

The Academy of Nail Design's

MODULE 2



*“Basic Human Anatomy and
Detailed Anatomy of the Nail”*

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Welcome to Module 2: *Basic Human Anatomy and Detailed Anatomy of the Nail*

In this module we will be discussing the *very basics* of human anatomy and the anatomy of the nail. As we point out within this module we are only taking a very brief look at human anatomy and would encourage you strongly to further your studies in order to get a more comprehensive understanding of the human body and its different functions. This knowledge will assist you in many aspects of your career as a nail professional.

As with this and all of our modules included in this program, we encourage you to conduct your own independent research on the subject. Every time you see this icon:



It means we recommend taking some time to do research outside of the material we have presented to you in order for you to reach a higher level of understanding. Use the library or the internet, or interview local salon owners or working nail professionals. Get their opinions or background on how they got into this field. What trials and tribulations did they face? How did they overcome them?

Answer the questions posed within the module on the 'Additional Notes' pages included with your study guide.

We've found that a common thread between our most successful students is that they use this program as a stepping stone, and spend a lot of time exploring the entire industry. We encourage you to do the same.

Once you feel confident in the material presented in this Module, watch your online lesson, then log in to your student desk and take the corresponding test and complete your assignments.

**If you have any questions regarding your module or program
Please feel free to contact us directly during Business Hours at
1 (844) 998-2663 or of course by email at info@taond.com**

Basic Human Anatomy

Before you can perform any nail, hand or foot service, you must have a basic understanding of anatomy and how the body works. Memorizing body parts is not the most exciting part of learning the craft of nail services, but it is essential to understanding what services can be offered to a client, benefits of that service, and how products and implements work with or could damage parts of the body.

Nail professionals rarely refer to client's anatomy using the correct medical terms when performing a service, but it is important that you know and have an understanding of what these correct terms are, mean and the function of each, as it could drastically affect a service or a client. Having knowledge of the working body will also help you to determine the health of a client's skin and nails.

What is anatomy?

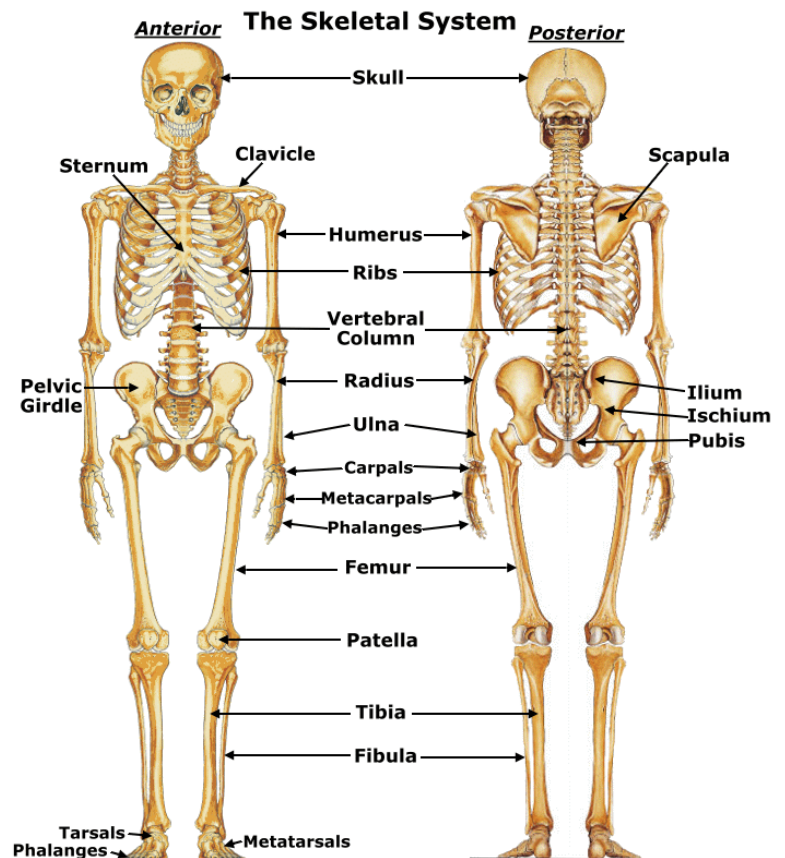
Anatomy is the study of the structure of the body, what it is made of, and the different functioning systems within it. For example, immune, integumentary (skin, hair, nails), respiratory, circulatory, digestive, muscular, skeletal, nervous, reproductive, endocrine, and urinary; each of these systems include organs which are made up of tissues and then cells. Without the proper functioning of each and every one of these systems our bodies would cease to work effectively.

While the study of anatomy and physiology (which is the study of the functioning of living organisms) is fascinating and in-depth, for the purposes of our course we will be taking only a preliminary look at three systems within the human body; skeletal, muscular, and skin.

SKELETAL SYSTEM

There are **206** bones that make up the human skeleton. These bones have several functions; **to protect internal organs, give shape to our bodies, produce blood cells, and to store calcium, phosphorus, sodium, and magnesium.** The skeletal system also works in conjunction with our muscles to produce the body's movements.

Bones are comprised of **calcium, phosphorus and other minerals and contain protein collagen** (component of connective tissue). Calcium is a vital component of our bones and is required to make bones hard which allowing your bones to support your body's weight. And because our bones have the ability to store calcium, (and other essential vitamins and minerals) this calcium can also be release into our bloodstream and directed to other parts of our bodies that may need it.

