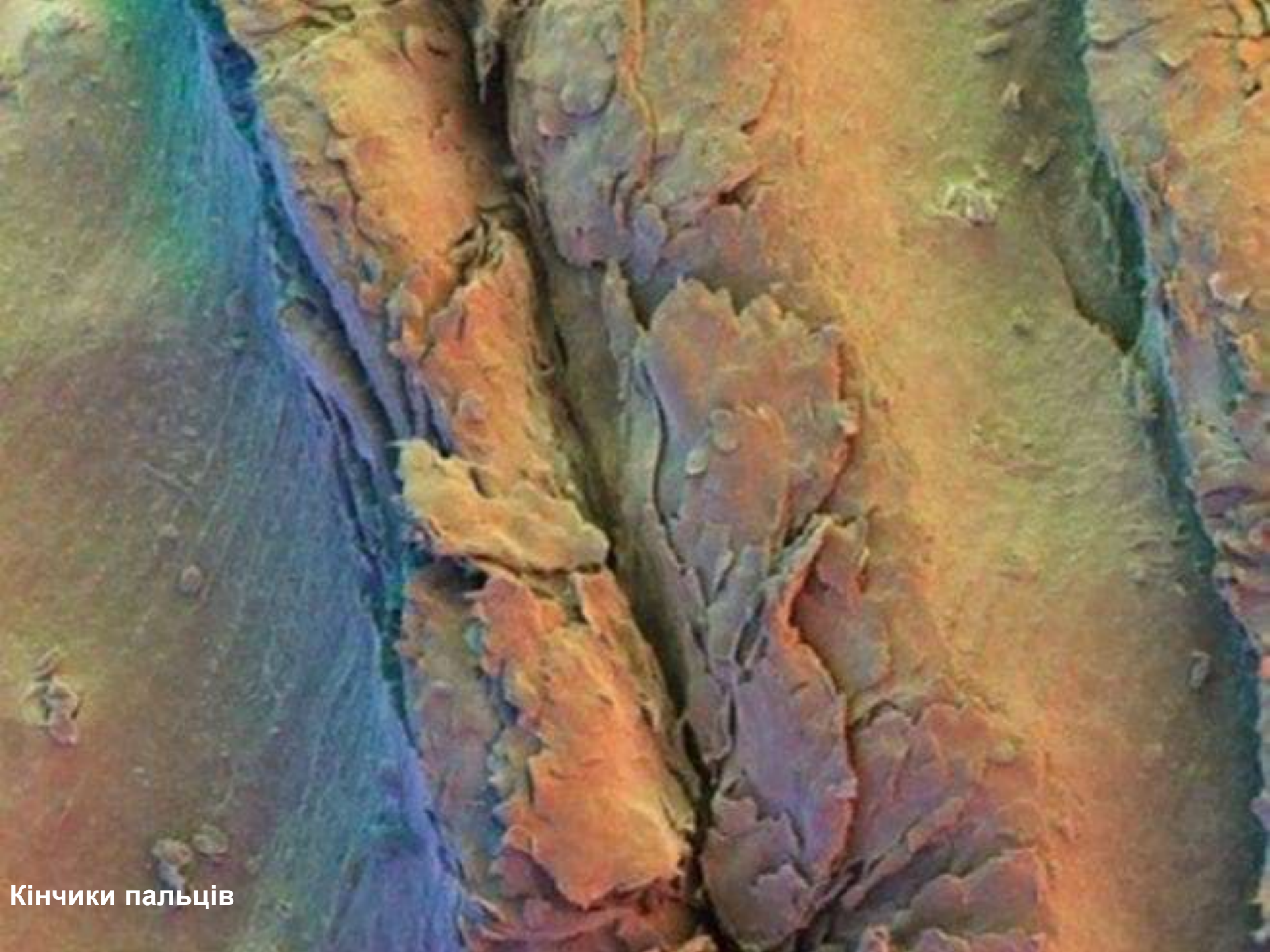
Пора потової залози





Слизова оболонка шлунка





Кінчики пальців





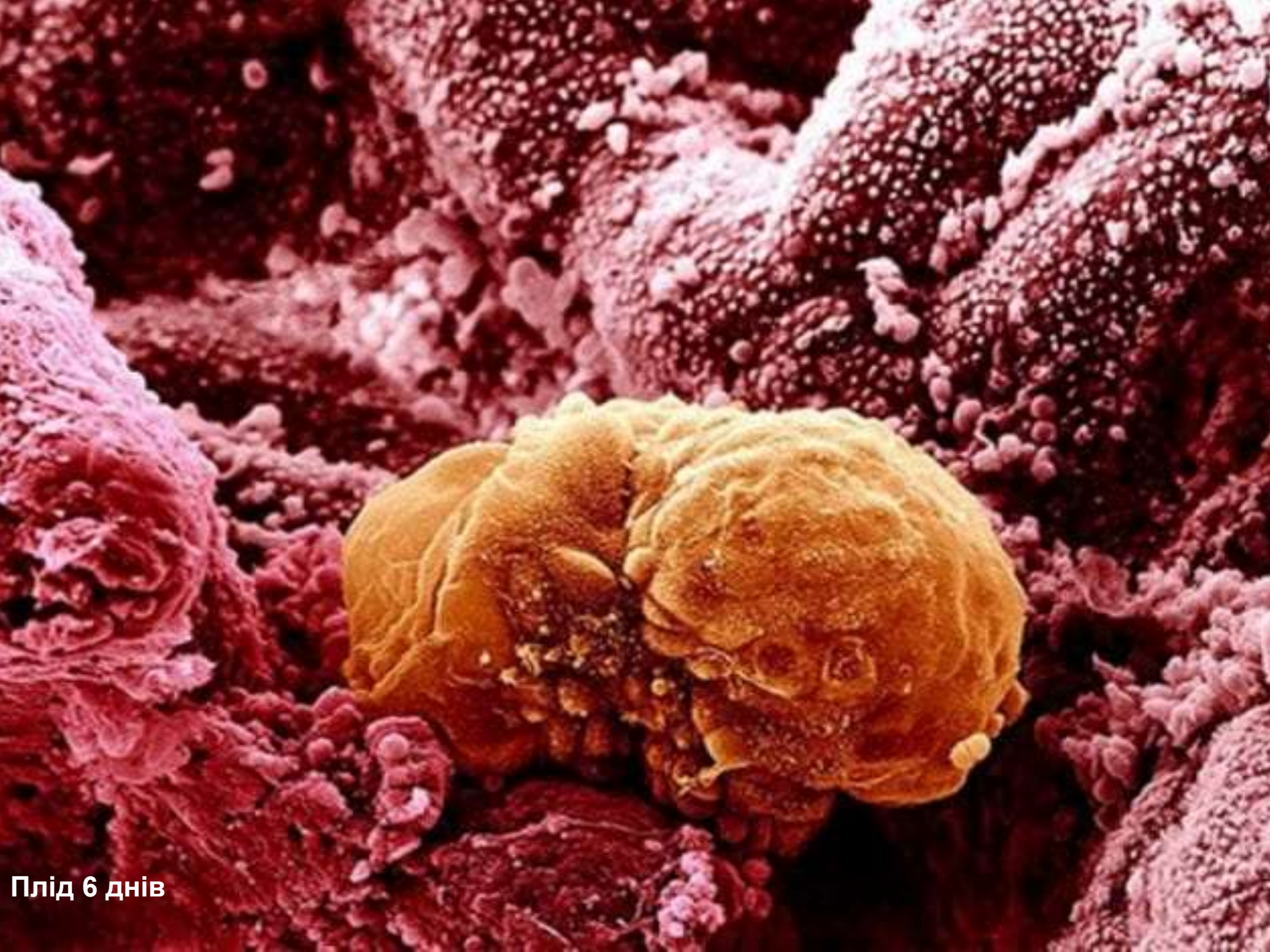
Сперма





Сперматозоїди в сім'явиносних каналцях





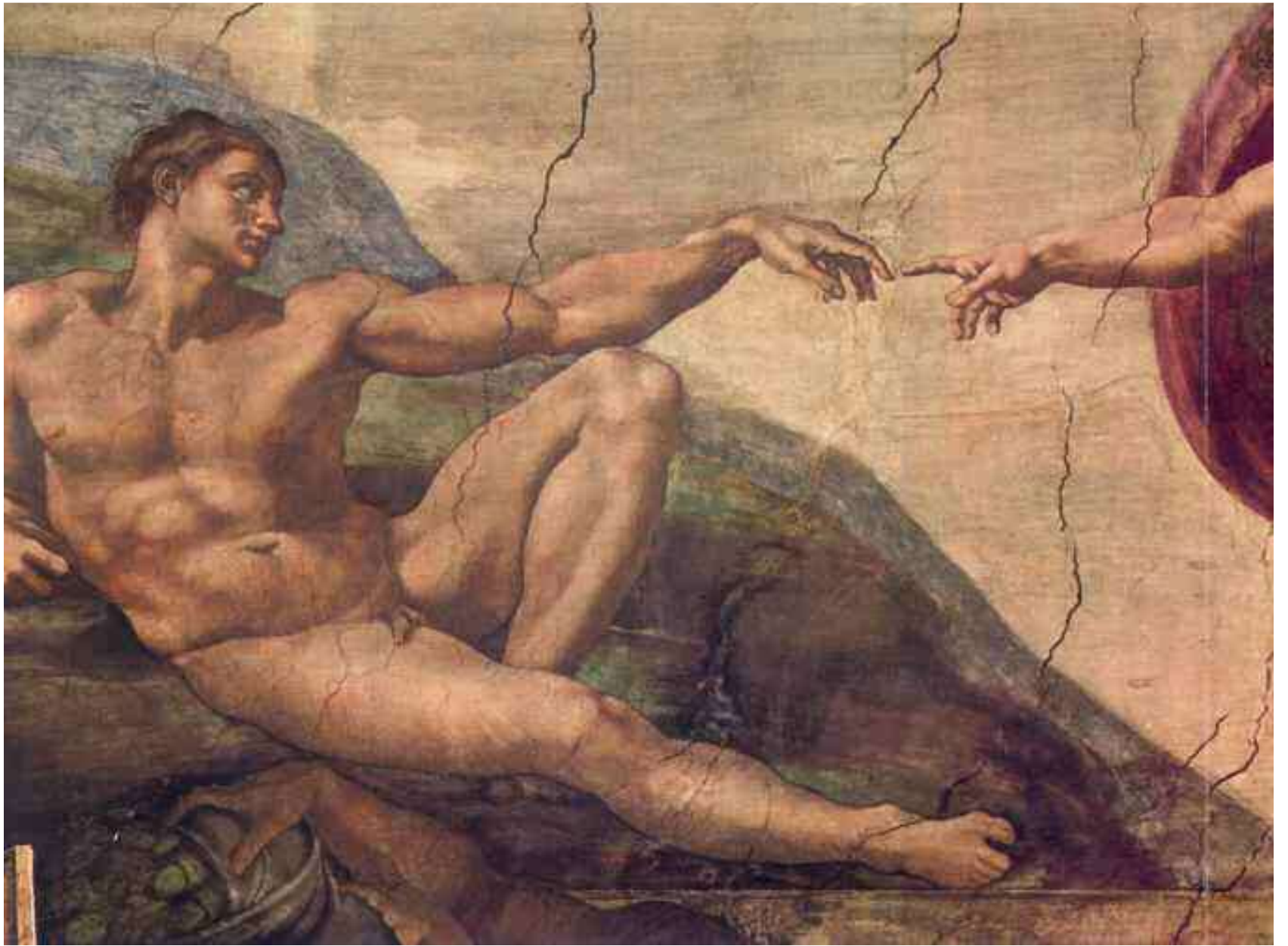
Плід 6 днів





Кристали серотоніна





# REMEMBER...

- “Diseases of the musculoskeletal system rank first among disease conditions that alter the quality of life...”



