9

NAIL STRUCTURE & GROWTH

OUTLINE

LEARNING OBJECTIVES

After completing this chapter, you will be able to:

LO1
Describe the characteristics of normal, healthy nails.

LO2
Describe the nine basic parts of the nail unit.

LO3
Discuss how nails grow.

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.

After reading the next few sections, you will be able to:

LO1 **Describe the characteristics of normal, healthy nails.**

Distinguish the Structure of the Natural Nail

A **natural nail**, also known as *onyx* (AHN-iks), is the hard protective plate composed mainly of keratin, the fiber-shaped 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 whitish and translucent in appearance, with the pinkish color of the nail bed below 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. Using an oil-based nail conditioner or nail polish to coat the plate can reduce water loss or prevent excessive absorption and improve flexibility.

After reading the next few sections, you will be able to:

LO2 Describe the nine basic parts of the nail unit.

Identify Nail Anatomy

The natural **nail unit** is composed of several major parts, including the nail plate, nail bed, matrix, cuticle, eponychium, perionychium, hyponychium, specialized ligaments, and nail folds (figure 9-1).

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.

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. As a professional, you should understand the difference and use the proper names for the parts of the nail unit—for example, nail polish is applied to the nail "plate," not the nail "bed."

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.

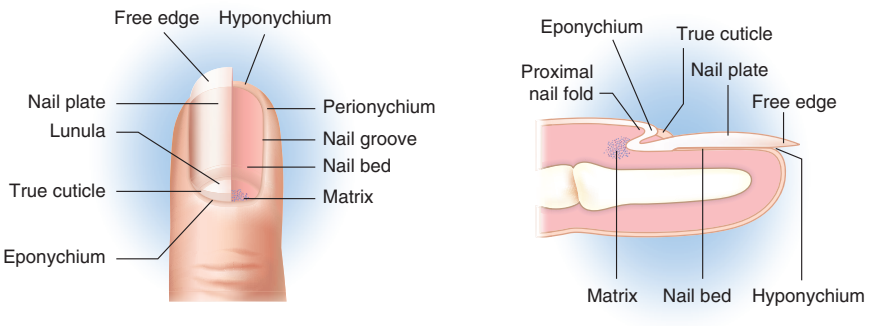

figure 9-1
Structure of the natural nail

Matrix

The **matrix** (MAY-trikz) is the area where the nail plate cells are formed. It is composed of matrix cells that produce the nail plate cells. The matrix area 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 the living skin is called the **lunula** (LOO-nuh-luh). It is the whitish, half-moon shape underneath the base of the nail. The whitish color is caused by the reflection of light off the surface of the visible part of the underlying 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 **cuticle** (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 sticks tight to the nail plate and can be difficult to remove. Its job is to seal the space between the natural nail plate and living skin above (the eponychium) to prevent entry of foreign material and microorganisms and to help avoid injury and infection.

Sometimes the names used for professional nail products are confusing. To avoid this problem, know the proper names for the various parts of the nail unit and pay close attention to what the product is actually designed to do.

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 for the eponychium, lateral sidewalls, and hyponychium—not for the cuticle!

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 up removal of stubborn cuticle tissue. Misunderstandings about the correct names for the parts of the nail cause a great deal of confusion, so make sure you learn these terms and use them properly.

Eponychium

The **eponychium** (ep-oh-NIK-ee-um) is the living skin at the base of the natural nail plate covering the matrix area. The eponychium is often mistaken for the 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.

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 can be 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 any 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.

Perionychium

Perionychium (payr-eeuh-NIK-ee-um), as shown in **figure 9-1**, is the living skin bordering the root and sides of a fingernail or toenail.

Hyponychium

The **hyponychium** (hy-poh-NIK-ee-um) is the slightly thickened layer of skin under the nail that lies between the fingertip and the free edge of the 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 edges of the nail bed.

Nail Folds

The **nail folds** are folds of normal skin that surround the nail plate. These folds form the **nail groove**, or furrow, on each side of the nail. The **sidewall**, also known as the *lateral nail fold* (LAT-ur-ul NAYL FOHLD), is the fold of skin overlapping the side of the nail.

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. Then examine the eponychium to see how these two differ in appearance from the cuticle. Identify which tissue can be removed and which tissue should never be cut.

After reading the next few sections, you will be able to:

LO3 Discuss how nails grow.

Discuss Nail Growth

In Chapter 7, Skin Structure, Growth, and Nutrition, you learned that nutrition, exercise, and a person's general health affects 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.

The average rate of nail plate growth in the normal adult is about 1⁄10" to 1⁄8" (2.5 mm to 3 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, while elderly adults' nails grow at a slower rate. 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. The nail growth rate decreases quickly after delivery of the baby and returns to normal, as do hormone levels in the body. It is a myth that nail growth rate is increased by taking prenatal care vitamins; nail growth rates will accelerate whether or not a woman takes these vitamins. A nail's position on the body also 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. Although toenail plates grow more slowly than fingernail plates, they are thicker because the toenail matrix is longer than the matrix found on fingernails (figure 9-2).