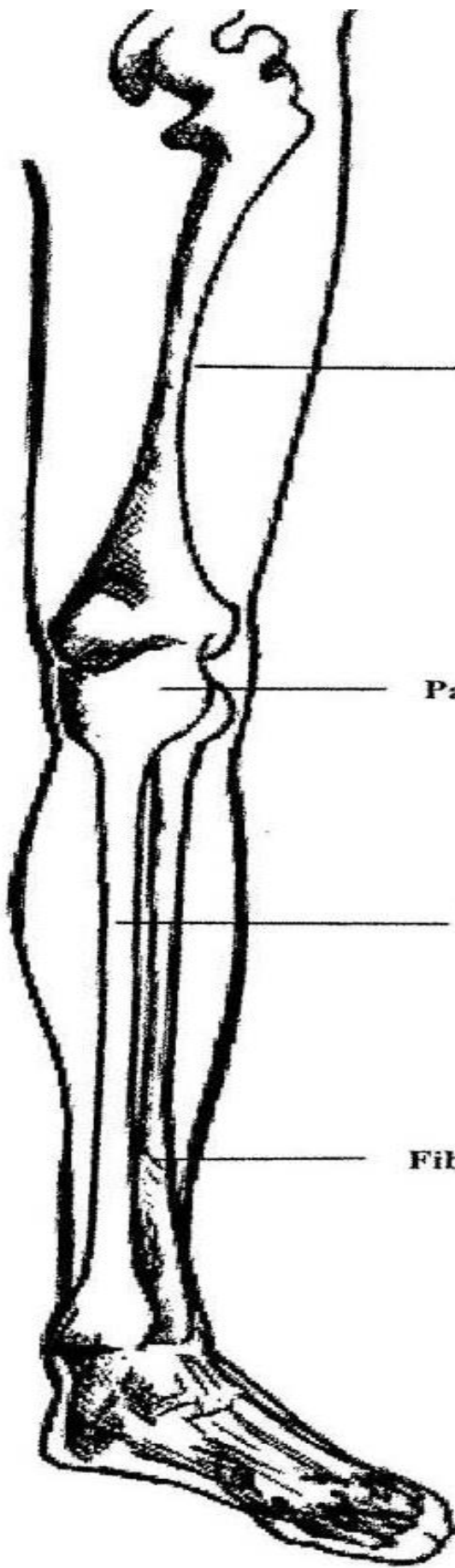


There are two types of materials that make up our bones; they are **compact** and **cancellous (Kan-suh-lus) bone**. **Compact bone** is the hard, solid outside of our bones that contains channels for our nerves and blood vessels to run through. **Cancellous** (Kan-suh-lus) is contained inside the compact bone and resembles sponge like material. This is where red and yellow marrow is found. **Bone marrow** is where many of our blood cells are made. Stem cells produce **red blood cells** (carry oxygen to the body's tissues) and **platelets** (aid in clotting when a cut occurs). Bones are fastened together by **ligaments** (long fibrous straps) and **cartilage** (rubbery substance in our joints that prevents our bones from rubbing together).

The bones that we will be focusing on are the ones located in the hands, arm, legs and feet.

BONES in the Leg and Foot:

- **Femur** – long thighbone
- **Tibia** - larger bone of the lower leg
- **Fibula** – smaller bone in the lower leg
- **Patella** – kneecap
- **Tarsal** – 7 small bones that make up the ankle
- **Calcaneous** – the heel bone
- **Metatarsals** – the base of the foot
- **Phalanges** – the digits or toes