- Skeleton: 206 bones
- Long: femur, humerus, radius
- Short: carpals, tarsals
- Irregular: vertebrae
- Bones protect, support, allow for locomotion and mineral storage (Ca,Mg)

- Joints: Range from joints that don't move to joints that freely move.
- Ligaments and tendons: stabilize joints
- Ligaments: attached from bone to bone
- Tendons: attached from muscle to bone
- Cartilage: ends on bones



- Muscles: controlled by nervous system
- Fascia: surrounds muscles, divides muscles, main blood vessels and nerves.
- Bursae: cushions moving parts
- Muscle tone: ability to resist force; graded 0-5
- Atrophy: decrease size





# Muscular System at a Glance

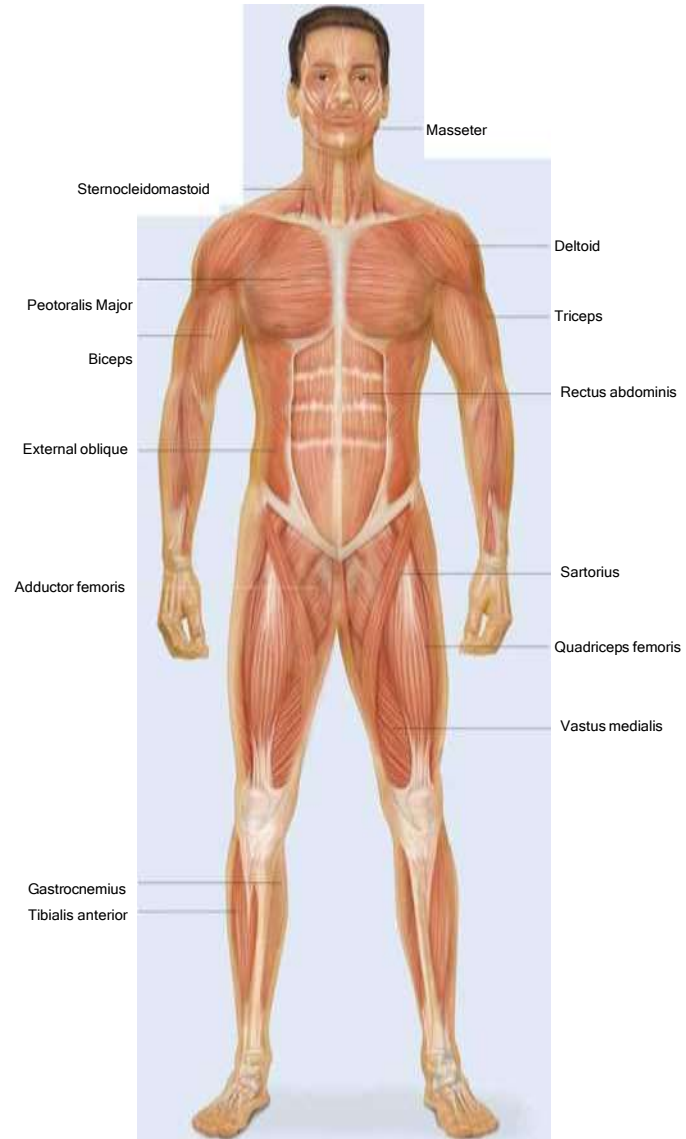
- **Function of Muscular System**
  - **Individual cells are able to contract or shorten in length**
  - **Shortening produces movement**

# Muscular System at a Glance

- Organs of Muscular System -  
**Muscles**

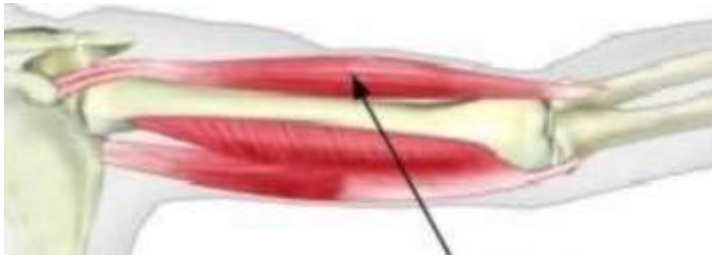


# Muscular System Illustrated



- Bundles of parallel **muscle tissue fibers**
- **Fibers contract**
  - **Shorten in length**
  - **Produce movement**
  - **Move bones closer together**
  - **Push food through digestive system**
  - **Pump blood through blood vessels**



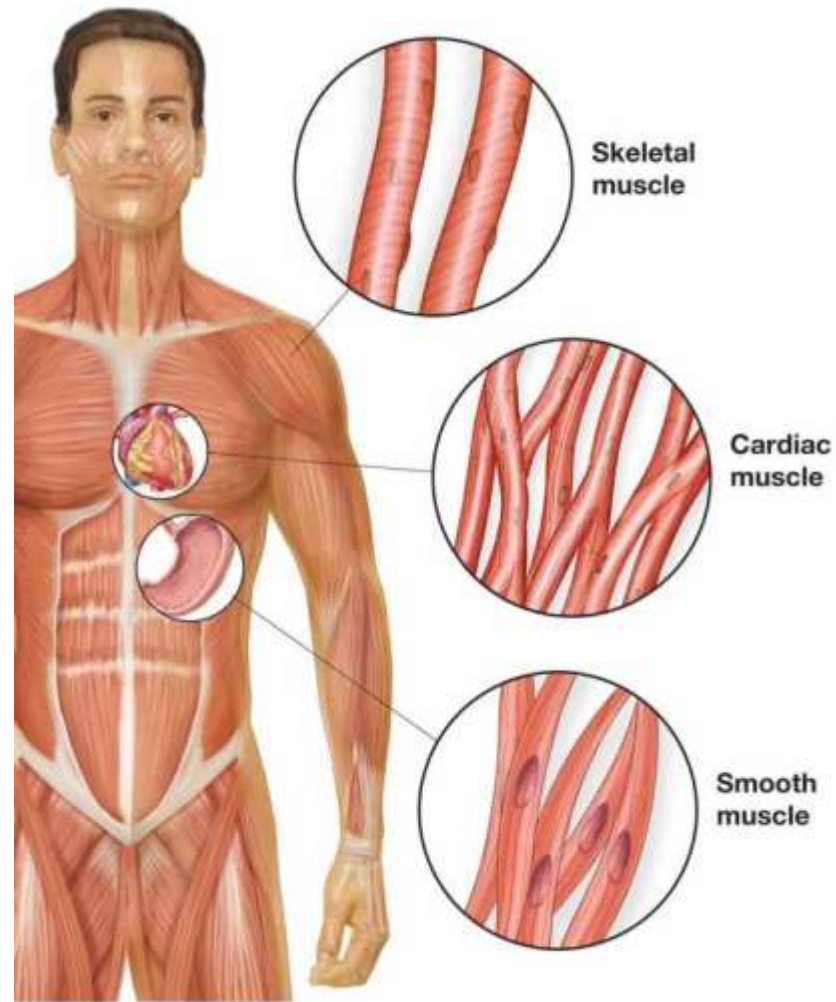


Muscle

# Types of Muscles

- Skeletal muscle
- Smooth muscle
- Cardiac muscle
- Voluntary muscles
  - **Consciously choose to contract the muscle**
  - **Skeletal muscles**
- Involuntary muscles
  - **Under control of subconscious brain**
  - **Smooth muscles and cardiac muscle**





**The three types of muscles: skeletal, smooth, and cardiac.**

# Skeletal Muscles

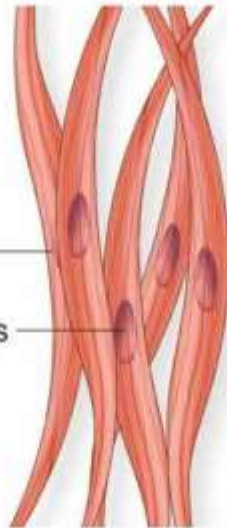
- Attached to bones
- Produce voluntary movement of skeleton
- Also referred to as **striated muscle**
  - **Looks striped under microscope**



# Skeletal Muscles

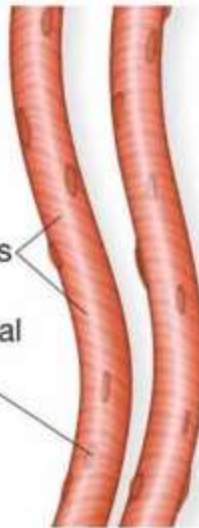
- Muscle is wrapped in layers of connective tissue
  - Called **fascia**
  - Tapers at the end to form **tendon**
  - Inserts into periosteum to attach muscle to bone
- Are stimulated by **motor neurons**
  - Point of contact with muscle fiber is called **myoneural junction**

**Visceral**  
(smooth)



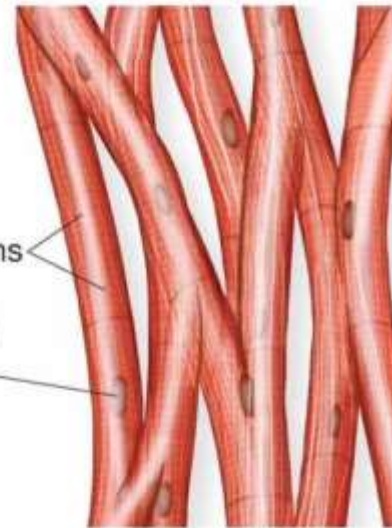
No striations  
Central nucleus

**Skeletal**  
(striated)



Striations  
Peripheral nuclei

**Cardiac**



Striations  
Central nuclei

<b>Contracts</b>	Slowly	Rapidly	Rapidly
<b>Found</b>	Viscera, blood vessels	Trunk, extremities, head and neck	Heart
<b>Control</b>	Involuntary	Voluntary	Involuntary

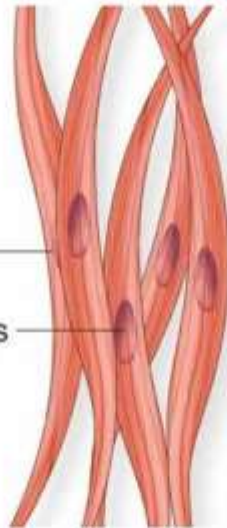
Characteristics of the three types of muscles.

