

Laboratory Investigation 24A

Station # _____

Chapter 24A: Human Skin

Human Anatomy & Physiology: Integumentary System

You may refer to pages 415-421
in your textbook for a general
discussion of the integumentary system.
Time required: 60 minutes

Background Material

What is a Human?

Man is the most magnificent part of God's creation - far more complex in structure and design than the earth or any heavenly body.

The human body is the crowning glory of God's creation; it is superior to the best machines that modern technology can build.

Humans are different from animals - Gen. 1:27 (created in God's image; we have a soul which makes us different from animals; both God and man are spiritual beings, an attribute not shared by animals - animals no matter how intelligent, are not spiritual beings, and therefore they are not morally accountable to God for their actions. Man is a spirit created in the image of God, in that he can make moral decisions and is accountable for them. Men, unlike angels, are limited to physical bodies; men, unlike animals, have spirits with their bodies.)

anatomy - how a structure is shaped, where it is found, and what it's made of
physiology - the function of a structure

The Body Cavities

1. **Cranial Cavity:** brain
2. **Spinal Cavity:** spinal cord
3. **Thoracic Cavity:** (chest area) heart, lungs, esophagus, trachea, thymus gland
4. **Abdominal Cavity:** (also called the abdominopelvic cavity) liver, stomach, pancreas, spleen, kidneys, urinary bladder, small and large intestine, gonads (reproductive organs)

The thoracic cavity and the abdominal cavity are separated by the **diaphragm**.

visceral organs: all the soft, internal organs within the thoracic and abdominal cavities such as the heart, lungs, intestines (not skin or bones)

Eleven Body Systems

system: a group of organs which function together as a unit to perform a definite job for the body

Internal transportation:

1. **Circulatory System:** heart, blood vessels, blood
bring food, water, and oxygen to the cells and carry away waste products
2. **Lymphatic System:** lymph, lymph vessels, lymph nodes, spleen, tonsils
protects body against disease-producing organisms

Incoming substances:

3. **Respiratory System:** nose, throat, trachea, larynx, lungs, bronchial tubes
to supply body tissues with oxygen and to remove CO₂
4. **Digestive System:** mouth, esophagus, stomach, intestines, liver, pancreas, gall bladder
to break down food into a form that can be absorbed by the bloodstream

Excretion:

5. **Excretory System:** kidney, urinary bladder, sweat glands, urethra
to remove wastes from body

Control:

6. **Nervous System:** brain, spinal cord, nerves, sense organs (eyes, ears, taste buds, touch, touch receptors)
to coordinate the activities of the body
the master control unit of the body
7. **Endocrine System:** pituitary gland, thyroid gland, adrenal gland, pancreas
produces hormones which influence many activities of the body
hormones - "chemical messengers" - they give an organ the message to slow down or to speed up

Covering:

8. **Integumentary System:** skin, hair
provides a means of communication with the world
protects body from microbes

Support & movement:

9. **Skeletal System:** bones, cartilage, joints
gives support to body
protects vital organs
produce blood cells
10. **Muscular System:** muscles
provides movement

Reproduction:

11. **Reproductive System:** ovaries, fallopian tubes, uterus
testes, vas deferens, prostate gland
for the continuation of life

histology - the study of tissues

tissue - a group of similar cells which work together to accomplish the task of an organ

Four Types of Tissues

- (1) **Connective tissue:** connect, support, cushion, & fill
example - bones, tendons, ligaments, fat, blood, lymph
- (2) **Epithelial tissue:** cover, line, protect, & secrete
example - layers of the skin, lining of the mouth & other membranes
- (3) **Muscular tissue:** move the body & substances in the body
example - muscles
- (4) **Nervous tissue:** irritable, conduct impulses coordinate movements, thought, emotions
example - nerves

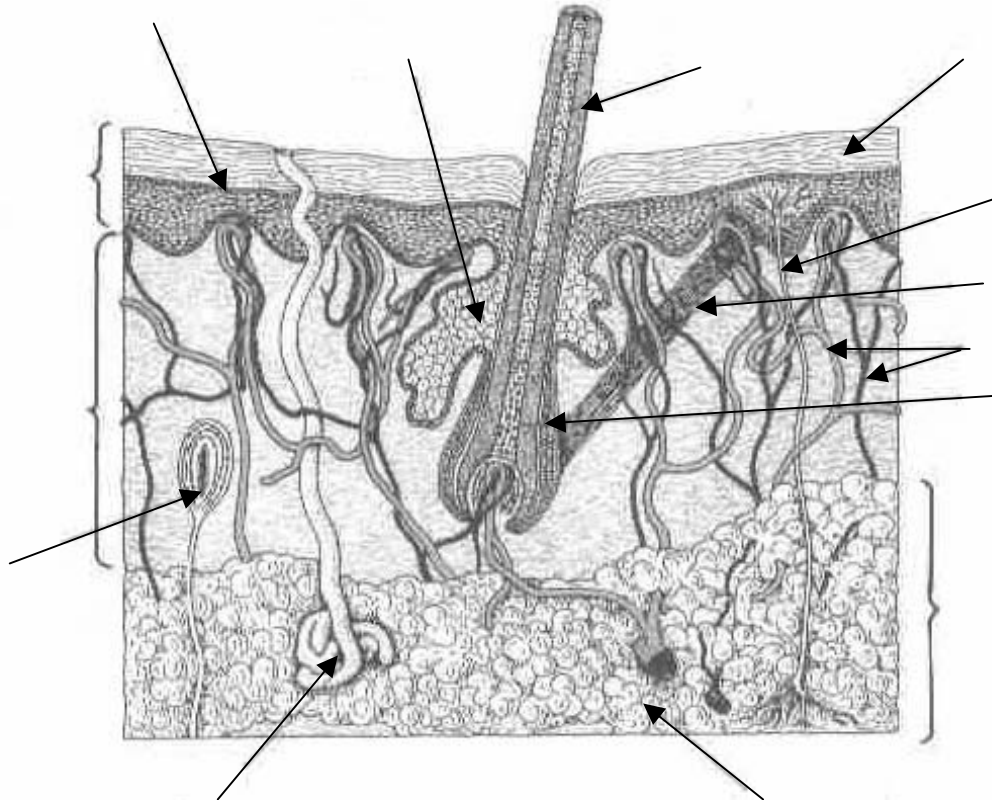
Materials

Part 1: microscope; preserved slide of a cross section of human skin

Part 2: water-soluble, felt-tip pen; metric ruler; toothpicks; cotton swab; paper clip; ice; paper towels; beakers

