

Nail Structure and Growth

Chapter Outline

Why Study Nail Structure and Growth?

The Natural Nail

Nail Anatomy

Nail Growth

Know Your Nails

Learning Objectives

After completing this chapter, you should be able to:

- ✓ **LO1** Describe the structure and composition of nails.
- ✓ **LO2** Discuss how nails grow.

Key Terms

Page number indicates where in the chapter the term is used.

bed epithelium
pg. 199

eponychium
pg. 200

free edge
pg. 199

hyponychium
pg. 200

ligament
pg. 200

lunula
pg. 200

matrix
pg. 199

nail bed
pg. 199

nail cuticle
pg. 200

nail folds
pg. 200

nail grooves
pg. 200

nail plate
pg. 199

natural nail (onyx)
pg. 198

natural nail unit
pg. 199

sidewall (lateral nail fold)
pg. 201

You probably know that the natural nail has a cuticle. Do you know whether the cuticle is living or dead skin? And do you know where the plate and the bed are located in the natural nail? This chapter gives you the answers to these questions and more. So, read on, because you cannot perform professional nail services without understanding the structure and growth of the natural nail.

Why Study Nail Structure and Growth?

Cosmetologists should study and have a thorough understanding of nail structure and growth because:

- Understanding the structure and growth of natural nails allows you to expertly groom, strengthen, and beautify nails.
- It is important to know the difference between the nail cuticle and the eponychium before performing nail services.
- Understanding the structure and growth cycles of the natural nail will prepare you for more advanced nail services.



The Natural Nail

A **natural nail**, also known as **onyx** (AHN-iks), is the hard protective plate composed mainly of keratin, the same fibrous protein found in skin and hair. The keratin in natural nails is harder than the keratin in skin or hair. The natural nail is located at the end of the finger or toe. It is an appendage of the skin and is part of the integumentary system, which is made up of the skin and its various organs. Nail plates protect the tips of the fingers and toes, and their appearance can reflect the general health of the body.

A normal, healthy nail is firm but flexible. The surface is shiny, smooth, and unspotted with no wavy ridges, pits, or splits. A healthy nail also is

did you know?

Nail plates are made of dead cells, so they do not require oxygen. In contrast, nail beds are live cells, so they do need oxygen, vitamins, and minerals.

H Sometimes the names used for professional nail products can create confusion. To avoid this problem, pay close attention to what the product is actually designed to do.

E For example, look at products marketed as nail cuticle moisturizers, softeners, or conditioners. The cuticle is dead skin on the nail plate, so why are these products designed to moisturize, soften, and condition the cuticle? That does not make any sense! Cuticle moisturizers, softeners, and conditioners are actually designed to treat the eponychium, sidewalls, and hyponychium—not the cuticle!

C Cuticle removers are properly named; they remove the dead cuticle. These professional products can quickly dissolve soft tissue, and when carefully applied to the nail plate, they speed removal of stubborn cuticle tissue.

© Perov Stanislav 2010; used under license from Shutterstock.com.

whitish and translucent in appearance, with the pinkish color of the nail bed showing through. In some races, the nail bed may have more yellow tones. The water content of the nail varies according to the relative humidity of the surrounding environment; in a humid environment, nails contain more water. A healthy nail may look dry and hard, but its water content is actually between 15 and 25 percent. The water content directly affects the nail's flexibility. The lower the water content, the more rigid the nail becomes. Coating the plate with an oil-based nail conditioner or nail polish improves flexibility by reducing water loss. These products also prevent excessive water absorption.

did you know?

The nail bed does not have sudoriferous (sweat) glands, so the nail cannot perspire. It is the skin around the nail that perspires.

Nail Anatomy

The **natural nail unit** is composed of several major parts, including the nail plate, nail bed, matrix, nail cuticle, eponychium, hyponychium, specialized ligaments, and nail folds.