# Smooth Muscles

- Associated with internal organs
  - Also called **visceral muscle**
  - **Stomach**
  - **Respiratory airways**
  - **Blood vessels**
- Called smooth because has no microscopic stripes
- Produces involuntary movement of these organs

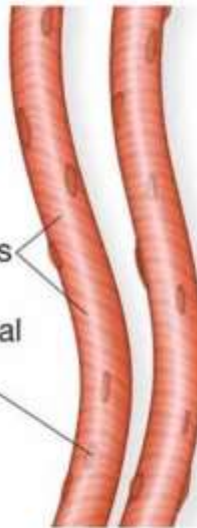


**Visceral**  
(smooth)



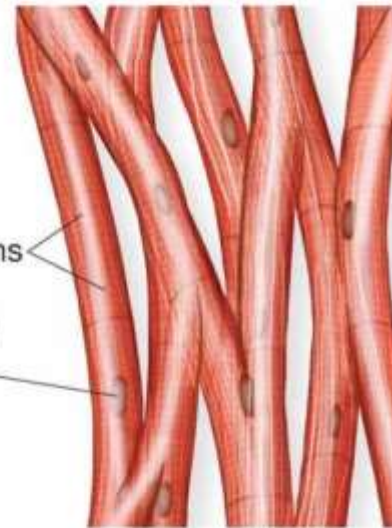
No striations  
Central nucleus

**Skeletal**  
(striated)



Striations  
Peripheral nuclei

**Cardiac**



Striations  
Central nuclei

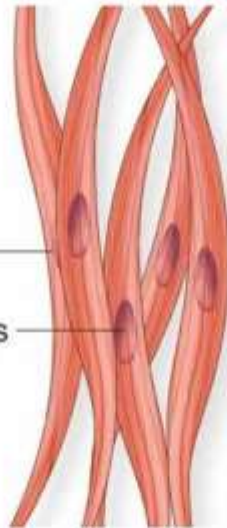
<b>Contracts</b>	Slowly	Rapidly	Rapidly
<b>Found</b>	Viscera, blood vessels	Trunk, extremities, head and neck	Heart
<b>Control</b>	Involuntary	Voluntary	Involuntary

Characteristics of the three types of muscles.

# Cardiac Muscle

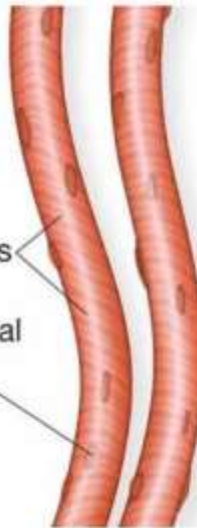
- Also called **myocardium**
- Makes up walls of heart
- Involuntary contraction of heart to pump blood

**Visceral**  
(smooth)



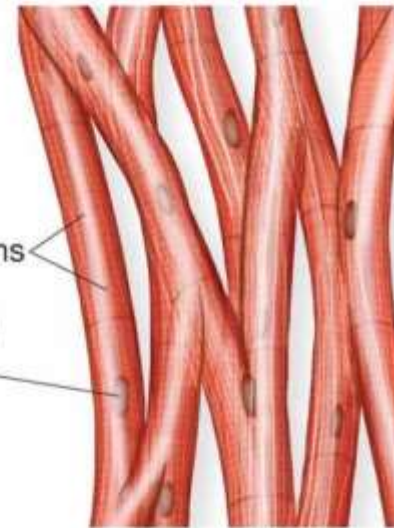
No striations  
Central nucleus

**Skeletal**  
(striated)



Striations  
Peripheral nuclei

**Cardiac**



Striations  
Central nuclei

<b>Contracts</b>	Slowly	Rapidly	Rapidly
<b>Found</b>	Viscera, blood vessels	Trunk, extremities, head and neck	Heart
<b>Control</b>	Involuntary	Voluntary	Involuntary

Characteristics of the three types of muscles.



# Skeletal Muscle Actions

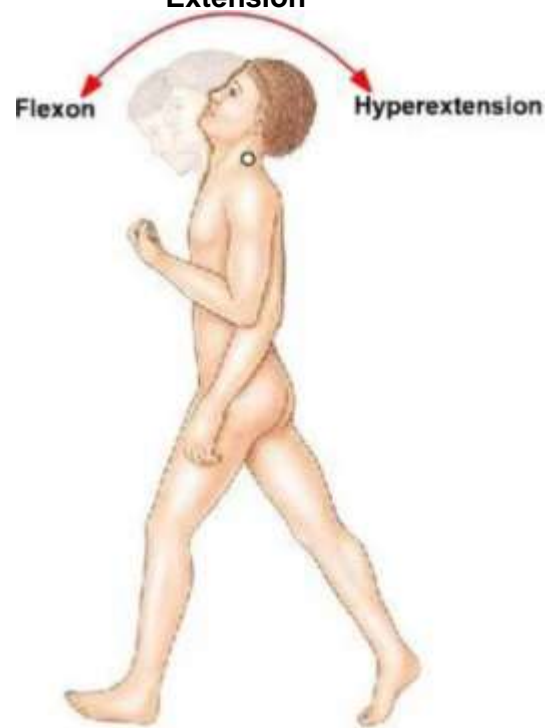
- Skeletal muscles attach to two different bones and overlap a joint
- When muscle contracts both bones move, but not equally
  - **Origin:** less moveable of 2 bones
  - **Insertion:** more moveable of 2 bones

# Skeletal Muscle Actions

- **Action**
  - **Type of movement produced by the muscle**
- **Antagonistic pairs**
  - **Pair of muscles arranged around a joint**
  - **Produce opposite actions**

## Flexion, Extension and Hyperextension of the Neck

Extension





# Movement Terminology

abduction	movement away from midline of body
adduction	movement toward midline of body
flexion	act of bending or being bent
extension	brings limb into a straight condition
dorsiflexion	backward bending of foot
plantar flexion	bending sole of foot; pointing toes





Figure 4.23 - Abduction and adduction.



# Humerus Adduction/Abduction

## Animation



Click [here](#) to view an animation on humerus adduction and abduction.

[Back to Directory](#)

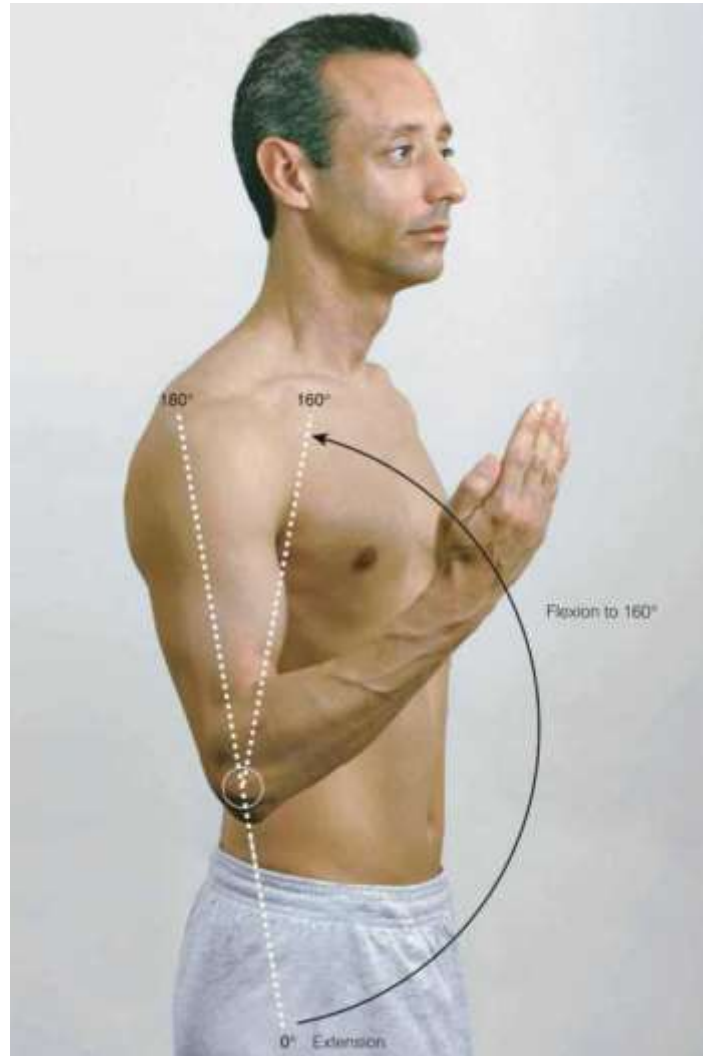


Figure 4.24 - Flexion and extension.

# Elbow Flexion/Extension

## Animation



Click [here](#) to view an animation on elbow flexion and extension.

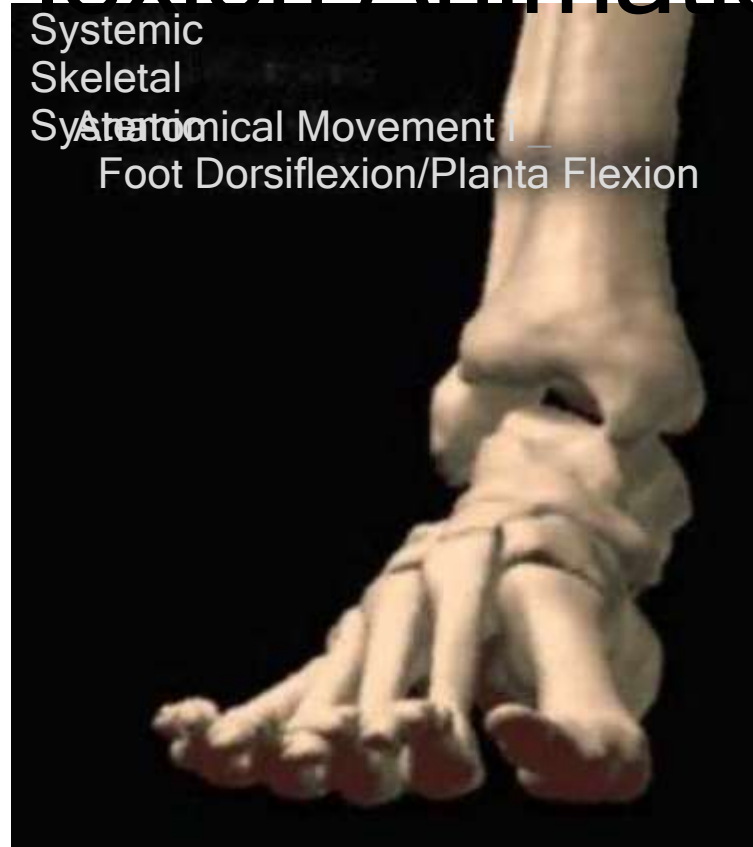
[Back to Directory](#)





Dorsiflexion and plantar flexion.

