



Toenails, including Fungal Toenails

Many things can happen to the toenails, making self-care at home very difficult & unsafe

The nail-module is extremely complex as it consists of:

- **The matrix bed** that is attached to the upper side of the underlying last bone of the toes and is covered by the skin of the toenail. In the beginning of some nails you can see a narrow curved white sliver. That is the end of the matrix.
- **All three nail layers** that are called the nail plate are produced by the matrix. The visible top layer is produced at the beginning of the matrix closest to the foot; the lowest layer is produced at the other end of the matrix closest to the visible nail.
- **The bottom nail layer** that is attached to **the nail bed** via an epithelium layer on its underside. The bottom epithelium layer has ridges that fit into grooves of the underlying nail bed which, due to its high blood volume, makes the nails look pink.
- All three nail layers are attached to each other due to **the cuticle system** all the way around the visible pink nail. The cuticle makes a tight seal between the upper nail layer and skin folds on the sides, as well as the beginning of the nail. At the end of the pink nail, a seal is made on the underside of the nail with a thick band called the solehorn.

Interesting facts about the nail and its growth:

- The width, horizontal curvature, or other abnormal shapes of the underlying bone determine the width and curvature of not only the matrix, but also the nail itself. A damaged matrix will cause the nail to take on the damaged transverse shape.
 - The four abnormal nail shapes: **Trumpet nails** that actually grow from a normal-shaped matrix. However, there is often a bone spur on top of the underlying bone that causes the nail bed and entire nail plate to be raised up. The tall and narrow nail has normal thickness. The two sides often grow together at the end. **Tile-shaped nails** are rounded, but not growing together at the end. This shape is from the matrix. **Plicatured nails** are flat on the top but curve downward at about 90% on one or both sides. This is caused by a deformed matrix. **Ingrown nails** are due to a plicatured nail or a very wide or curved nail plate.
- The shorter the matrix, the thinner the nail; as well as the opposite.
- The last bone in each toe points downward at the end, also causing the nail-plate to grow downward at the end. Some toes point completely down into the shoe.
- Poor arterial circulation (both amount and quality of the blood), high fevers, severe infections, cold external temperatures, and more, cause the nails to grow slower.
- Psoriasis, warm external temperatures, and more, cause the nails to grow faster.
- It takes 12-18 months for an entire nail to grow out. The free edge grows faster.
- Decreased mobility cause the bones to get smaller, increasing the nail curvature.



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Abnormalities to the visible nail module (nail and surrounding skin) can sometimes give the nail-professional a clue about which part of the nail module was damaged either due to a big or several repetitive smaller injuries and/or a systemic or localized disease. There may also be a clue about what the outcome may be.

- **Systemic (sometimes localized) diseases** that affect the nail module usually include psoriasis, diabetes, arteriosclerosis, chronic eczema, hyperhidrosis (too much water exposure), and probably many more.
- **Acute injuries or several repetitive minor injuries** can include damage from a fall or a car crash; the pressure from a heavy object hitting the toe or the toe bumping into a heavy object; or repetitive pressure from an ill-fitting shoe.

Fungal Nails: Fungus thrives well on the skin around the toenails due to the warm, moist, and dark environment. Any opening in the seal around the nail can allow fungus (and bacteria) to invade the nail-plate or surrounding nail folds. The fungus will only be able to thrive if there is dead or diseased organic matter available to sustain its life. Systemic diseases and local trauma therefore cause the invading fungus to thrive better.

Fungus that attacks the nail bed from the end of the nail will usually cause: Thickening of the nail bed and the area of the solehorn; Discoloration (white, yellow, blue, green); and flaking of nail plate; Breakdown and crumbling of the nail plate; Misshapen matrix; Matrix stops producing nail plate. If the fungus only attacks the superficial nail plate at the end of the nail, it grows a whitish discoloration on top of the nail that often can be scraped away. If candida (yeast) attacks the nail folds on the sides, they will become bright red. *A lab test can always confirm if fungus or yeast is present or something else is going on.*

Smaller fungal-infected areas of the nail plate might respond to treatment:

Medications should not be used for nails where the whole nail module is involved.

Oral medications can be rough on the liver. **Natural products** may work. Clinical trials have been done on the following three **topical products:**

- Kerydin: On affected nails daily for 48 weeks. 9.1% complete cure. Cost \$14,987.
- Jublia: On affected nails daily for 48 weeks. 16.5% complete cure. Cost \$7,709.
- Vicks VapoRub with Camphor: Once or twice daily for 48 weeks. 27.8% complete cure; 55.6% partial clearance; 16.6% no change. Cost \$14.64.
It includes Eucalyptus oil: antibacterial, antiviral, anti-inflammatory properties and Camphor: anti-microbial and anti-fungal properties. Very beneficial to HIV patients.

Nail self-care: If you need help with your toenails, only use an Emory board at home.

The “Service Overview” handout tells you what a foot care nurse can do for your nails.