**Who is Mast T. Langerhans?**
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*Global Cosmetic Industry;* Nov 2003; 171, 11; Research Library
pg. 52

CHEMICAL REACTION **BY STEVE HERMAN**

# Who is Mast T. Langerhans?

Understanding the immune system is a vital key to understanding how skin care can promote healthier skin at the cellular level.

"I'm tired of all this nonsense about beauty being only skin deep. That's deep enough. What do you want, an adorable pancreas?"
– Jean Kerr

ANYONE dozing during a lecture on cellular irritation might well wake up and wonder who Mast T. Langerhans is. Mast cells, T cells and Langerhans cells are all part of a complex process that unfolds when a cell encounters an intruder. The response mechanism is a vital key to the successful promotion of healthy skin, and is, thus, of lively interest to the cosmetics industry.

Even nodding off at the Latin American Candle Convention in the tropical paradise of Puerto Vallarta, one could rouse to a slide mentioning cytokines and IgE.[1] How do these materials impact disciplines from medicine to cosmetics and candles? Irritation can come from anywhere—from UV exposure to chemical insult to fragrance emission from a candle.

The skin is not only a mechanical barrier between the environment and the body: it is the largest organ in the immune system. The immunological function of skin is principally linked to the presence in the epidermis of a distinct subpopulation of dendritic cells: the Langerhans cells (LC). LCs constitute 2–4 percent of epidermal cell population, play a key role in the initiation of T cell responses to cutaneous antigens, and pick up the antigen and migrate to the lymph node, where they trigger T helper cells, which activate B cells to make antibodies.

The nomenclature of imposes a steep learning curve on the uninitiated, as they encounter a variety of white blood cells, immunoglobulins and a laundry list of chemical mediators. Antibodies were discovered originally in the bloodstream and were called "immunoglobulins" for the surprisingly obvious reason that they are globular molecules related to the immune system. The most common form is Immunoglobulin G (IgG), the others being IgA, IgM, IgD and IgE, with numerous subcategories.

**FIGURE 1. ANTIBODY BINDING PROCESS**

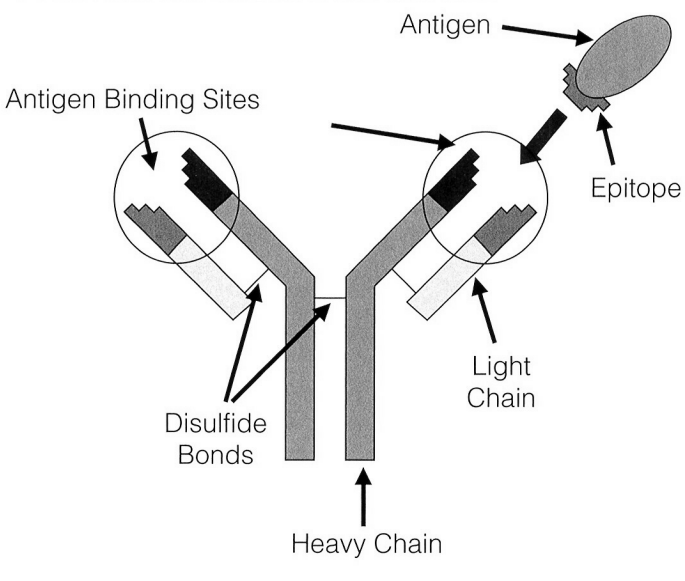
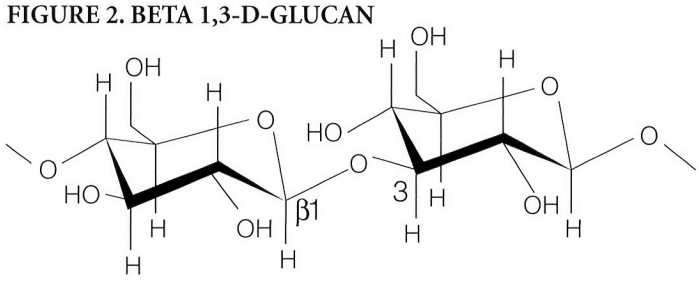



**FIGURE 2. BETA 1,3-D-GLUCAN**



B-lymphocytes, usually simply called B cells, are produced and mature in the bone marrow—thus the "B." T lymphocytes, T cells, originate in the bone marrow but then mature in the thymus, accounting for the "T." Knowing the origin of the names of the immune system components is a good beginning to understanding their nature. LCs were named after their discoverer, Paul Langerhans.

The 1908 Nobel Prize in medicine went to the French doctor Elie Metchnikoff, who in 1883 proposed that our bodies contain cells that hunt down and devour bacteria and other disease-causing organisms. These cells, named macrophages (meaning "big eaters"), have been described as the Pac-Man of our immune system. Macrophages are Langerhans cells in the blood.

The body must attack invaders, but not itself. To identify the difference, every body cell carries distinctive molecules that characterize it as "self." Foreign molecules also carry distinctive shapes called epitopes that protrude from their surface. The immune system can recognize millions of non-self molecules and produce specific antibodies that can counteract them. An antigen is a foreign substance capable of triggering an immune response.

The antibody molecule itself is a protein with two heavy chains and two light chains. The stalk of the antibody consists of a portion of the heavy chain, while the part that binds the antigen consists of a claw-like complex of a light and a heavy chain. The shape of the antigen-binding portion of the "claw" determines which antigen the antibody binds to and how strongly it holds (Figure 1). Disulfide bonds, the same ones that are a key aspect of hair structure, hold the protein chains together. The body has an incredibly complex chemistry, but numerous permutations of a few core mechanisms and building blocks accomplish the diversity of structures and biochemical pathways.

The immune system is not static—taking a picture of it will not tell its story. The cells are in a constant state of movement and development, and a cell can be quite different at the beginning and end of its life.[2]

One of the most widely recognized cosmetic ingredients that can enhance the immune system, and specifically Langerhans Cells, are the beta glucans.[3] Early work showed that a polysaccharide extract of bakers yeast (*Saccharomyces cerevisiae*) cells, zymosan, stimulates macrophages. Most subsequent work focused on the beta glucans, which are polymers of glucose. Besides yeast, oat has been a common source. The structure of beta glucan is shown in Figure 2, with the links providing an important feature for determining activity, being either 1,3; 1,4 or 1,6, with beta 1,3 D-glucan attracting the most interest. Although some beta glucans are better than others for stimulating the immune system, it seems reasonable that derivatives of both yeast and oats can produce viable benefits.

Oat-based material is available from Nuture Inc., most recently as Beta-Glucan 70. Water-soluble and with low use levels (0.1–1.0% in skin care), it is positioned as an economical additive. Product claims include stimulating collagen production, reduction of stinging from alpha hydroxy acid products, suppression of damage from UV, and alleviation of the symptoms of erythema. A similar product from Croda, Cromoist CM-Glucan (Sodium Carboxymethyl Beta-Glucan), has recommended use from 0.2–4 percent in a variety of products.

Understanding the immune system is a vital key to understanding how cosmetics can promote healthier skin at the cellular level. Combined with proper diet, avoidance of unnecessary sun exposure and smoking, the right materials can result in skin that doesn't just look young, but is young at its molecular heart. ■ GCI

ACKNOWLEDGEMENT

Thanks to Dr. Laurie Joseph, Croda Inc., for reviewing this column.

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Steve Herman is vice president, new technology development, at AFF International. He has more than 30 years of experience in the industry, primarily in fragrance application. He serves as an adjunct professor in the FDU Masters in Cosmetic Science program and has been active in numerous capacities with the SCC.

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