Nail Plate

The **nail plate** is a hardened keratin plate that sits on and covers the nail bed. It is the most visible and functional part of the nail unit. The nail plate is relatively porous and will allow water to pass through it much more easily than through normal skin of an equal thickness. As it grows, the nail plate slowly slides across the nail bed. The nail plate is formed by the matrix cells. The sole job of the matrix cells is to create nail plate cells. The nail plate may appear to be one solid piece, but is actually constructed of about 100 layers of nail cells. The **free edge** is the part of the nail plate that extends over the tip of the finger or toe.

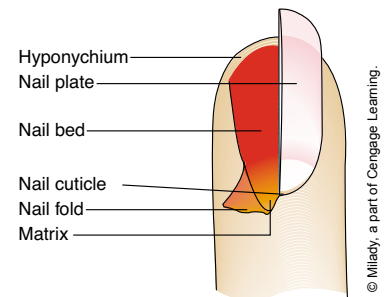
Nail Bed

The **nail bed** is the portion of living skin that supports the nail plate as it grows toward the free edge. Because it is richly supplied with blood vessels, the nail bed has a pinkish appearance from the lunula to the area just before the free edge of the nail. The nail bed contains many nerves, and is attached to the nail plate by a thin layer of tissue called the **bed epithelium** (BED ep-ih-THEE-lee-um). The bed epithelium helps guide the nail plate along the nail bed as it grows (**Figure 9-1** and **Figure 9-2**).

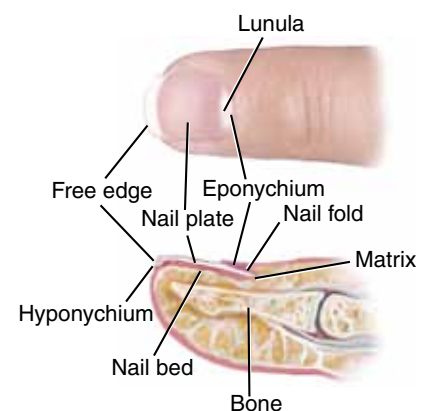
Matrix

The **matrix** (MAY-trikz) is the area where the nail plate cells are formed; this area is composed of matrix cells that produce the nail plate cells. The matrix contains nerves, lymph, and blood vessels to nourish the matrix cells. As long as it is nourished and healthy, the matrix will continue to create new nail plate cells.

The matrix extends from under the nail fold at the base of the nail plate. The visible part of the matrix that extends from underneath



▲ **Figure 9-1**
Structure of the natural nail.



▲ **Figure 9-2**
Cross-section of the nail.



Many people cannot tell the difference between the nail cuticle and the eponychium, but it is easy when you use this simple checklist.

- Is the tissue adhering directly to the natural nail plate but easily removed with gentle scraping?
- Is the tissue very thin and colorless but easily visible under close inspection?
- Is the tissue nonliving and not directly attached to living skin?

If you answered “Yes” to any of the questions above, then this tissue is called the cuticle.

- Is the tissue part of the skin that grows up to the base of the natural nail plate?
- Is the tissue part of the skin that covers the nail matrix and lunula?
- If you cut deeply into this tissue, will it bleed?

If you answered “Yes” to any of the questions above, this tissue is called the *eponychium*.

Cosmetologists are permitted to gently push back the eponychium, but are prohibited from cutting or trimming any part of the eponychium, since it is living skin. Cutting living skin is outside the scope of cosmetology and not allowed under any conditions or circumstances.

the living skin is called the **lunula** (LOO-nuh-luh). It is the whitish, half-moon shape at the base of the nail. The whitish color is caused by the reflection of light off the surface of the matrix. The lighter color of the lunula shows the true color of the matrix. Every nail has a lunula, but some lunulas are short and remain hidden under the eponychium.

Growth and appearance of the nails can be affected if an individual is in poor health, if a nail disorder or disease is present, or if there has been an injury to the matrix.