Femur —

Patella —

Tibia -

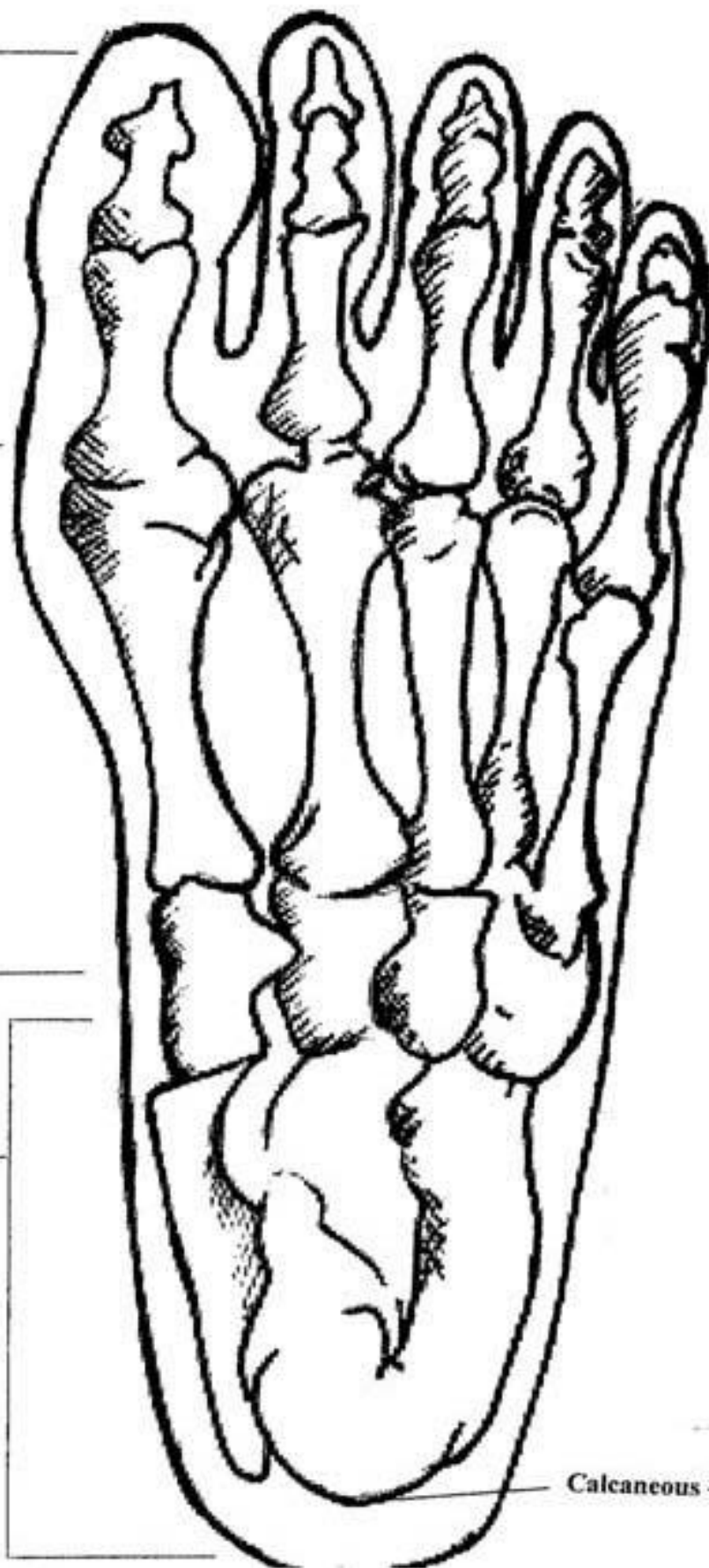
Fibula —

Phalanges

Metatarsals

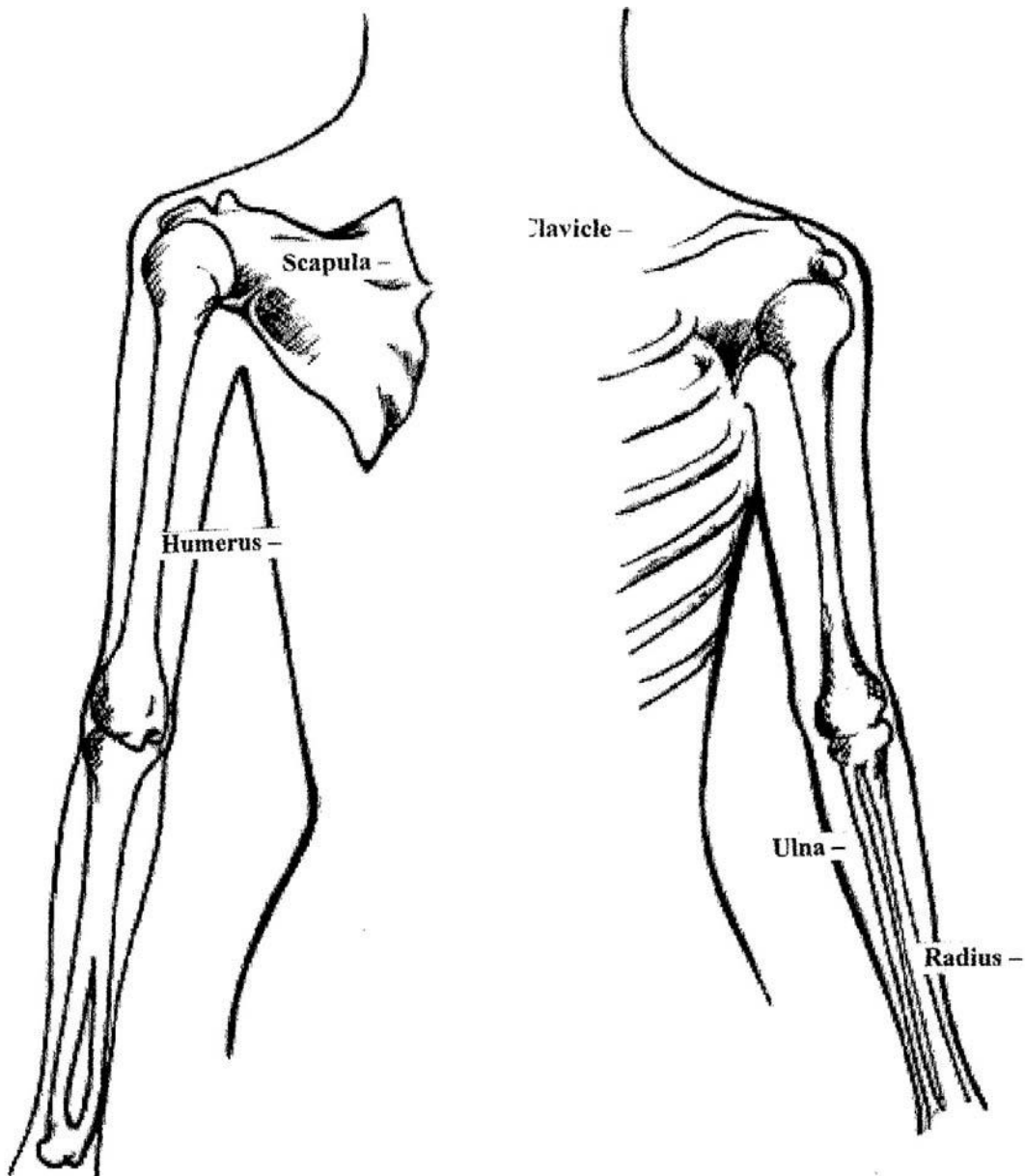
Tarsal

Calcaneous



BONES in the Arm and the Hand:

- **Scapula** – located in the shoulder
- **Clavicle** – collarbone
- **Humerus** – upper most bone in the arm
- **Ulna** – smaller bone in the forearm
- **Radius** – larger bone in the forearm
- **Carpus** – has 8 small bones and makes up the wrist
- **Metacarpals** – are the bones in the palm of the hand
- **Phalanges** – are the digits or fingers



MUSCULAR SYSTEM

Muscles

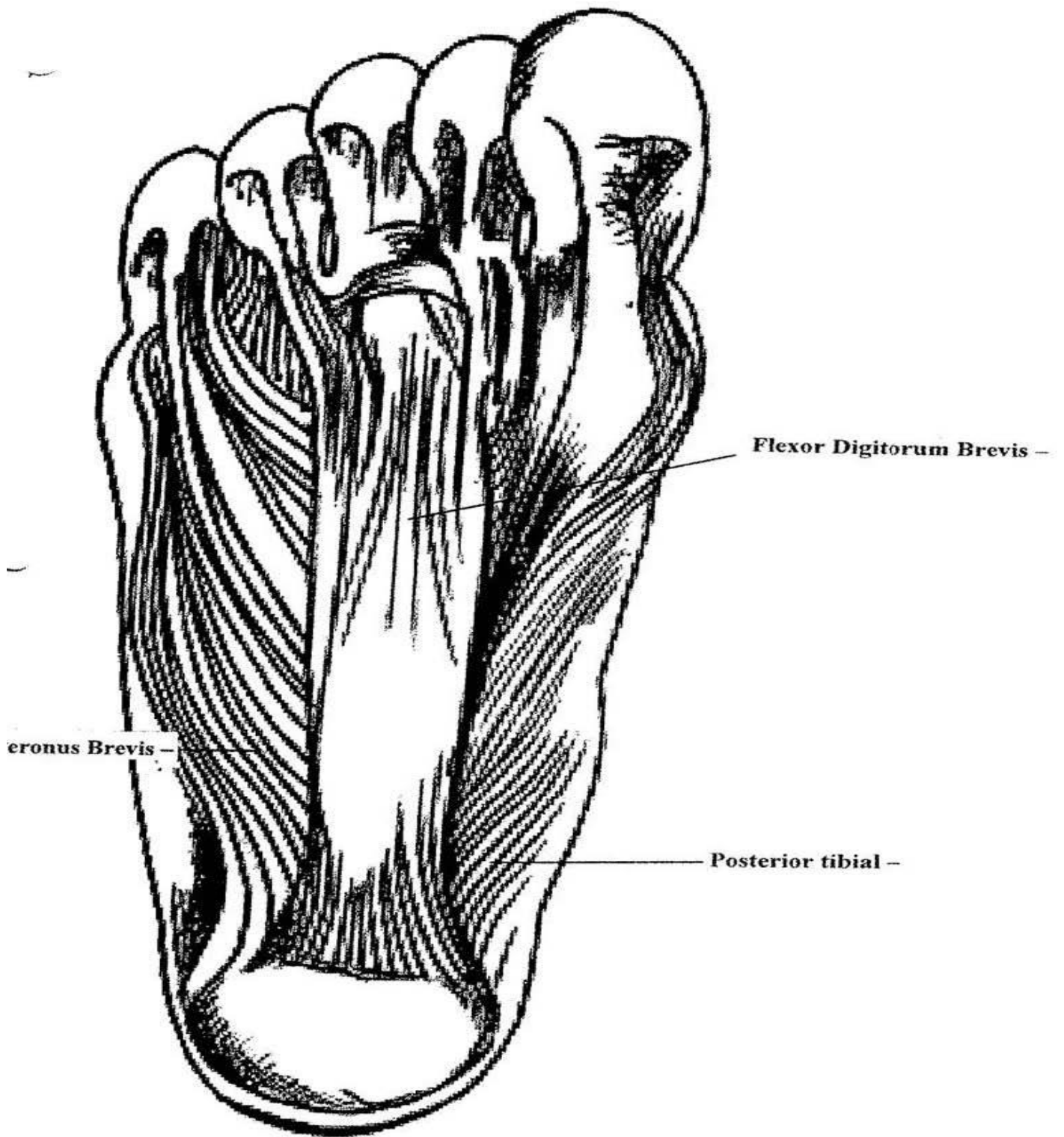
There are **640** named muscles in the human body. In order to create movement our bones require the help of our muscles. Muscles are attached to bones by cord-like tissue called **tendons**. Your muscles comprise about $\frac{1}{2}$ your body's weight. Muscles are each made up of tough elastic tissues which are thin, long muscle fibers. These fibers relax and contract to produce movement.