# Ankle Dorsiflexion and Plantar Flexion Animation



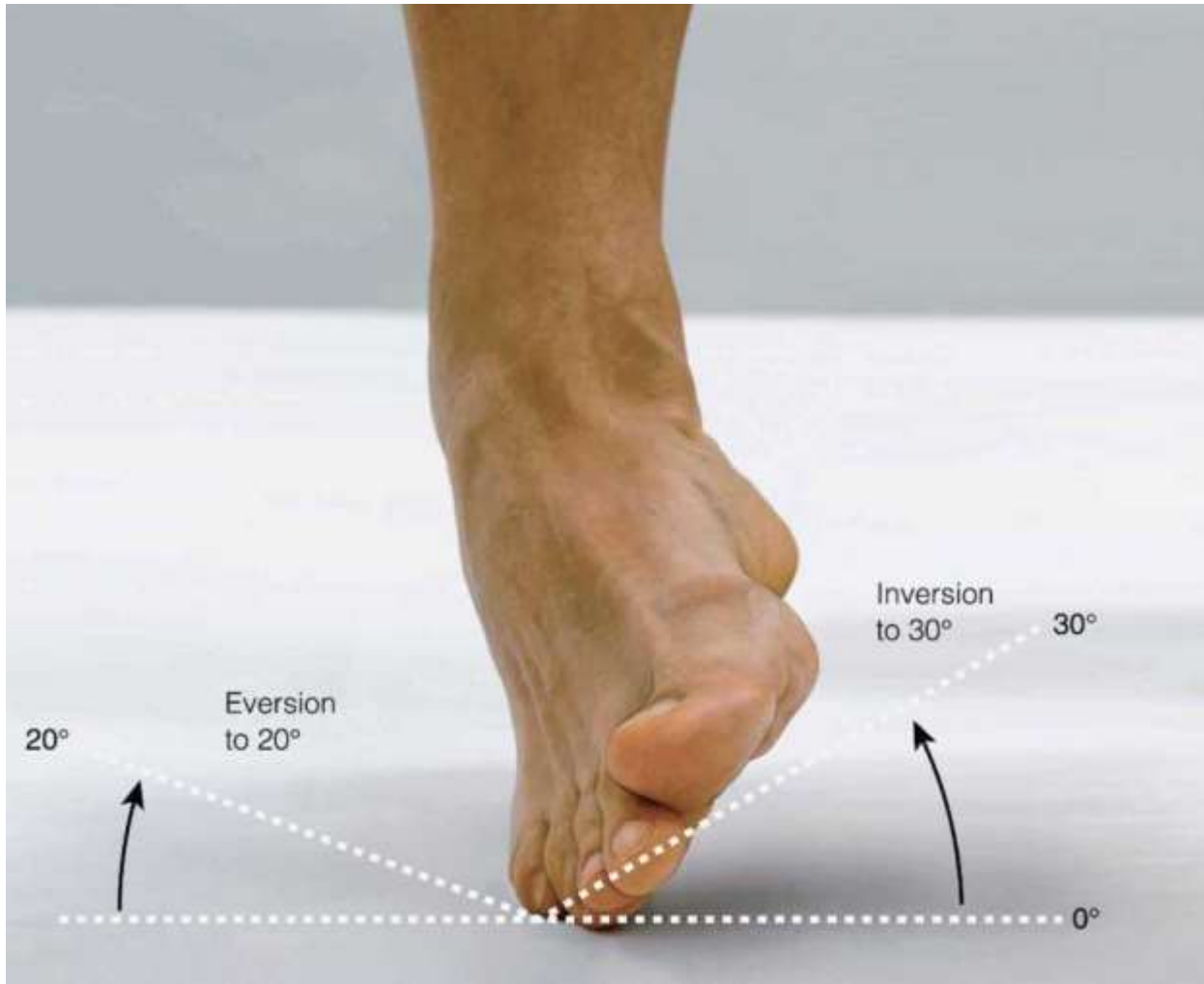
Click [here](#) to view an animation on ankle dorsiflexion and plantar flexion.

[Back to Directory](#)

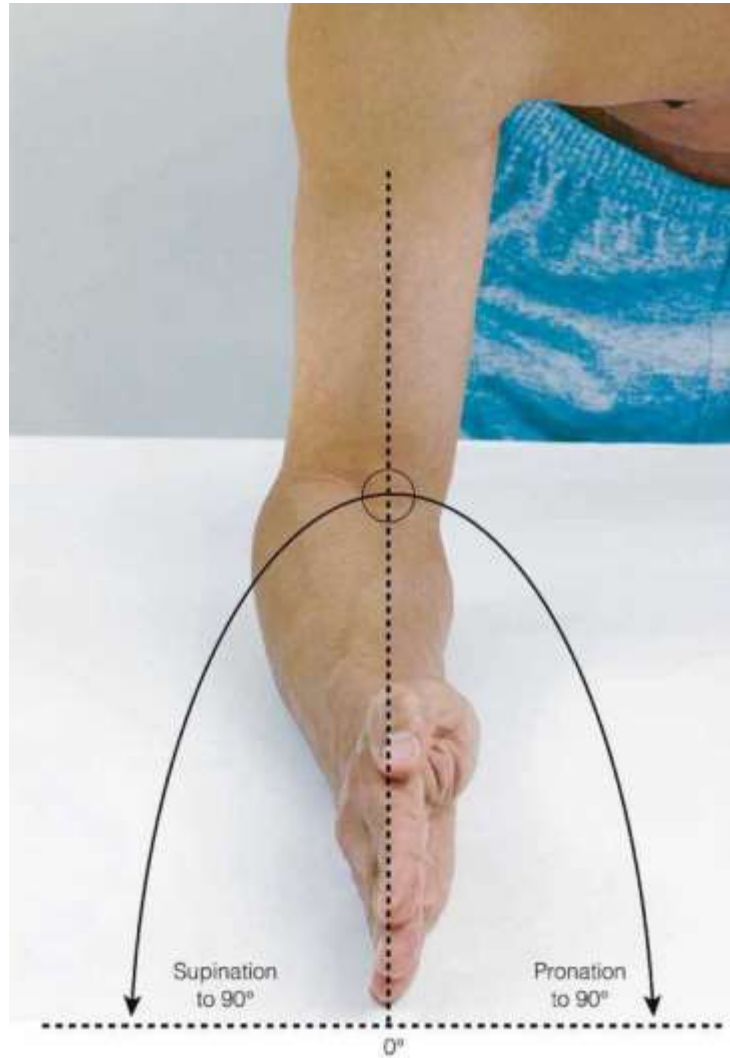
# Movement Terminology

eversion	turning outward
inversion	turning inward
pronation	turning palm downward
supination	turning palm upward
elevation	to raise
depression	to drop down





Eversion and inversion.

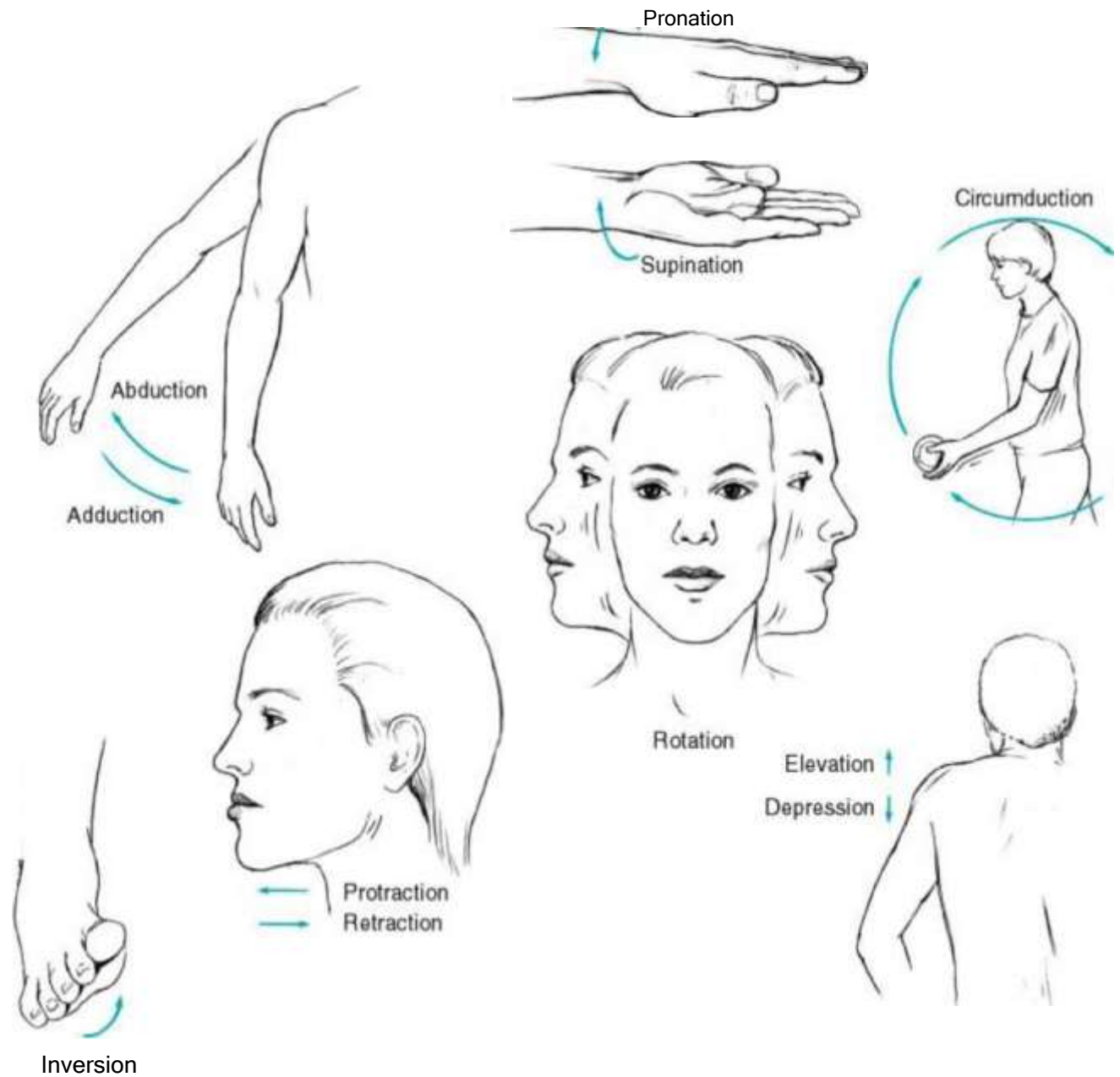


Pronation and supination.

# Different Circular Movements

- **Circumduction**
  - **Movement in circular direction from a central point**
- **Opposition**
  - **Moving thumb away from palm to contact tip of other fingers**
- **Rotation**
  - **Moving around a central axis**





## SKELTAL MUSCLE MOVEMENTS

# Different types of muscles

- Each of the muscles reacts differently to exercise

- **Skeletal**

- Demands Oxygen and Glycogen
  - At rest 20% of our blood goes to our muscles.
  - In a warm up 50% of our blood goes to our working muscles
  - In intense exercise 80% of our blood goes to our working muscles
- Works harder
- Warms up



Cardiac muscle cell

Skeletal muscle cell

Smooth muscle cell

- **Cardiac**

- Works harder (beats more often and with larger amount of blood in each beat) to provide the Oxygen and Nutrients to the skeletal muscle via the blood, and get rid of the Waste products of exercise (Carbon Dioxide, Water and Heat).