Cuticle

The **nail cuticle** (NAYL KYOO-tih-kul) is the dead, colorless tissue attached to the natural nail plate. The cuticle comes from the underside of the skin that lies above the natural nail plate. This tissue is incredibly sticky and difficult to remove from the nail plate. Its job is to seal the space between the natural nail plate and living skin. This prevents entry of foreign material and microorganisms and helps avoid injury and infection.

Eponychium

The **eponychium** (ep-oh-NIK-eeum) is the living skin at the base of the natural nail plate that covers the matrix area. The eponychium is often confused with the nail cuticle. They are *not* the same. The cuticle is the *dead tissue* adhered to the nail plate; the eponychium is *living tissue* that grows up to the nail plate. The cuticle comes from the underside of this area, where it completely detaches from the eponychium and strongly attaches to the new growth of nail plate. It pulls free to form a seal between the natural nail plate and the eponychium. Cosmetologists are prohibited from cutting the eponychium, even when a client requests it during a service.

Hyponychium

The **hyponychium** (hy-poh-NIK-eeum) is the slightly thickened layer of skin that lies between the fingertip and the free edge of the natural nail plate. It forms a protective barrier that prevents microorganisms from invading and infecting the nail bed.

Specialized Ligaments

A **ligament** (LIG-uh-munt) is a tough band of fibrous tissue that connects bones or holds an organ in place. Specialized ligaments attach the nail bed and matrix bed to the underlying bone. These ligaments are located at the base of the matrix and around the wedges of the nail bed.

Nail Folds

The **nail folds** are folds of normal skin that surround the nail plate. These folds form the **nail grooves**, which are the slits or furrows

ACTivity

Use a small magnifying glass to examine the hands of at least 10 friends or classmates. Look at the nail cuticle and eponychium on each finger. Observe how the thin cuticle tissue attaches to and rides on top of the nail plate as the cuticle emerges from under the eponychium at the base of the nail plate. Next, examine the eponychium to see how it differs in appearance from the cuticle. Identify which tissue can be removed and which tissue should never be cut.

on the sidewall. The **sidewall**, also known as **lateral nail fold** (LAT-ur-ul NAYL FOHLD), is the fold of skin overlapping the side of the nail. **LO1**

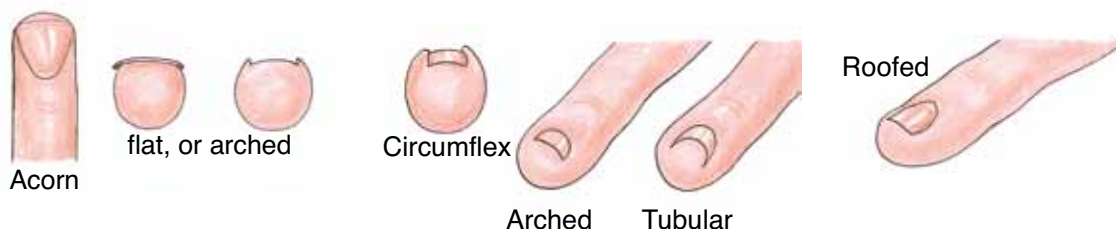
Nail Growth

In Chapter 7, Skin Structure, Growth, and Nutrition, you learned that nutrition, exercise, and a person's general health can affect the health of the skin. These factors affect the growth and health of the nail plate as well.

A normal nail grows forward from the matrix and extends over the tip of the finger. Normal, healthy nails can grow in a variety of shapes, depending on the shape of the matrix. The length, width, and curvature of the matrix determine the thickness, width, and curvature of the natural nail plate. For example, a longer matrix produces a thicker nail plate, and a highly curved matrix creates a highly curved free edge. No product or procedure can make the nail plate grow thicker because a thicker nail plate would require a larger matrix. Toenails are also thicker and harder than fingernails because the toenail matrix is longer than the fingernail matrix (**Figure 9–3**).



◀ **Figure 9–3**
Various shapes of nails.




© Mladý, a part of Cengage Learning.

did you know?

Typing on a keyboard or lightly touching natural nails on piano keys stimulates the nails and makes them grow.