Humans have three types of muscles;

- 1) **Skeletal** – are attached to our bones to produce movement, give shape to our bodies and hold our skeleton together.
- 2) **Smooth or involuntary** – the muscles surrounding our main organs and the walls of our blood vessels. These muscles are controlled by our nervous system and work automatically for example these muscles aid in moving our digested food through our digestive system.
- 3) **Cardiac** – these are involuntary muscles also that are found in the heart. These muscles are responsible for pumping blood out of the heart and through our bodies.

MUSCLES in the Foot

- **Peronus Brevis** – on the outside of the ankle. Brings the foot down and out
- **Posterior Tibial** – supports the arch of your foot
- **Flexor Digitorum Brevis** – found in the bottom of the foot
- **Extensor Digitorum**
- **Longus** – runs down the leg and onto the top of the foot. Helps to flexes toes upward (shown on the diagram of the leg)

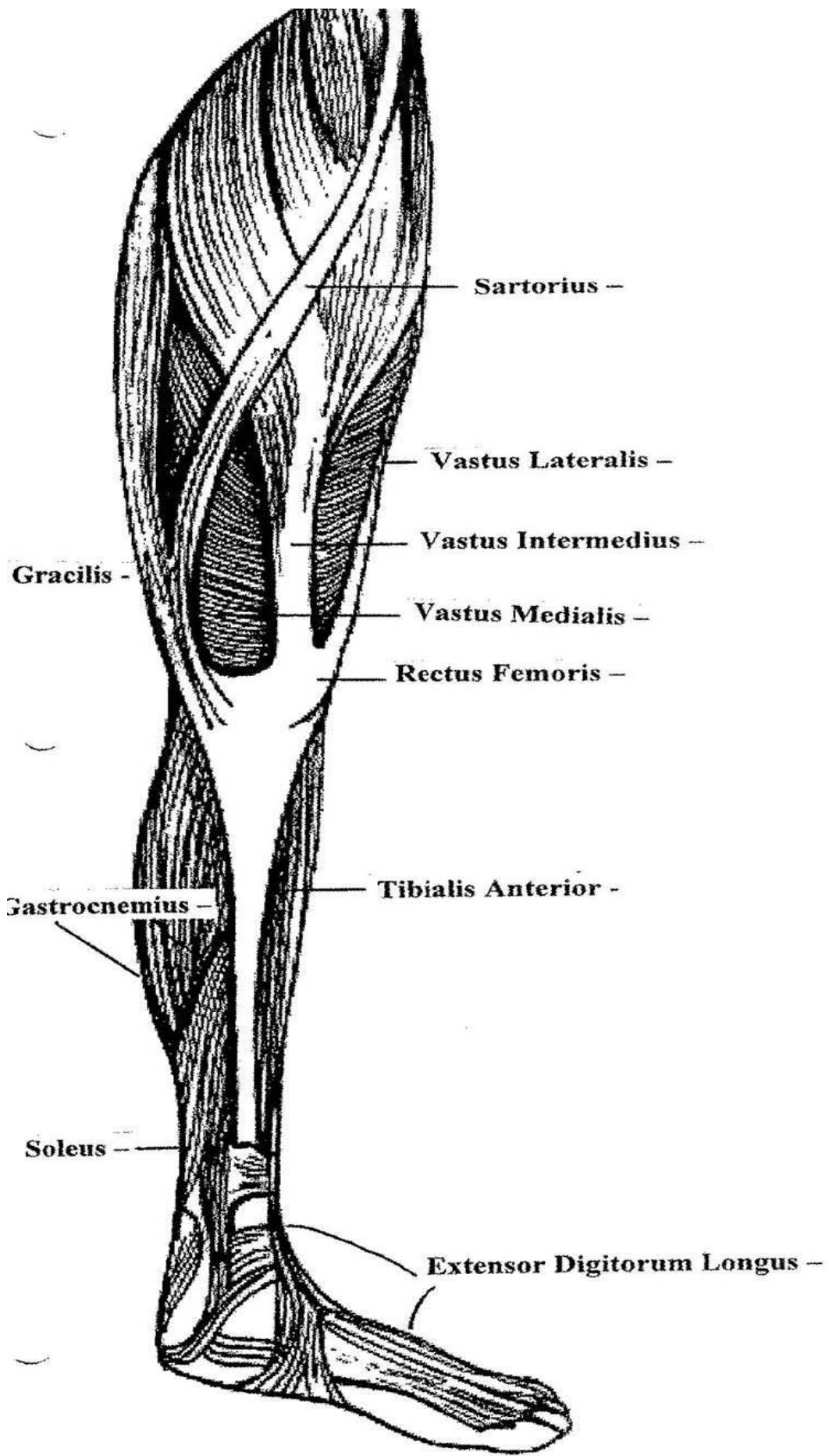


What are Joints?

A **joint** occurs when two or more bones come together and allow flexibility and movement.