- **Involuntary**

**Blood is shunted away from the parts of the body that don't need it**

**Eg the stomach gets 25% of our blood during rest. This can reduce to 1% during**

# Muscular System Combining Forms

myocardi/o

heart muscle

myos/o

muscle

plant/o

sole of foot

ten/o

tendon

tend/o

tendon

tendin/o

tendon



## Muscular System Suffixes

–asthenia

–kinesia

–tonia

weakness

movement

tone

# Muscular System Prefixes

ab–

ad–

circum–

away from

towards

around

# Anatomy and Physiology

Bundles of parallel **muscle tissue fibers**

Fibers contract

Shorten in length

Produce movement

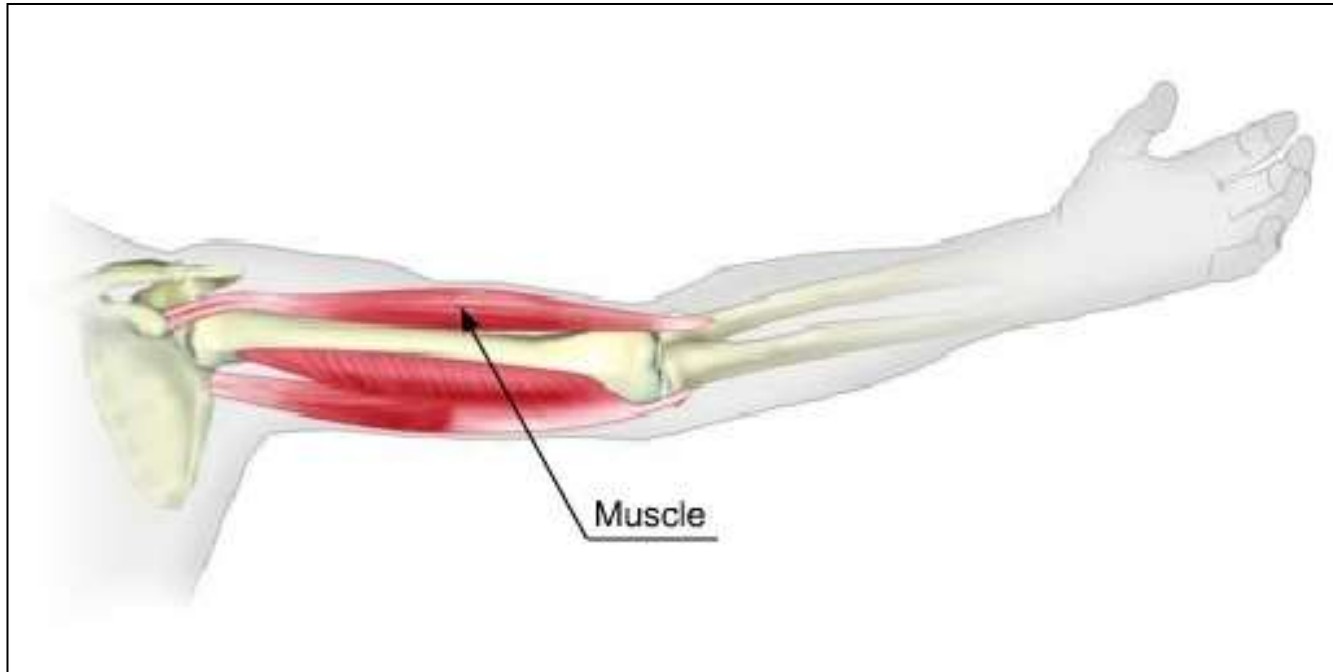
Move bones closer together

Push food through digestive system

Pump blood through blood vessels



## Muscles Animation



Click [here](#) to view an animation on muscles.

[Back to Directory](#)

# Types of Muscles

**Skeletal muscle**

**Smooth muscle**

**Cardiac muscle**

Voluntary muscles

Consciously choose to contract the muscle

Skeletal muscles

Involuntary muscles

Under control of subconscious brain

Smooth muscles and cardiac muscle

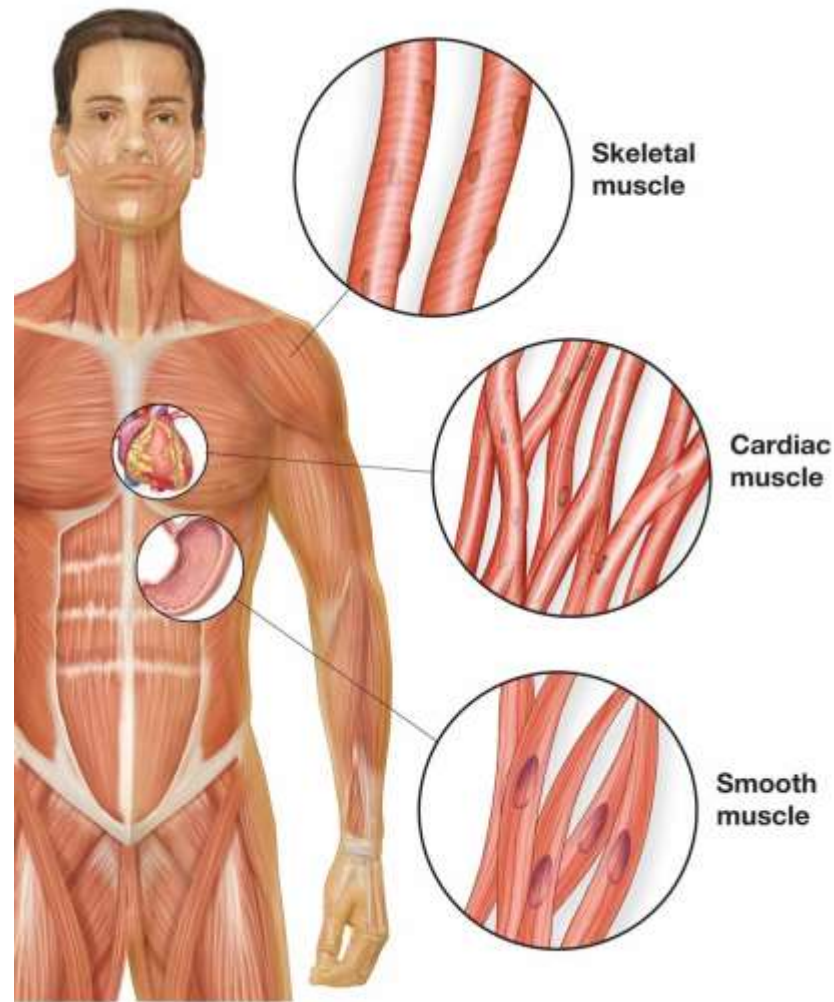


Figure 4.21 – The three types of muscles: skeletal, smooth, and cardiac.



# Skeletal Muscles

Attached to bones

Produce voluntary movement of skeleton

Also referred to as **striated muscle**

Looks striped under microscope

# Skeletal Muscles

Muscle is wrapped in layers of connective tissue

Called **fascia**

Tapers at the end to form **tendon**

Inserts into periosteum to attach muscle to bone

Are stimulated by **motor neurons**

Point of contact with muscle fiber is called **myoneural junction**

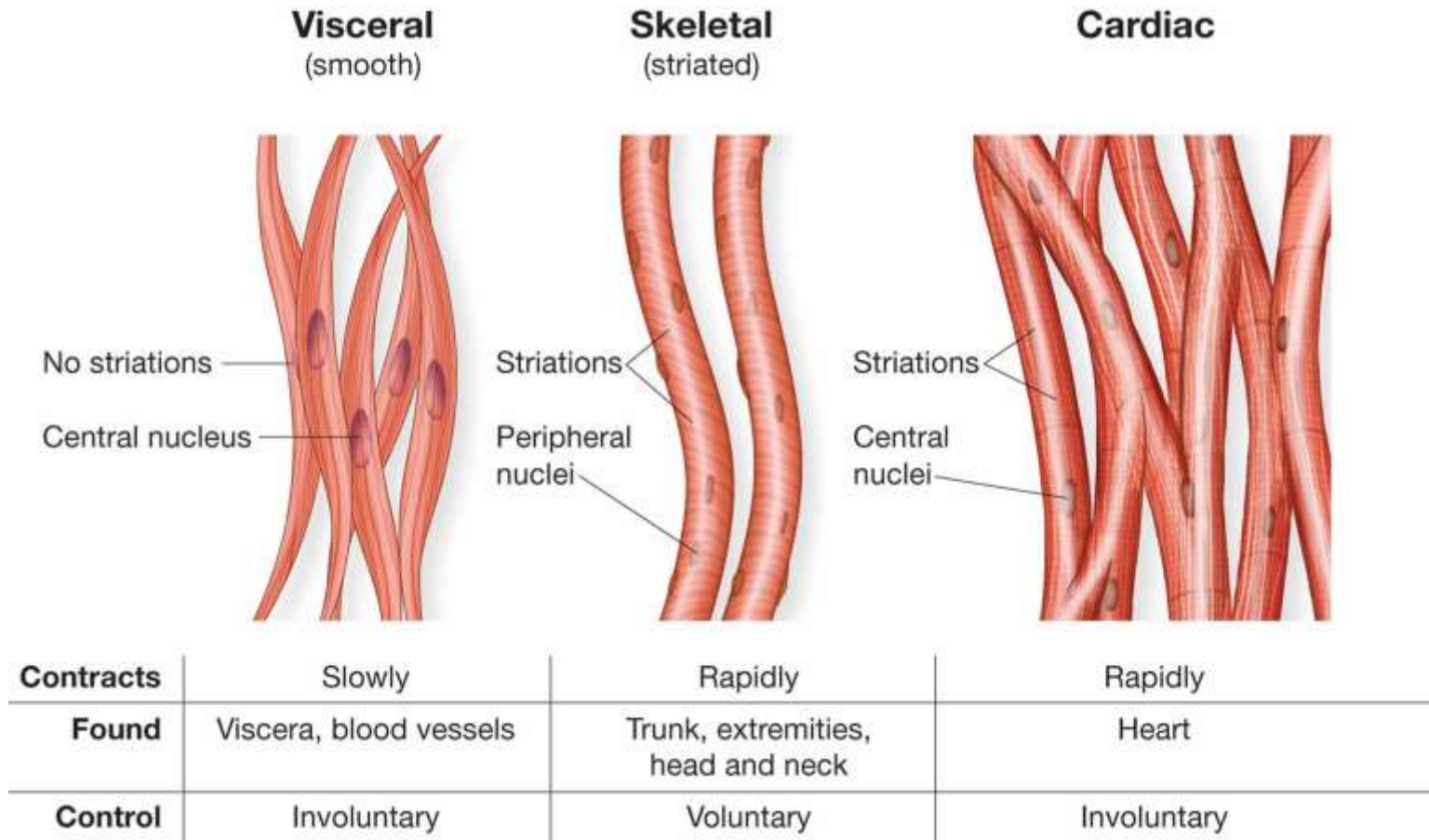


Figure 4.22 – Characteristics of the three types of muscles.