Label the diagram of the skin

A Section of Typical Skin



Procedures Part 1 - Microscope

Obtain and set up your microscope.

Focus your microscope on the slide of human skin. The epidermis should be toward the top, and the subcutaneous layer toward the bottom.

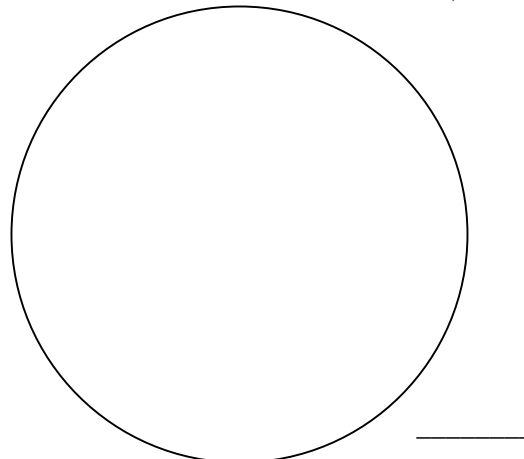
Find and observe the epidermis, the dermis, the subcutaneous layer, hair, hair follicle, blood vessels, oil gland, sweat gland, and muscle.

Make a drawing using color.

Answer the following questions

Drawing Part 1

A Cross Section of Human Skin (Slide # _____)



Observations Part 1 (Describe means what it looks like under the microscope.)

1. Which layer is the epidermis? _____
2. Describe the epidermis. _____
3. Where is the dermis? _____
4. Describe the dermis. _____
5. Describe hair. _____
6. Describe a hair follicle. _____
7. Describe blood vessels. _____
8. Describe an oil gland. _____
9. Describe a sweat gland. _____
10. Describe muscle. _____
11. Where are the oil glands located in relation to the hair follicles? _____
12. What is the significance of this relationship? _____
13. Describe the shape of a hair inside the follicle. _____
14. Where is the subcutaneous layer? _____
15. Describe the subcutaneous layer? _____
16. What structures can you find in the subcutaneous layer? _____

Summing up Part 1

- 17-20. List four ways your skin protects your body.

- 21-25. Match the letter of the term in the right column with its definition in the left column.

- | | | |
|-----------|--|-----------------|
| 21. _____ | keep hair and skin from drying out | A. epidermis |
| 22. _____ | inner part of the skin | B. dermis |
| 23. _____ | connective tissue that stores fats | C. oil glands |
| 24. _____ | outer part of the skin | D. sweat glands |
| 25. _____ | remove water and salt from blood and release them through skin | E. fatty tissue |

Procedures Part 2 – Mapping Skin Sensitivity

1. On the back of your partner's hand, use a felt-tip pen to draw a grid.
2. Draw a grid like that shown below with 16 squares 1 cm by 1 cm each.
3. Have your partner look away. Using the toothpick, gently press each square on your partner's hand. When your partner feels pain, mark the squares in the data grid that match the squares on the hand with the letter *P*.
4. Repeat the steps using the cotton swab. Record the letter *R* on a new grid when your partner feels pressure.
5. Touch each square with the cold paper clip, writing the letter *C* on a new grid when your partner feels cold.

Record **your** data here for **back of the hand**:

Data Grid for Pain Sensors

Data Grid for Pressure Sensors

Data Grid for Cold Sensors

6. Trade places with your partner and repeat steps 1-5.

Record your **partner's** data here for the **back of the hand**:

Data Grid for Pain Sensors

Data Grid for Pressure Sensors

Data Grid for Cold Sensors

7. Complete the data table. Compare your results with those of your classmates. Record the total number of pain-, pressure-, and cold-sensitive spots detected by those in your class.

Data Table for the back of the hand

	Number of Sensitive Spots		
	You	Your Partner	Your Class
Pain			
Pressure			
Cold			

8. Calculate the average number of sensitive spots per square centimeter of skin on the back of the hand. _____

9. If time permits repeat the activity for an area on the palm of your hand.

Record **your** data here for **palm of the hand**:

Data Grid for Pain Sensors

Data Grid for Pressure Sensors

Data Grid for Cold Sensors

Record your **partner's** data here for the **palm of the hand**:

Data Grid for Pain Sensors

Data Grid for Pressure Sensors

Data Grid for Cold Sensors

Data Table for the palm of the hand

Number of Sensitive Spots			
	You	Your Partner	Your Class
Pain			
Pressure			
Cold			

10. Calculate the average number of sensitive spots per square centimeter of skin on the palm. _____

Analysis and Conclusions for Part 2

1. How are sensitive spots distributed on the back of your hand?

2. Based on your observations, does every part of the skin on your hand feel pain, pressure, and cold?

3. Do you and your classmates have more pain spots, pressure spots, or cold spots?

4. How does the number of sensitive spots vary with different students?

5. How did the sensitive spots on the palm of your hand compare with those on the back of your hand?