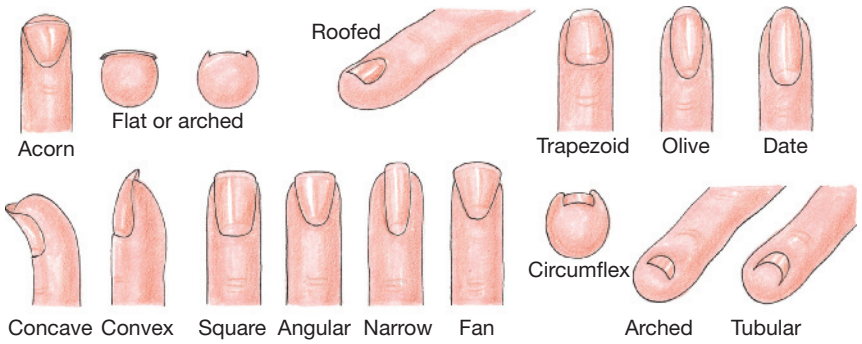

figure 9-2
Various shapes of nails

Nail Malformation

If the nail is abnormal in shape or form it is called **nail malformation**. This can be a temporary or permanent condition caused by disease, injury, or infection that has affected the matrix. In this case, it can change the shape or thickness of the nail plate and can appear altered or deformed. In fact, these conditions are generally the only reason a person will shed a nail. Healthy nails are not shed automatically or periodically in the way that healthy hair is shed. Ordinarily, replacement of a natural fingernail takes about four to six months. Toenails take about nine months to a year to be fully replaced.

The nail matrix is constantly creating new nail cells. Each time a new cell is created, it pushes the previously created cells upward and away from the matrix. This causes the plate to flow slowly toward the free edge, but only as quickly as new cells are produced. If a small portion of the matrix stops making new cells, the nail plate will become thinner and develop a narrow groove. As a person ages, parts of the nail matrix begin to permanently slow down production, causing the plate to develop a series of narrow grooves running down the length of the plate. This is considered to be a normal part of the aging process. Often these grooves are mistaken for "ridges." The matrix does not grow any ridges in the nail plate, only grooves, and filing away these so-called "ridges" only thins and weakens the entire nail plate.

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. You will learn more about nail plate malformation and common disorders in the next chapter.

DID YOU KNOW?

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

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 (**figure 9-3**).

figure 9-3
Men's manicure

REVIEW QUESTIONS

1. What is the technical term for the natural nail?
2. What is the major protein that makes up the natural nail?
3. Describe the appearance of a normal, healthy nail.
4. Name the basic parts of the nail unit.
5. Explain the difference between the nail plate and the nail bed.
6. What part of the nail unit contains the nerves, lymph, and blood vessels?
7. What is the difference between the cuticle and the eponychium?
8. Why are cosmetologists not allowed to cut the skin around the base of the nail plate, even if the client requests this during the service?
9. What can affect the growth of the nail plate?

STUDY TOOLS

- **Reinforce what you just learned:** Complete the activities and exercises in your Theory or Practical Workbook, or your Study Guide.
- **Expand your knowledge:** Search for websites about the topics in this chapter and make a list of additional resources.
- **Study and prepare for your quiz:** Take the chapter test in your Exam Review or your Milady U: Online Licensing Prep.
- **Re-Test your knowledge:** Take the Chapter 9 *Quizzes*!
- **Learn even more:** Look up in a dictionary or search the internet for the definitions of any additional terms you want to learn about.

CHAPTER GLOSSARY

bed epithelium BED ep-ih-THEE-lee-um	p. 199	Thin layer of tissue that attaches the nail plate and the nail bed.
cuticle KYOO-tih-kul	p. 200	Dead, colorless tissue attached to the natural nail plate.
eponychium ep-oh-NIK-ee-um	p. 200	Living skin at the base of the natural nail plate that covers the matrix area.
free edge	p. 199	Part of the nail plate that extends over the tip of the finger or toe.
hyponychium hy-poh-NIK-ee-um	p. 201	Slightly thickened layer of skin under the nail that lies between the fingertip and free edge of the natural nail plate.
ligament LIG-uh-munt	p. 201	Tough band of fibrous tissue that connects bones or holds an organ in place.
lunula LOO-nuh-luh	p. 200	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 MAY-trikz	p. 200	Area where the nail plate cells are formed; this area is composed of matrix cells that produce the nail plate.

nail bed	p. 199	Portion of the living skin that supports the nail plate as it grows toward the free edge.
nail folds	p. 201	Folds of normal skin that surround the natural nail plate.
nail groove	p. 201	Furrow on each side of the nail.
nail malformation	p. 203	When the nail is abnormal in shape or form.
nail plate	p. 199	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.
nail unit	p. 199	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.
natural nail	p. 198	Also known as *onyx*; 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.
perionychium payr-eeuh-NIK-ee-um	p. 201	The tissue bordering the root and sides of a fingernail or toenail.
sidewall	p. 201	Also known as *lateral nail fold*; the fold of skin overlapping the side of the nail.