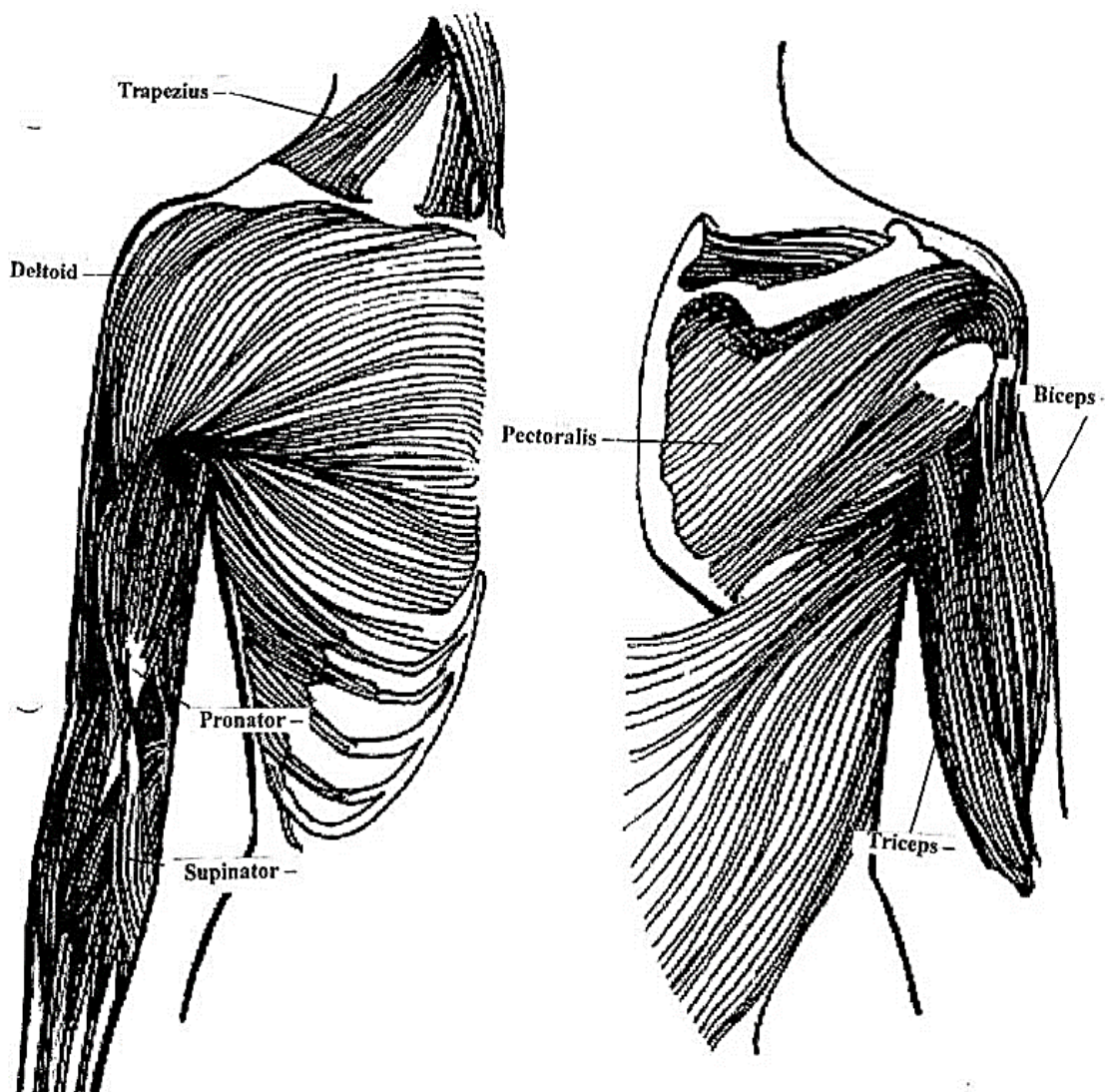
MUSCLES in the Leg

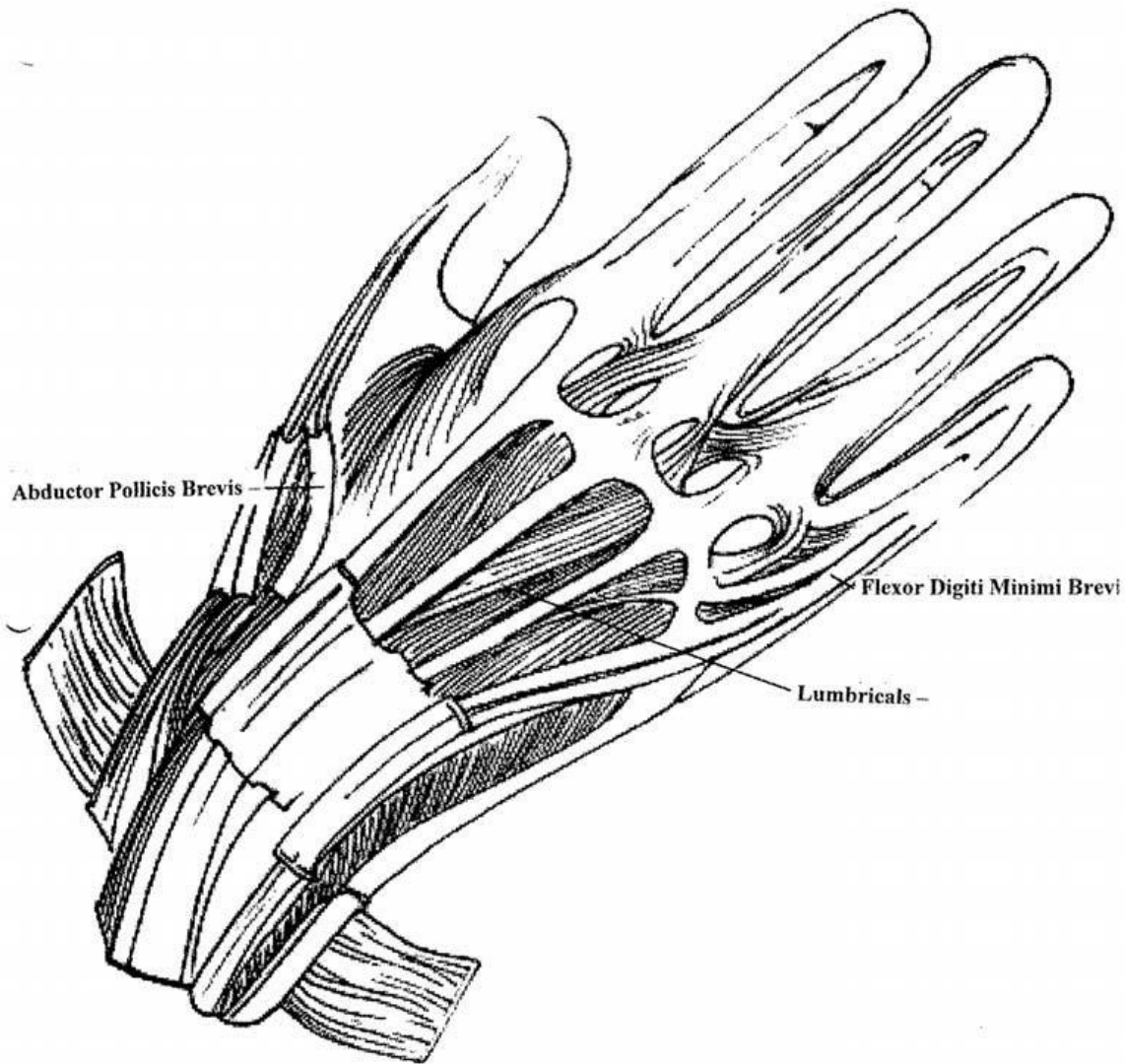
- **Sartorius** – longest muscle in the body. Starts at the hip and crosses over to the inside of the knee. Also known as the inner thigh muscle
- **Gracilis** - muscles located in each of the upper-legs of the human body, brings the leg towards the body
- **Tibialis Anterior** - found at the front of the lower leg and helps to turn the sole of the foot inward and flex the foot upward
- **Gastrocnemius** – larger of the two calf muscles found at the back of the lower leg. Helps to flex the ankle and foot downward
- **Soleus** – smaller of the two calf muscles found at the back of the leg lies beneath the gastrocnemius and helps to flex the ankle and foot towards the floor
- **Quadriceps Muscles** - a group of 4 muscles that sit at the front of the thigh
 - **Vastus Lateralis** – found on the outer side of the thigh
 - **Vastus Intermedius** – the largest thigh muscle
 - **Vastus Medialis** – inner side of the thigh
 - **Rectus Femoris** – outside of the thigh and knee