# Smooth Muscles

Associated with internal organs

Also called **visceral muscle**

Stomach

Respiratory airways

Blood vessels

Called smooth because has no microscopic stripes

Produces involuntary movement of these organs

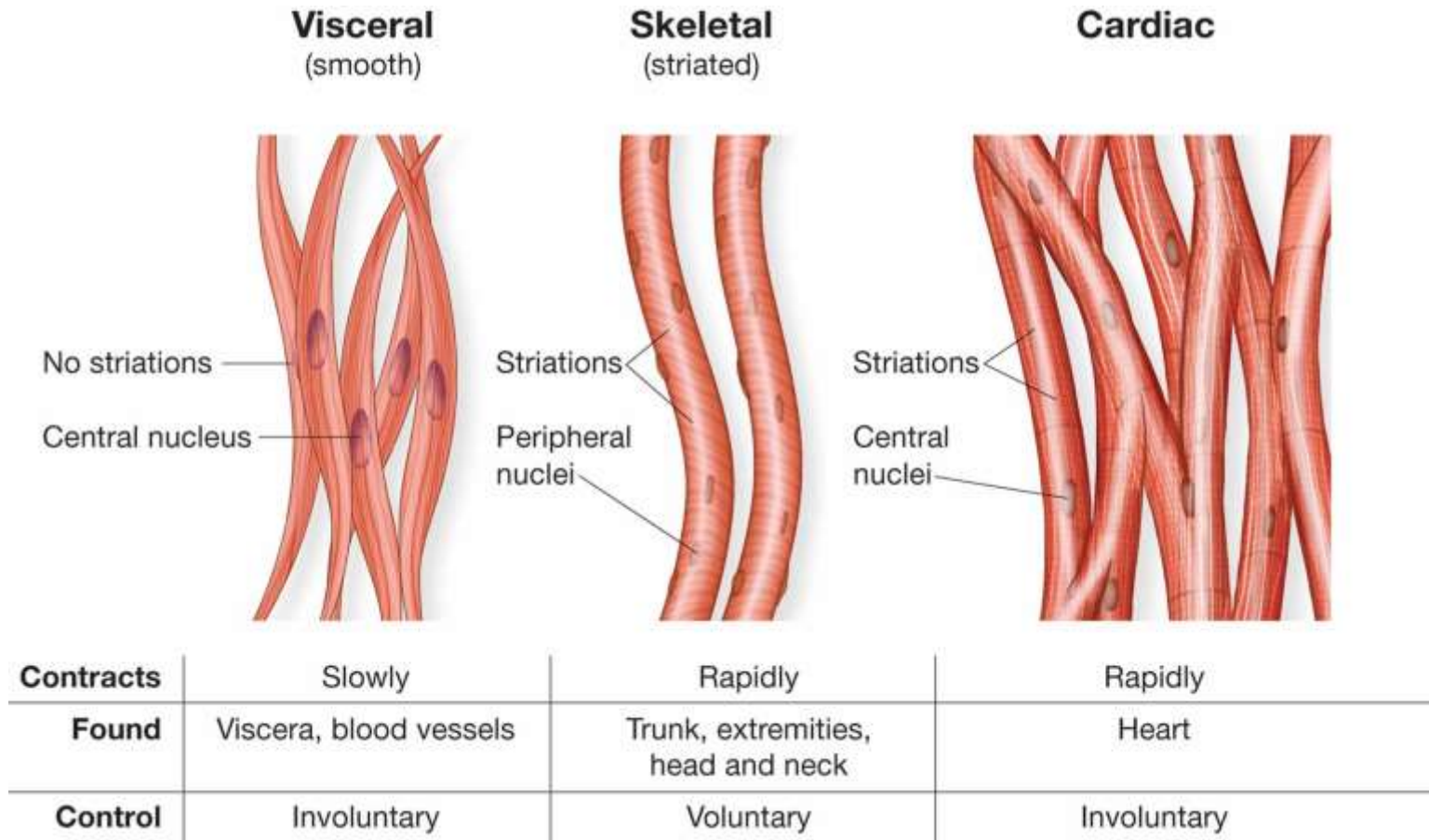


Figure 4.22 – Characteristics of the three types of muscles.

# Cardiac Muscle

Also called **myocardium**

Makes up walls of heart

Involuntary contraction of heart to pump blood

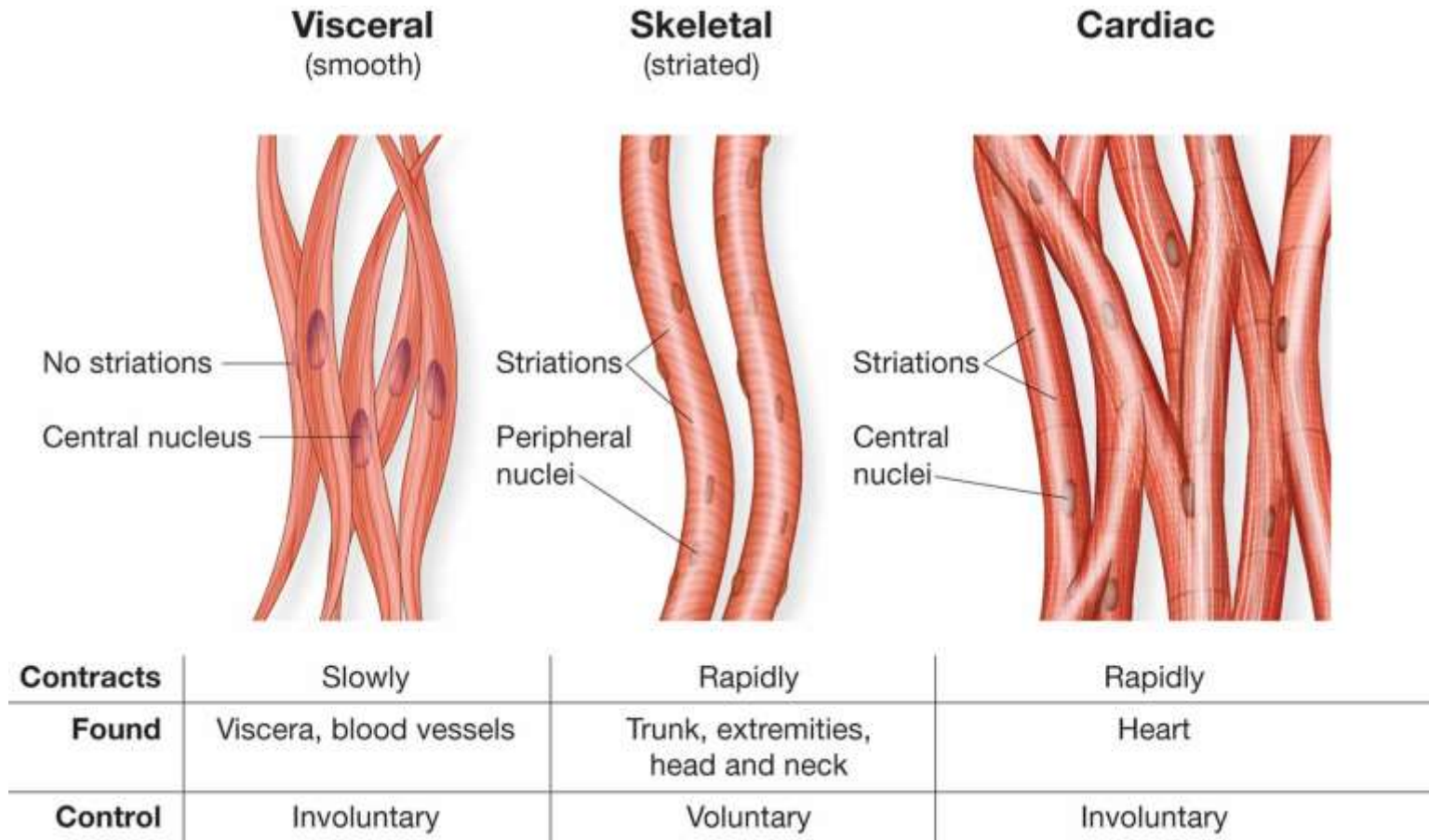


Figure 4.22 – Characteristics of the three types of muscles.



## Muscle Names

<b>Location</b>	rectus abdominis	straight abdominal muscle
<b>Origin and insertion</b>	sternocleidomastoid	named for its two origins: sternum and clavicle
<b>Size</b>	gluteus maximus	large buttock muscle

## Muscle Names

<b>Action</b>	flexor carpi	muscle that bends the wrist
<b>Fiber direction</b>	external oblique	abdominal with fibers running on an angle
<b>Number of attachment points</b>	biceps	muscle with two heads

## Skeletal Muscle Actions

Skeletal muscles attach to two different bones and overlap a joint  
When muscle contracts both bones move, but not equally

**Origin:** less moveable of 2 bones

**Insertion:** more moveable of 2 bones

# Skeletal Muscle Actions

## **Action**

Type of movement produced by the muscle

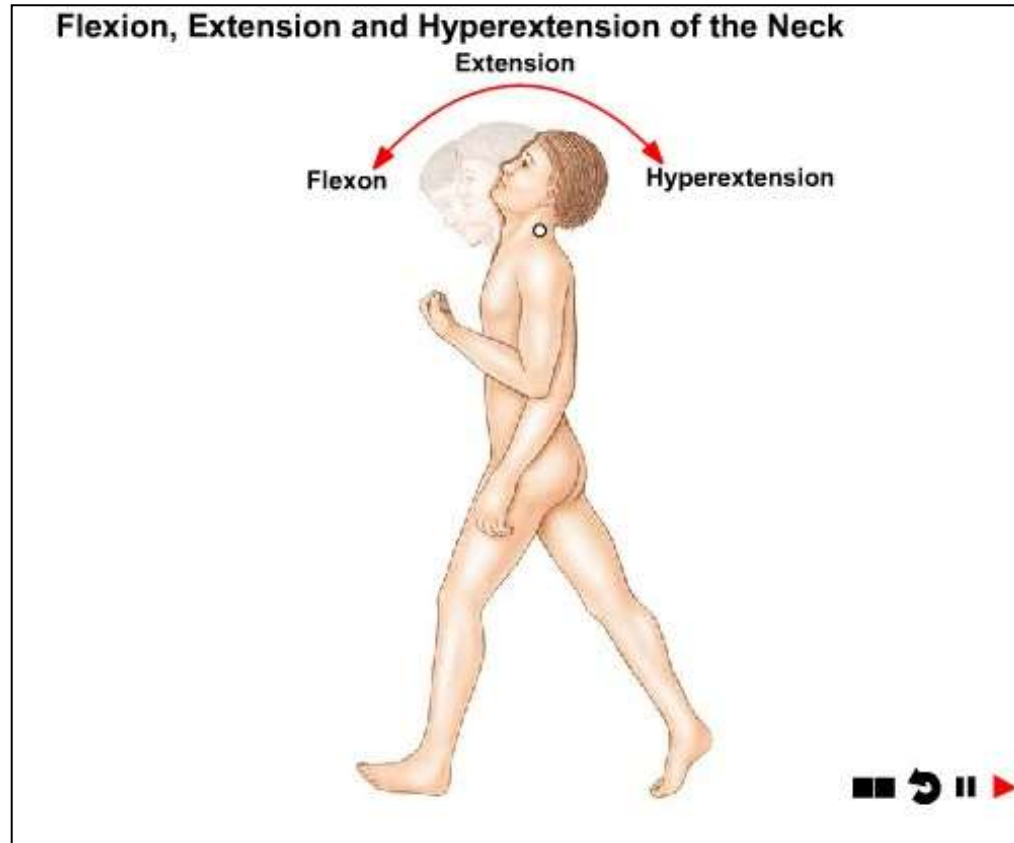
## **Antagonistic pairs**

Pair of muscles arranged around a joint

Produce opposite actions



# Joint Movement Animation



Click [here](#) to view an animation on the movement of joints.

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## Movement Terminology

abduction	movement away from midline of body
adduction	movement toward midline of body

flexion	act of bending or being bent
extension	brings limb into a straight condition

dorsiflexion	backward bending of foot
plantar flexion	bending sole of foot; pointing toes



Figure 4.23 – Abduction and adduction.

# Humerus Adduction/Abduction Animation



Click [here](#) to view an animation on humerus adduction and abduction.