The average rate of nail growth in the normal adult is about 1/10 of an inch (2.5 mm) per month, but many factors affect this growth rate. Age, for example, affects nail growth. Compared with the nails of an average adult, children's nails grow more rapidly, and elderly adults' nails grow more slowly. Seasons also affect nail growth rate; nails grow faster in the summer than they do in the winter. Pregnancy dramatically affects nail growth because of hormonal changes in the body. Nail growth rates increase dramatically during the last trimester of pregnancy and decrease quickly after delivery, returning to normal as hormone levels return to normal. (In spite of a popular myth, nail growth rates accelerate during pregnancy whether or not a woman takes prenatal vitamins.) A nail's position on the body affects its growth rate. Nail growth rate is fastest on the nail of the middle finger and slowest on the thumb, and toenails grow more slowly than fingernails.

Nail Malformation

If disease, injury, or infection occurs in the matrix, the shape or thickness of the nail plate can change. In fact, these conditions are generally the only reasons that a person will shed a nail. Healthy nails are not shed automatically or periodically in the way that healthy hair is shed. Often after a disease, injury, or infection that has affected the nail's growth, the natural nail will return to its healthy growth as long as the matrix is healthy and undamaged. Ordinarily, replacement of a natural fingernail takes about four to six months. Toenails take about nine months to one year to be fully replaced.  **L02**

Know Your Nails

Many cosmetologists are interested in nails because of the creative opportunities they present. As with every other area of cosmetology, this creativity must be grounded in a full awareness of the structure and physiology of the nails and the surrounding tissue.

Working on strong, healthy nails can be a pleasure. Remember that as a licensed cosmetologist, you are allowed to work only on healthy nails and skin with no visible signs of disease or infection.



© Christopher Elwell, 2010; used under license from Shutterstock.com.

Review Questions

1. What is the technical term for the natural nail?
2. What protein is in the natural nail?
3. Describe the appearance of a normal, healthy nail.
4. Name the major parts of the natural nail unit.
5. Explain the difference between the nail plate and the nail bed.
6. What part of the natural nail unit contains the nerves, lymph, and blood vessels?
7. What is the difference between the nail cuticle and the eponychium?
8. Why are cosmetologists prohibited from cutting the skin around the base of the nail plate, even when a client requests it during a service?
9. What are three factors that can affect growth of the natural nail?

Chapter Glossary

bed epithelium	Thin layer of tissue that attaches the nail plate and the nail bed.
eponychium	Living skin at the base of the natural nail plate that covers the matrix area.
free edge	Part of the nail plate that extends over the tip of the finger or toe.
hyponychium	Slightly thickened layer of skin that lies between the fingertip and free edge of the natural nail plate.
ligament	Tough band of fibrous tissue that connects bones or holds an organ in place.
lunula	Visible part of the matrix that extends from underneath the living skin; it is the whitish, half-moon shape at the base of the nail.
matrix	Area where the nail plate cells are formed; this area is composed of matrix cells that produce the nail plate.
nail bed	Portion of the living skin that supports the nail plate as it grows toward the free edge.
nail cuticle	Dead, colorless tissue attached to the natural nail plate.
nail folds	Folds of normal skin that surround the natural nail plate.
nail grooves	Slits or furrows on the sides of the sidewall.
nail plate	Hardened keratin plate that sits on and covers the natural nail bed. It is the most visible and functional part of the natural nail unit.
natural nail	Also known as <i>onyx</i> ; the hard protective plate is composed mainly of keratin, the same fibrous protein found in skin and hair. The keratin in natural nails is harder than the keratin in skin or hair.
natural nail unit	Composed of several major parts of the fingernail including the nail plate, nail bed, matrix, cuticle, eponychium, hyponychium, specialized ligaments, and nail fold. Together, all of these parts form the nail unit.
sidewall	Also known as <i>lateral nail fold</i> ; the fold of skin overlapping the side of the nail.