MUSCLES in the Arm and Hand

- **Deltoid** – found at the shoulder helps to lift the arm
- **Biceps** – found at the front of the arm helps to bring the lower arm to the upper arm
- **Triceps** – found at the back of the upper arm helps extend the arm backward
- **Trapezius** – found between the neck and the shoulder helps to bring shoulders up
- **Pectoralis** – the chest muscles
- **Pronator** – found in the lower arm helps to rotate the arm
- **Supinator** – also found in the forearm rotates so that the palm faces up





Hand

The hand is comprised of Abductors which help to separate fingers, Adductors which help to draw fingers together and Opponent muscles which are found in the palm of the hand and allow us to grasp items with our thumb.

- **Abductor Pollicis Brevis** – located in the thumb – separates the thumb from the hand
- **Flexor Digiti Minimi Brevi** – found on the little finger and helps to flex the little finger
- **Lumbricals** – found on the back of the hand and helps flex middle fingers up

SKIN

The study of our skin is called **Dermatology**. The skin is an organ that forms a protective barrier against germs (and other organisms) and keeps the inside of your body inside your body, and keeps what's outside of your body outside. Skin also helps maintain a constant body temperature. Human skin is only about 0.07 inches (2 mm) thick.

Skin is made up of two layers that cover a third fatty layer. The outer layer is called the **epidermis**; it is a tough protective layer that contains melanin (which protects against the rays of the sun and gives the skin its color). The second layer (located under the epidermis) is called the **dermis**; it contains nerve endings, sweat glands, oil glands, and hair follicles. Under these two skin layers is a fatty layer of **subcutaneous tissue** (the word subcutaneous means "under the skin").

On average, an adult has from 18-20 square feet (about 2 square meters) of skin, which weighs about 6 pounds (2.7 kg).

Your skin has more functions than any other organ in your body. It is the protective layer between the inside of your body and the external world of germs, bacteria, the elements, parasites etc. It also prevents the loss of water from our bodies. Within our skin our several receptors that allow us to feel pain, heat, cold, and pressure.

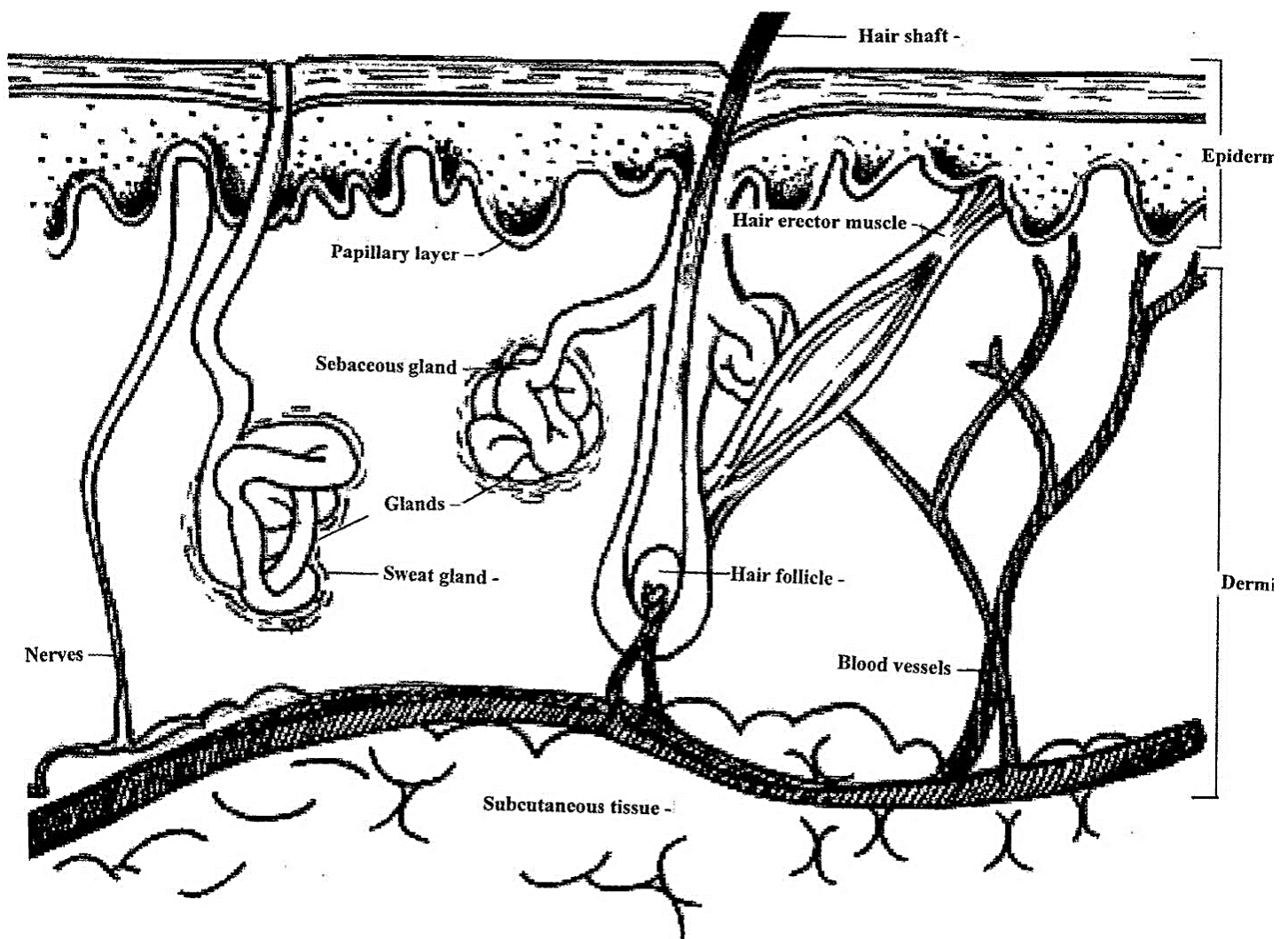
Younger skin healthy skin has elasticity that allows skin to regain its shape when pulled. As we age we lose this elasticity which causes the skin to wrinkle. We lose and replace millions of skin cells a day. Waste is filtered out of our bodies as is sweat and oil. Your sweat glands aid in regulating our body temperature.

