

1.0 Introduction

Onychomycosis is a fungal infection of the nail and the nail bed. To understand onychomycosis and how [AGENT NAME] treats this disease, it is essential to first understand the anatomy and physiology of the nail unit. This module reviews the structure and function of the skin, nail, and nail bed, and describes how these concepts relate to onychomycosis.

Learning Objectives

After completing this module, the sales representative will be able to:

- List the major components of the integument.
- Describe the structure and function of the nail and nail bed, specifically the great toe.
- Differentiate the structure and function of the nails and skin.
- Describe the structures and processes involved in nail growth and development.
- Describe the components of the immune system that are active in the nail unit.
- Identify the parts of the nail unit that are affected by onychomycosis.

Important terms are bolded throughout the text and listed in the glossary at the end of the module.

2.0 The Integument

The **integument** is the outermost surface covering of the body.¹ The integument includes the skin, hair, and nails (Figure 1).²

In this section, we will review the major functions and structures of the integument and will examine the nails as part of the integumentary system.

2.1 The Skin

Functions

The skin's major function is to create a barrier between the inside and outside of the body.³ This **barrier function** helps prevent loss of water and solutes, infection by invading pathogens, chemical and mechanical injuries, and damage by electromagnetic radiation.³

The skin also plays important roles in sensation, regulation of body temperature, and vitamin D synthesis.²

Tissue Organization of the Skin

The **epidermis**, or outermost tissue structure of the skin, is essential for the skin's barrier function.³ The epidermis consists of five layers of cells in different stages of maturation.² These layers are the:²

1. Stratum corneum (top layer)
2. Stratum lucidum
3. Stratum granulosum (granular layer)
4. Stratum spinosum
5. Stratum basale (deepest or germinative layer)

The **stratum corneum** is the top or outermost layer of the epidermis. The stratum corneum is made up of lipid (fat) and flattened **keratinocytes**, which are cells that produce a strong, fibrous protein called **keratin**.¹

The stratum corneum continually sheds keratinocytes, which are replaced by dividing skin cells in the deepest (or germinative) layer of the epidermis (Figure 2). The ongoing shedding and replacement of keratinocytes facilitates the removal of damaged or infected cells and maintains the skin's barrier function against toxins and infection.^{1,3}

The epidermis lacks blood vessels, and receives vascular support from the underlying layer of skin, called the **dermis** (Figure 2).²

The **dermis** contains collagen and elastin fibers that are able to expand and contract; nerves that enable the skin to react to heat, cold, pain, and pressure; and capillaries that carry blood, nutrients, and waste products to and from the epidermis.

Capillaries in the dermis also help regulate body temperature.² If the body is too warm, they expand, and blood flow to the skin increases to aid in heat loss. If the body is too cold, the capillaries in the dermis constrict to help reduce heat loss.²

The dermis also has millions of sweat glands and sebaceous glands that produce an oily substance called sebum (Figure 2).²

Beneath the dermis lies a layer of **subcutaneous adipose (fatty) tissue** that helps insulate the body (Figure 2).²