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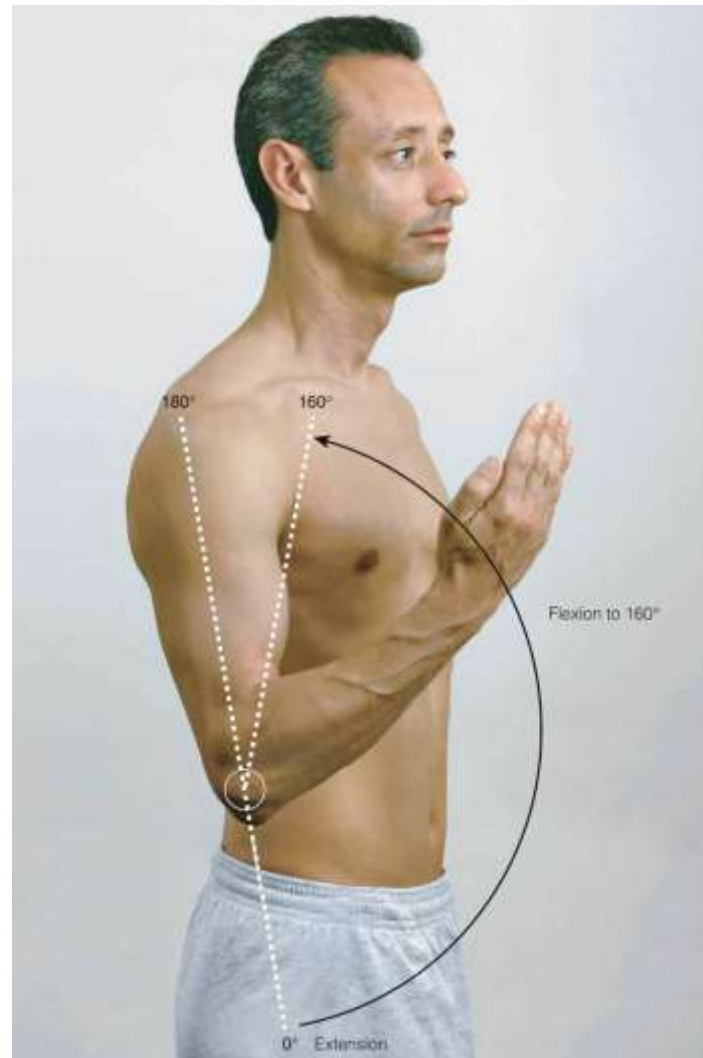
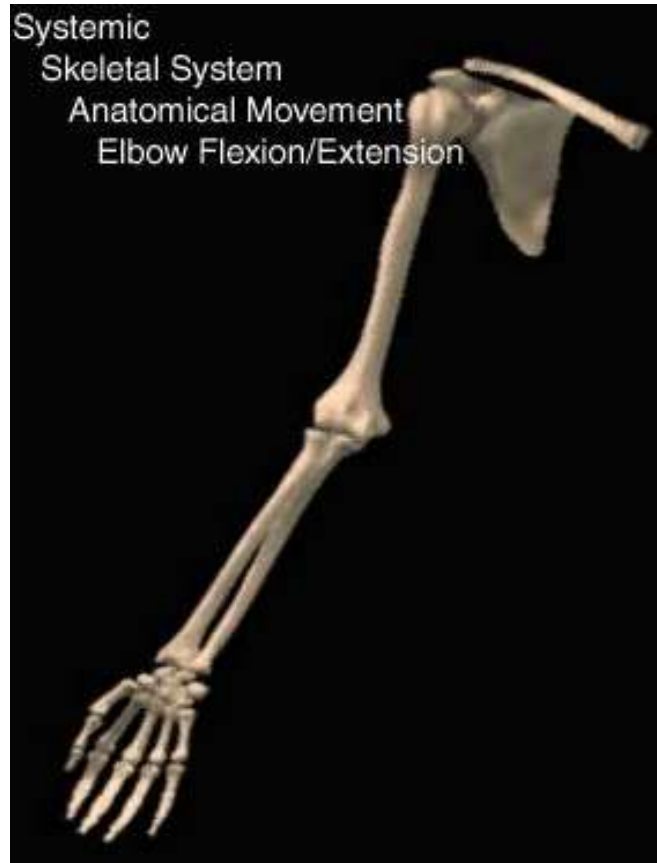


Figure 4.24 – Flexion and extension.

## Elbow Flexion/Extension Animation



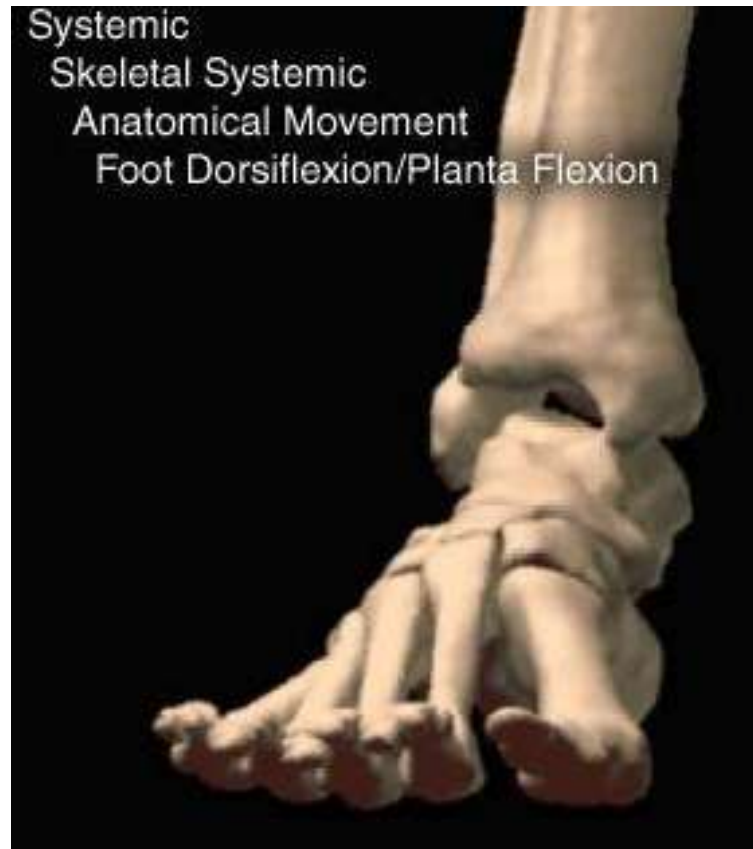
Click [here](#) to view an animation on elbow flexion and extension.

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Figure 4.25 – Dorsiflexion and plantar flexion.

## Ankle Dorsiflexion and Plantar Flexion Animation



Click [here](#) to view an animation on ankle dorsiflexion and plantar flexion.

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## Movement Terminology

everision	turning outward
inversion	turning inward

pronation	turning palm downward
supination	turning palm upward

elevation	to raise
depression	to drop down

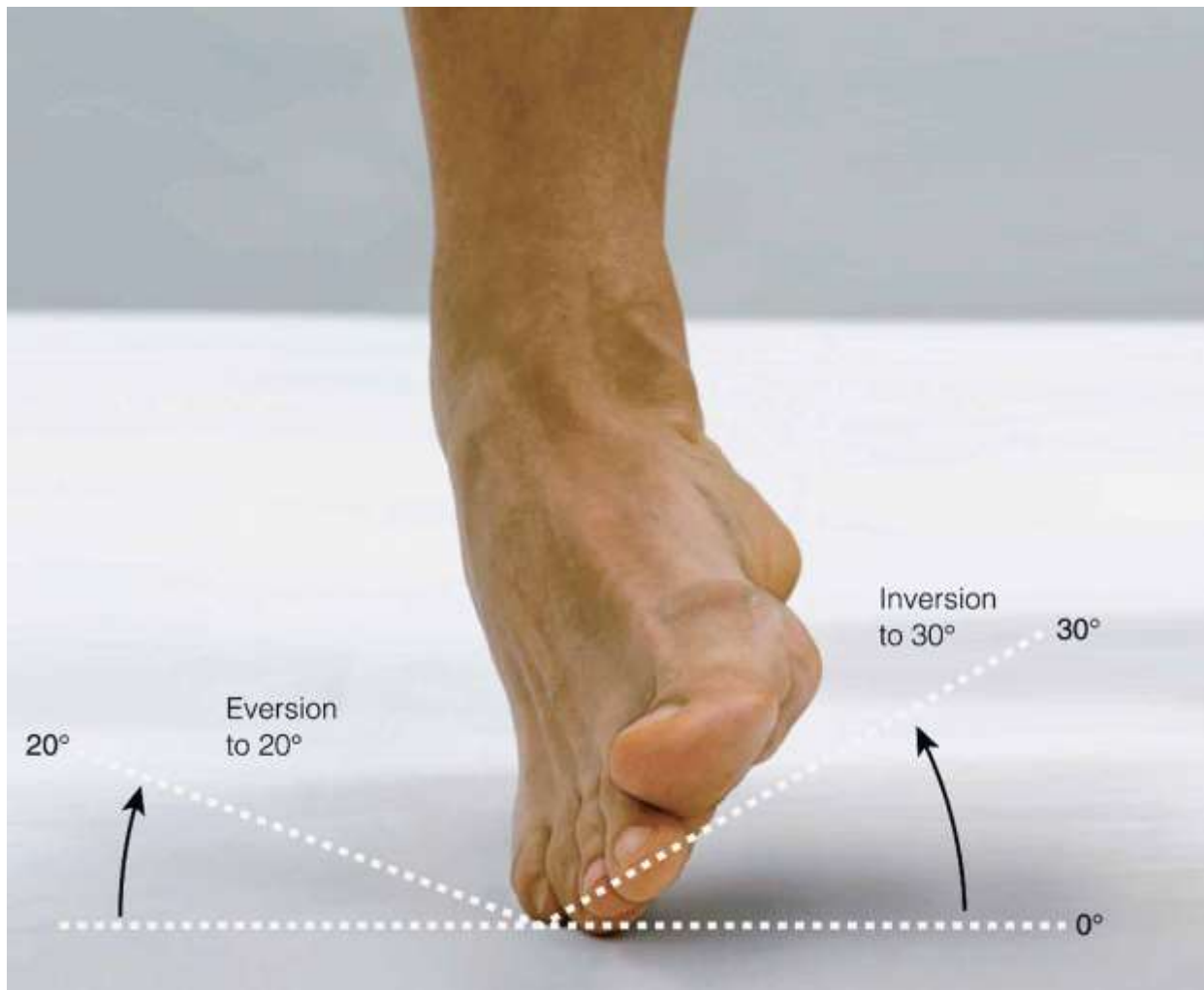
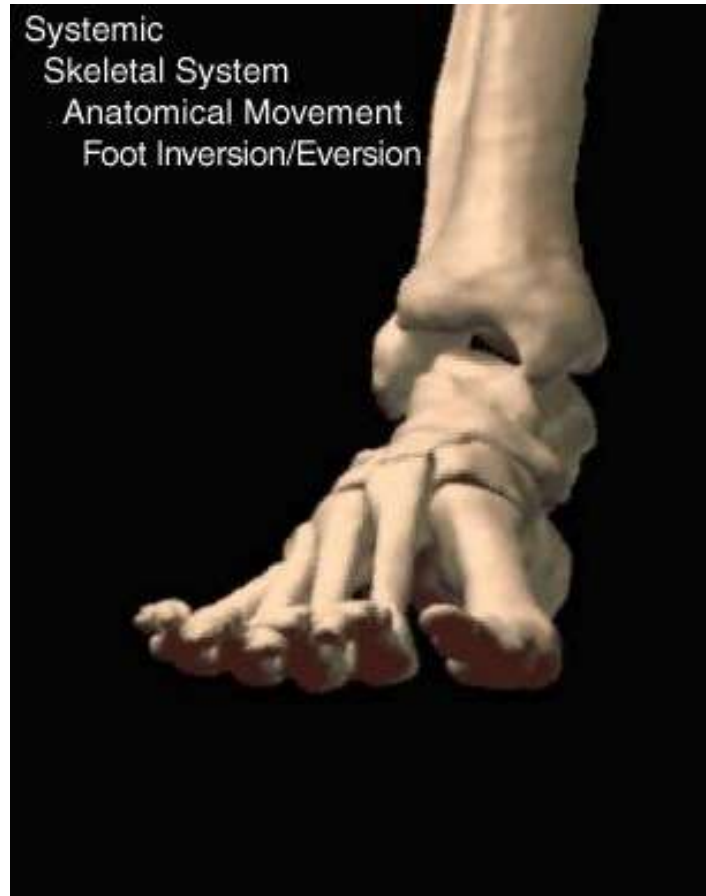


Figure 4.26 – Eversion and inversion.