Within the epidermis are pigments that determine the colour of your skin. The skin is thickest on your palms and soles and is thinnest on your eyelids.

Identify the following on your Cross Section of Skin Diagram:

- **Epidermis** - the outer layer of the skin.
- **Dermis** - (also called the cutis) the layer of the skin just beneath the epidermis.
- **Papillary layer** – lies directly underneath the epidermis
- **Subcutaneous tissue** - fatty tissue located under the dermis.
- **Nerves** – little fibers that send messages to the central nervous system
- **Glands** – there are two types of duct glands – sweat and oil
- **Hair follicle** - a tube-shaped sheath that surrounds the part of the hair that is under the skin. It is located in the epidermis and the dermis. The hair is nourished by the follicle at its base (this is also where the hair grows).
- **Hair shaft** - The part of the hair that is above the skin

- **Hair erector muscle** - a muscle is connected to each hair follicle and the skin - it contracts (in response to cold, fear, etc.), resulting in an erect hair and a "goose bump" on the skin
- **Blood vessels** - Tubes that carry blood as it circulates. Arteries bring oxygenated blood from the heart and lungs; veins return oxygen-depleted blood back to the heart and lungs.
- **Sweat gland** - (also called sudoriferous gland) a tube-shaped gland that produces perspiration (sweat). The gland is located in the epidermis; it releases sweat onto the skin.
- **Sebaceous gland** - a small, sack-shaped gland that releases oily (fatty) liquids onto the hair follicle (the oil lubricated and softens the skin). These glands are located in the dermis, usually next to hair follicles.



The Anatomy of a Nail

To give your clients the best service possible, your job as a nail professional is to familiarize yourself with the structure and functionality of the nail and its components. This will help you determine what services are appropriate for each individual client

Nails or “**ONYX**”, their technical name, are made up of the same protein as skin – **KERATIN**. Finger and toenails are of the hardest keratin, while skin is the softest. The purpose of our nails is to protect. What are they protecting? The end of our fingers and toes.



Just the Facts

We've heard all kinds of craziness when it comes to hands, feet and nails, and you'll hear much more when you start performing nail services. So to help you out we thought we'd share some interesting facts with you.

- ❖ **Nail plate cells are permeable which means they absorb liquid on contact. So soaking a nail in a liquid will expand the cells, which is why it is never a good idea to file nails that have been soaking in any liquid. If you are performing a water manicure, always file and buff the nails before soaking them, and never soak nails for longer than 5 minutes. Anything longer than that will dry the nail plate out.**
- ❖ **Fingernails grow faster than toenails at an average rate of 1/10 of an inch a month or about 1-3mm a day.**
- ❖ **Healthy nails replace themselves approximately every four to five months from cuticle to tip.**
- ❖ **Nails are also the barometer of your health, many imbalances in the body can be detected by examining your nails.**
- ❖ **Nails typically grow faster in the summer and slower in the winter, with your dominant hand (the hand you write with – apparently due to blood flow) usually outgrowing your non-dominant hand.**
- ❖ **The fastest growing nail is the middle finger and the slowest is the thumb.**



Come up with more interesting facts about nails that will impress your clients by conducting your own research.

Parts of the Nail

Understanding the parts of the nail and how a nail is formed and grows are vital components of your skill set as a professional. Without this knowledge you could be causing damage to a client or using the wrong products or implements.

We have three very important seals to our nails that protect against the invasion of dirt, bacteria and other damaging materials. These three seals are also referred to as the “GUARDIAN SEALS”. They are the following:

Hyponychium – (Hi-po-nik-ee-um) The skin seal under the free edge of your fingernail. This seal attaches the nail plate to the nail bed and prevents dirt, moisture and bacteria etc. from entering under the nail plate

Eponychium – (Ep-o-nik-ee-um) The skin fold at the base of your nail plate, often mistaken for the cuticle. Prevents dirt, moisture and bacteria etc. from entering into the Matrix area

Perionychium – (Per-i-o-nik-ee-um) The part of the skin that surrounds and seals the entire nail plate.

Nail plate – Hardened layers of dead keratinized cells that form a plate at the end of each finger and toe

Free edge – The part of the nail plate that extends beyond the end of the finger

Nail Groove – Slits or tracks in the nail bed at both sides of the finger and toe along which the nail plate grows

Cuticle – Thin layer of dead skin growing from underneath the lateral fold that adheres to the nail plate – this dead skin can safely be removed through physical and chemical manipulation

Nail Wall – The sides of the nail plate above the nail grooves

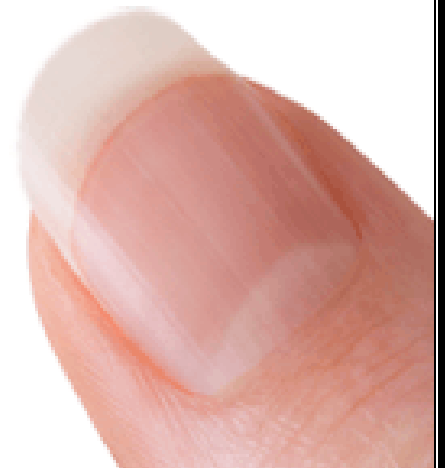
Solehorn – Epidermis attached to the underside of some natural nails, often on almond shaped nails. It contains nerve and blood supply and should not be removed or damaged during services. Not the same as the Hyponychium.

