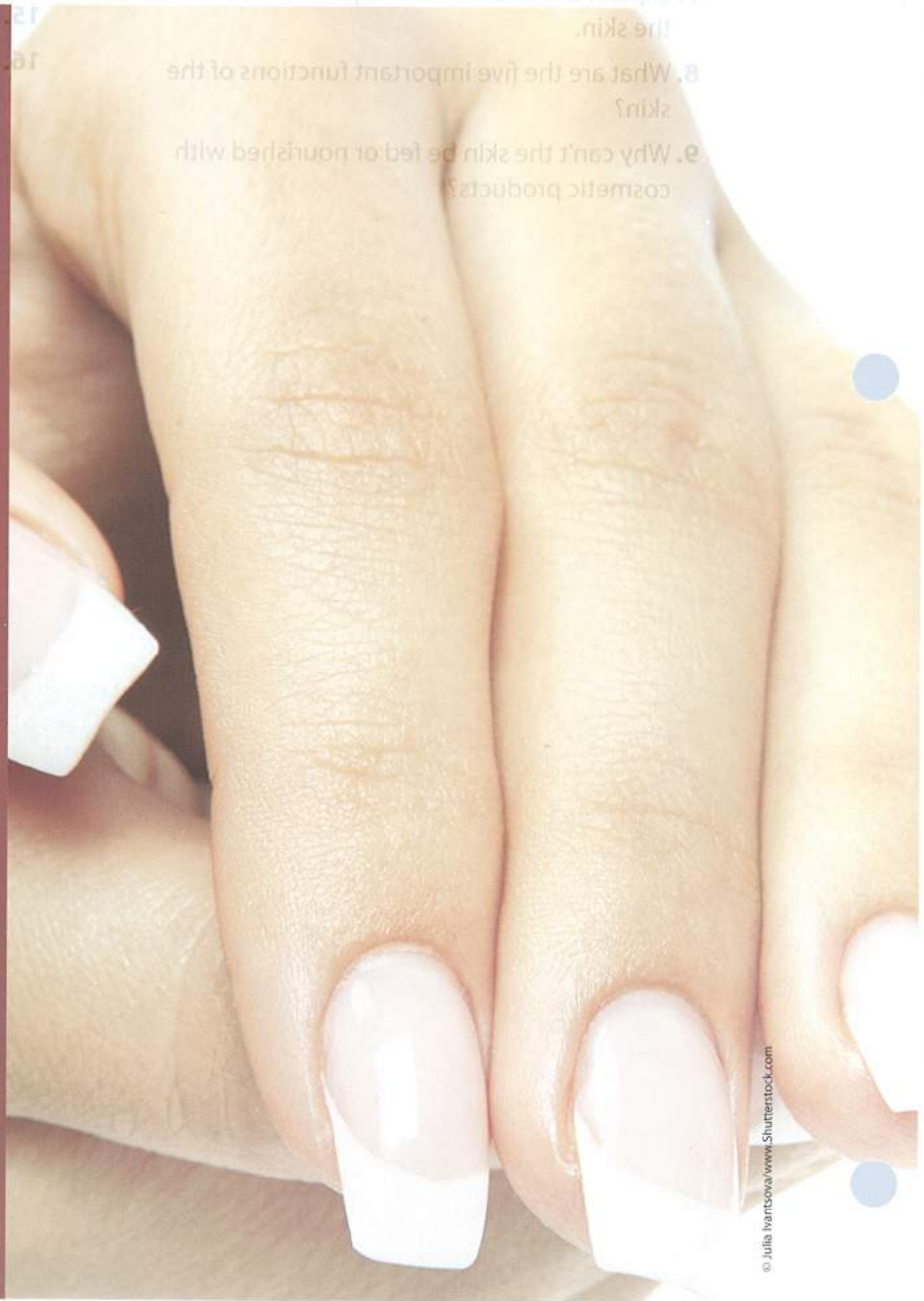


8

Nail Structure and Growth

Chapter Outline

- Why Study Nail Structure and Growth?
- The Natural Nail
- Nail Anatomy
- Nail Growth
- Know Your Nails



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Learning Objectives

After completing this chapter, you will be able to:

✓ **LO1** Describe the structure and composition of nails.

✓ **LO2** Discuss how nails grow.

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Key Terms

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

bed epithelium / 155

cuticle / 155

eponychium / 156

free edge / 155

hyponychium / 156

lateral nail fold / 157

ligament / 157

lunula / 155

matrix / 155

nail bed / 155

nail folds / 157

nail groove / 157

nail plate / 155


nail unit / 154

natural nail / 154

onyx / 154

sidewall / 157

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When people think of nail services, they immediately envision pleasurable manicures, pedicures, and nail enhancements that produce strong gorgeous nails. While your goal for nail school should be to learn how to expertly groom, strengthen, and beautify the nails, it is equally important to understand nail physiology.