## Ankle Inversion and Eversion Animation



Click [here](#) to view an animation of ankle inversion and eversion.

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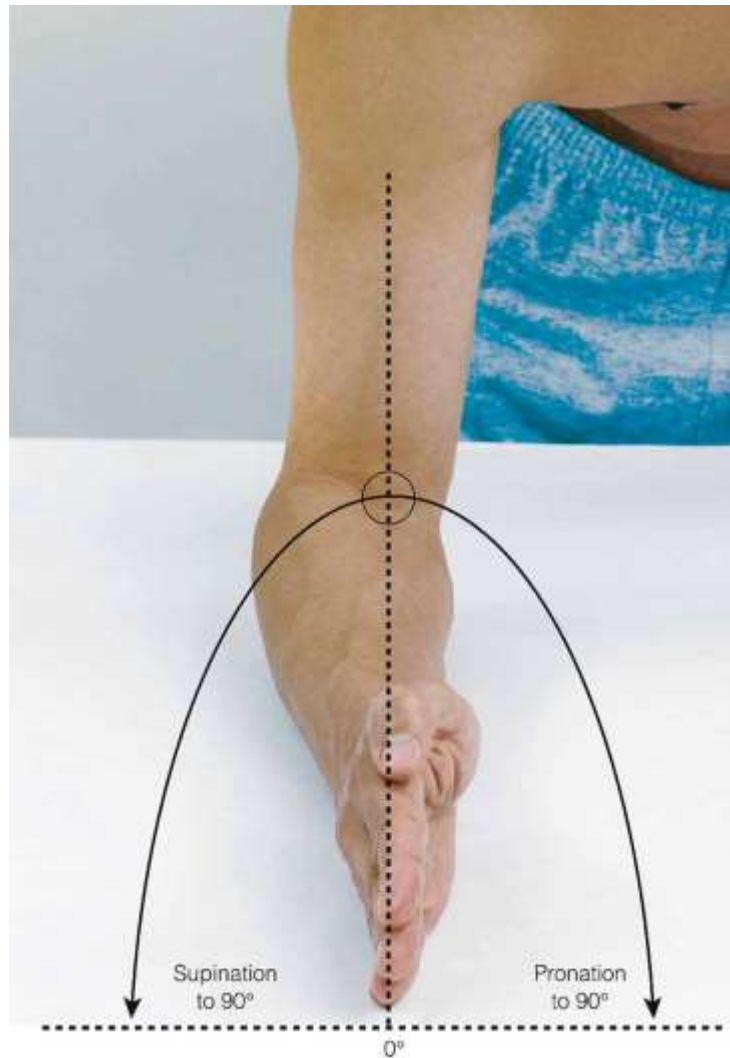
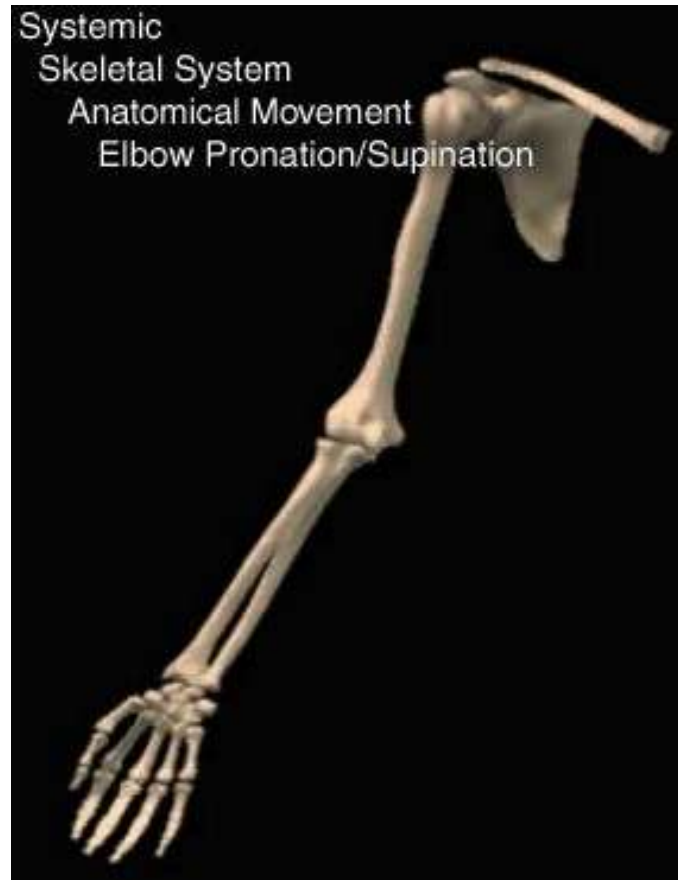


Figure 4.27 – Pronation and supination.



## Elbow Pronation and Supination Animation



Click [here](#) to view an animation of forearm pronation and supination.

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# Different Circular Movements

## **Circumduction**

Movement in circular direction from a central point

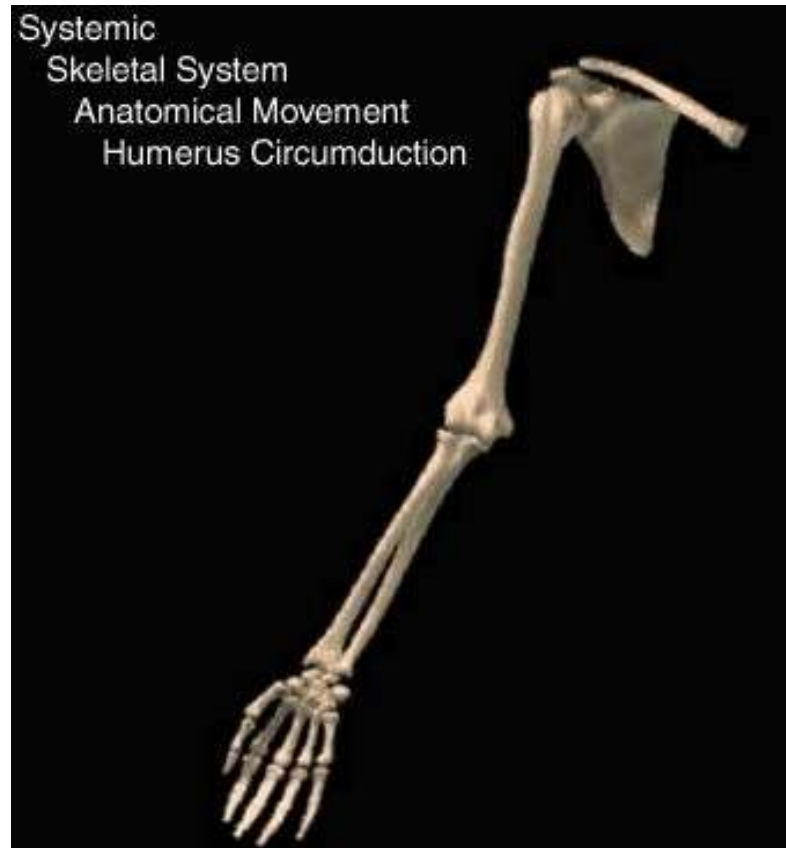
## **Opposition**

Moving thumb away from palm to contact tip of other fingers

## **Rotation**

Moving around a central axis

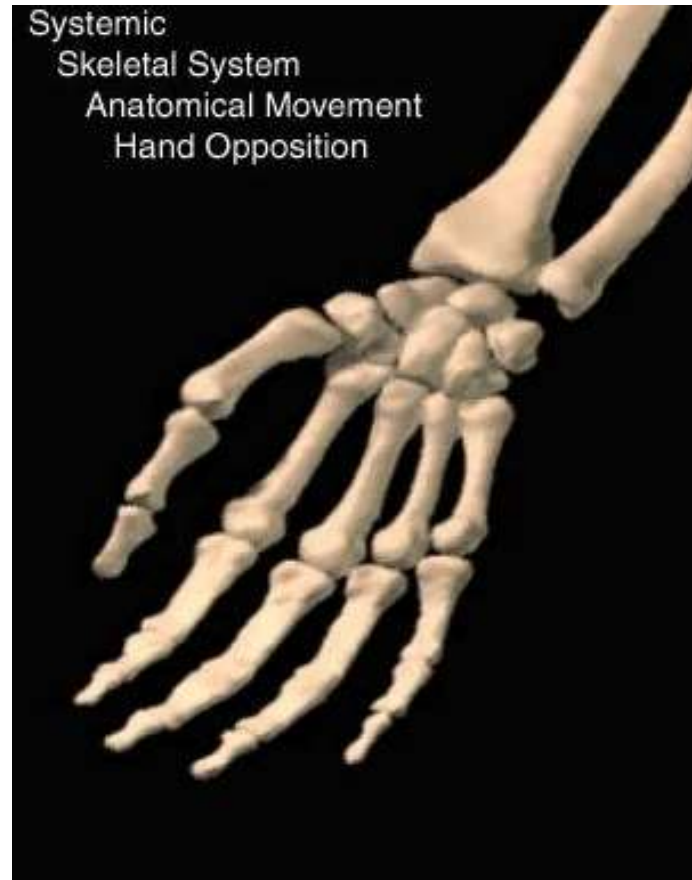
# Humerus Circumduction Animation



Click [here](#) to view an animation of humerus circumduction.

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## Hand Opposition Animation



Click [here](#) to view an animation of thumb and finger opposition.

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# Humerus Rotation Animation



Click [here](#) to view an animation of humerus rotation.

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Trapezius-

Deltoid -

Triceps-

Biceps-

Lactissimus dorsi-

Extensors of the hand

Biceps femoris

Vastus lateralis -

Rectus femoris -



Peroneus  
longus

Tibialis  
anterior

Gastrocnemius

END

Questions???

  
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