Nail Bed – A thick growth of epidermal cells that support the nail plate. Contains nerve and blood supply

Lunula – The whitish, moon crescent shaped area at the base of the nail where keratinization is completed. Cells in this area are plump, round and soft unlike those found at the free edge where they are more mature, thin and flat.

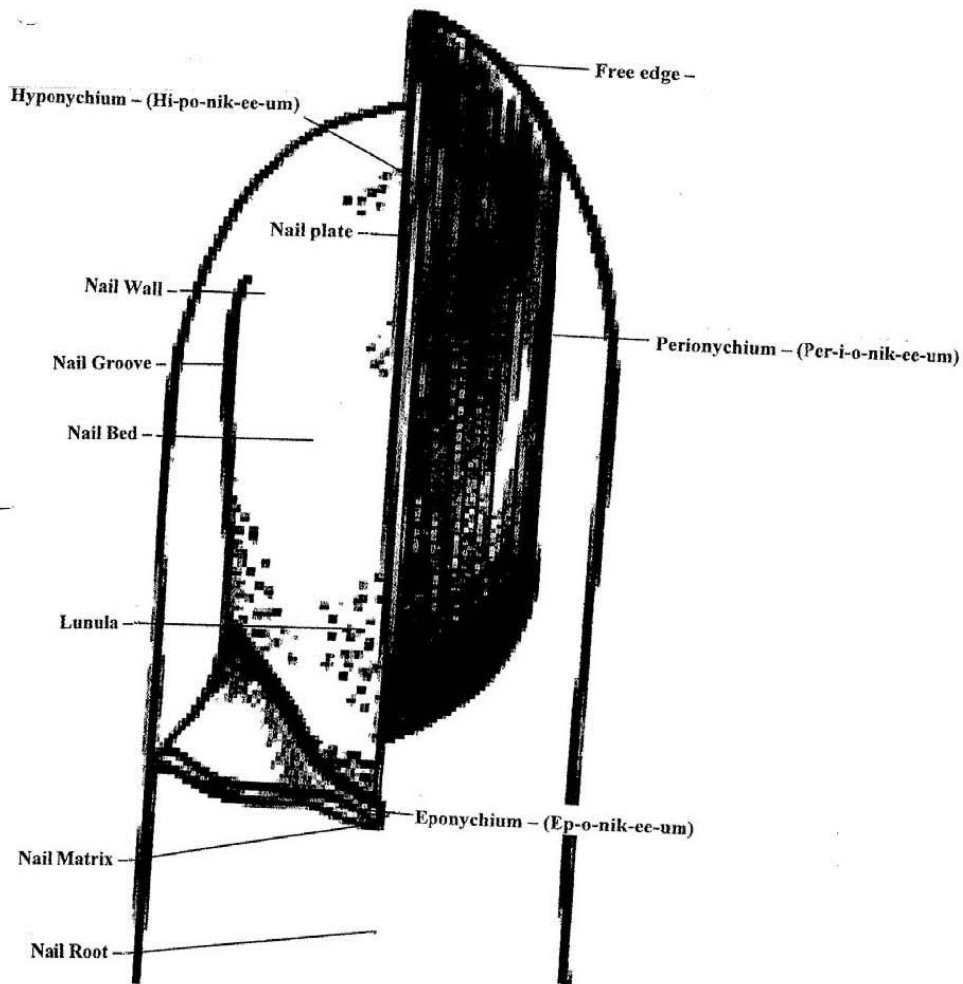
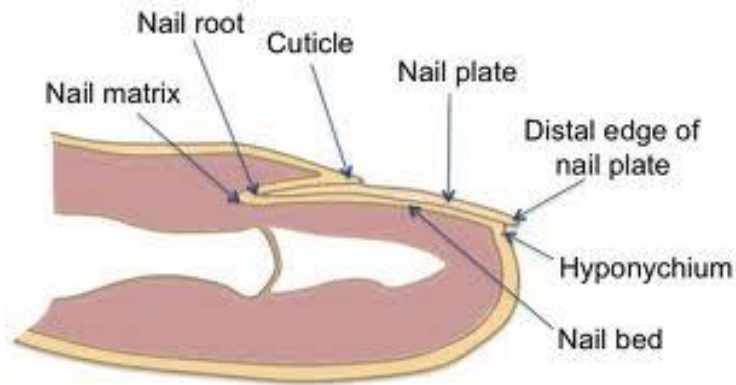
Nail Matrix – small area of living tissue found directly below the nail fold. Produces the nail cells and controls the rate and thickness of your nails. This a very sensitive area and if damaged could lead to permanent irregularities.

Nail Root – The area where nail growth begins. It is embedded underneath the skin at the base of the nail. Also supplies nourishment to the nail matrix.



We've included 2 diagrams from 2 different perspectives so you can get a better understanding of the different components of the nail.

The first diagram is a cross section of a finger and the second is looking down on the nail and finger.



How does a nail grow?

What is Keratin and Keratinization? Keratin is the group of proteins that form the major component of the outer layer of the dermis and keratinization is the process by which the epidermis forms the outer layer, when keratin is deposited in cells and cells become horny (nails, skin and hair).

Keratin cells are formed in the **MATRIX** and are pushed up onto the **NAIL BED**. As they mature and move along the **Nail Bed** these cells change in consistency from **round** and **plump** to **thin** and **flat**. Become **flatter** and **harder**.

This is why you have to use extreme care when dealing with the skin and nail plate near the **Eponychium** and **Lunula** area. These cells are much newer and softer than the flattened mature cells at the **FREE EDGE** and can be easily damaged.

Grooves in the top side of the epidermis fit into the grooves in the bottom of the **NAIL BED**. This allows the nail plate to glide along the **NAIL BED** as the nail grows out towards the **FREE EDGE**

Also note that the length of the **MATRIX** determines the thickness of your nails. The longer the **MATRIX** the thicker the nail, likewise the shorter the **MATRIX** the thinner the nail.

Remember, given this fact then that any nail product that advertises that it can make your nails thicker isn't a reliable product. A nail product could make your nail plate more flexible and better moisturized, but not change the thickness – this is determined at birth and by the size of your matrix.

So...

As you can see human anatomy is made up of several connecting functions all combined to maintain and regulate our bodies. As a nail professional your job is to understand and preserve the integrity of these systems. By gathering a basic understanding of how the human body works, you will obtain an ability to perform professional services in a professional manner and that your clients can enjoy safely.

Also, only by developing a comprehensive understanding of the human nail, finger and skin, their functionality and components will your job as a nail professional be complete.

Your understanding of these components is vital to providing professional services, key to understanding the science behind your services and crucial to adhering to industry sanitation standards.

Additional Notes

These Additional Module pages are for you to answer the extra questions we asked within the module and to be adding your research notes.