The **natural nail** is the hard protective plate located at the end of the finger or toe. It is an appendage of the skin and part of the integumentary system. The nail plates protect the tips of the fingers and toes, and their appearance can reflect the general health of the body. To provide professional services and care for your clients, you must educate yourself about the natural nail's structure and growth.

WHY STUDY NAIL STRUCTURE AND GROWTH?

Nail technicians should 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 you perform nail services.
- ▶ Understanding the structure and growth cycles of the natural nail will prepare you for more advanced nail services.

THE NATURAL NAIL UNIT

All of the parts of the finger from the tip to the first knuckle are referred to as the natural nail unit. The natural nail itself is technically referred to as the **onyx** (AHN-iks) and is composed mainly of keratin, the fiber-shaped protein found in skin and hair. The keratin in natural nails is more durable than the keratin in hair or skin.

A normal, healthy nail is firm and flexible, shiny, and slightly pink in color. Its surface is usually smooth and unspotted, with no splits or deep grooves. A healthy nail should be whitish and translucent in appearance, with the pinkish or beige color of the nail bed below showing through. The nail plate is relatively porous to water, allowing it to pass much more easily than it will pass through normal skin of equal thickness. The water content of the nail is related to the relative humidity of the surrounding environment. A healthy nail may look dry and hard but actually has a water content of 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.

NAIL ANATOMY

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

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Nail Plate

The **nail plate** is the hardened keratin plate that sits on top of the underlying nail bed. The nail plate slowly slides across the nail bed while it grows and is the most visible and functional part of the nail unit. 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 area under the nail plate can have a pinkish appearance in the area that extends from the lunula to the area just before the free edge of the nail. The nail bed is supplied with many nerves and is attached to the nail plate by a thin layer of tissue called the **bed epithelium** (ep-ih-THEE-lee-um). That bed epithelium helps guide the nail plate along the nail bed as it grows (**Figure 8-1**). Unfortunately, many nail technicians confuse the nail bed with the nail plate. 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.”

Matrix

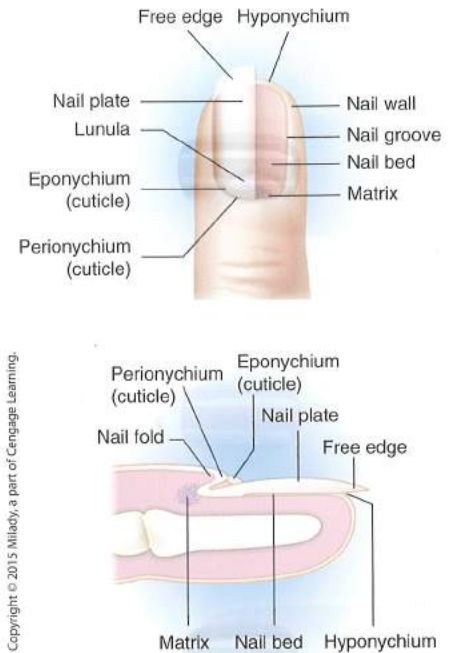
The **matrix** is the area where the nail plate cells are formed. It is composed of matrix cells that produce other cells that become the nail plate. The matrix area contains nerves, lymph, and blood vessels to nourish the matrix cells. As long as it is nourished and kept in healthy condition, the matrix 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 plate. This appearance is caused by the reflection of light off the surface of the visible part of the underlying nail matrix. The lighter color of the lunula shows the true color of the matrix. Everyone has a lunula, but not all lunulas are visible. Some lunulas cannot be seen; they are short and remain hidden under the eponychium. The growth of the nail plates can be affected if an individual is in poor health, if there is a nail disorder or disease 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 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 the living skin above (the eponychium) to prevent the entry of foreign material and microorganisms and to help prevent 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



▲ **Figure 8-1** Structure of the natural nail.

unit and pay close attention to what the product is actually designed to do. For example, look at products marketed as *cuticle moisturizers*, *softeners*, or *conditioners*. The cuticle is dead skin on the nail plate, so why are there products designed to pamper, soften, and moisturize the cuticle? That does not make any sense! Cuticle moisturizers, softeners, or conditioners are *actually* designed for the *eponychium*, *lateral sidewalls*, and *hyponychium*—not for the cuticle!

Cuticle removers are properly named and are just what they say they are. These professional products can quickly dissolve soft tissue and, when carefully applied to the nail plate, they speed removal of stubborn cuticle tissue. Misunderstandings about the correct names for the parts of the nail cause a great deal of confusion and shed a poor light on the nail industry in general. Make sure you learn these terms and use them properly.

Eponychium

The **eponychium** (ep-oh-NIK-eeum) is the living skin at the base of the 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 the living tissue at the base of the nail plate. The cuticle comes from the underside of this area, where it completely detaches from the eponychium and becomes strongly attached to the new growth of nail plate. It is pulled free to form a seal between the natural nail plate and the eponychium.

Many people cannot tell the difference between the cuticle and the eponychium, but it is easy when you use these simple checklists:

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

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

Nail technicians 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. Even if this skin appears dry and hardened, it is part of the living eponychium. Cutting any part of the eponychium or other living skin is outside the scope of nail technology and not allowed under any conditions or circumstances; clients cannot give a nail technician permission to cut any living skin.

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 nail plate. It forms a

Activity

Use a small magnifying glass to examine the cuticles and eponychiums of at least 10 friends or classmates. Observe how the thin cuticle tissue attaches to and rides on top of the nail plate as it emerges from under the eponychium at the base of the nail plate. Then examine the eponychium to see how these two differ in appearance. Identify which one can be removed and which should never be cut.

protective barrier that prevents microorganisms from invading and infecting the nail bed. When this area is damaged, the nail plate can separate from the nail bed; this can make infections under the nail plate more likely to occur, so this area should be treated with care.

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. They 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 called the **lateral nail fold**, is the fold of skin overlapping the side of the nail. **LO1**

NAIL GROWTH

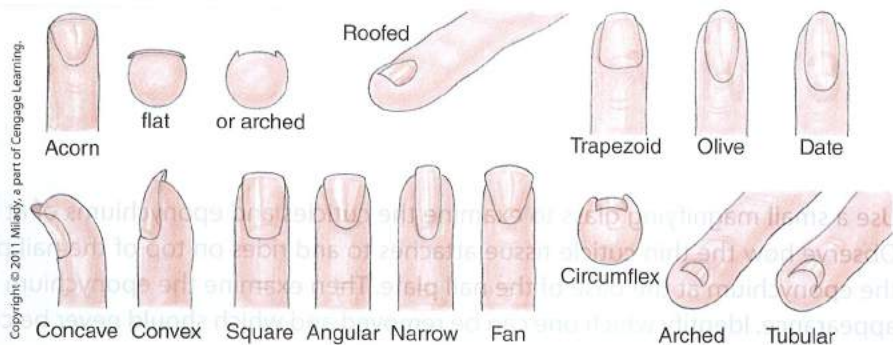
The growth of the nail plate is affected by nutrition, exercise, and a person's general health. A normal nail plate grows forward from the matrix and extends over the tip of the finger. Normal, healthy nail plates can grow in a variety of shapes, depending on the shape of the matrix. The length, width, and curvature of the matrix determine the thickness, width, and curvature of the plate. For example, a longer matrix produces a thicker nail plate, and a highly curved matrix creates a highly curved free edge. Nothing can make the nail plate grow thicker: this would require the size of the matrix to grow larger.

The average rate of nail plate growth in the normal adult is about $\frac{1}{10}$ " to $\frac{1}{8}$ " (2.5 mm to 3 mm) per month. Nail plates grow faster in the summer than they do in the winter. Children's nails grow more rapidly, while those of elderly persons grow at a slower rate. The nail of the middle finger grows the fastest; the thumbnail grows the slowest. Nail growth rates increase dramatically during the last trimester of pregnancy because of hormonal changes in the body. The nail growth rate decreases dramatically after the delivery of the baby and returns to normal, as do hormone levels in the body. It is a myth that nail growth is caused by taking prenatal care vitamins; nail growth rates will accelerate whether or



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► **Figure 8-2** Various shapes of nails.



not a woman takes these vitamins. 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 8-2**).

Nail Plate Malformation

If disease, injury, or infection occurs in the matrix, the shape or thickness of the nail plate can change. The plate will continue to grow as long as the matrix is healthy and undamaged. Ordinarily, complete replacement of the nail plate takes about 4 to 6 months. Toenail plates take 9 months to 1 year to be fully replaced. Nail plates are not shed automatically or periodically, as is the case with hair. 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 nail cells are produced faster, the plate will grow more quickly. The reverse is also true. 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 begins 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. You will learn more about nail plate malformation and common disorders in the next chapter. **LO2**

KNOW YOUR NAILS

Many nail professionals 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 good, strong, healthy nails can be a pleasure. As a licensed nail professional, you are only allowed to work on healthy nails and skin with no visible signs of disease or infection. Working on healthy nails will be the canvas on which your creativity and artistry can soar!

■ Review Questions

1. What is the technical term for the nail unit?
2. What is the major protein which makes up the nail plate?
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 bed and the nail plate.
6. What part of the nail unit contains the nerve, lymph, and blood vessels?
7. Why are nail technicians not allowed to cut the skin around the base of the nail plate, even if the client requests it during the service?
8. Explain why the nail matrix produces grooves rather than ridges in the nail plate.