4.1.1

Functions of the Integumentary System

Probably the most important function of the integumentary system is to provide a barrier between our internal organs and the external environment. A benefit of this barrier is that we are protected from infectious agents, from dehydration and from damage due to mechanical or chemical agents.

Another important function of the integumentary system is regulation of body temperature. When our core temperature increases, blood vessels in the skin dilate allowing the warm blood to flow near the surface. The excess heat can then be radiated from the body. Conversely, when body temperature decreases those same vessels constrict, driving the blood to deeper tissues and conserving heat. Additionally, hair helps insulate the body and prevent the loss of body heat. For most of us this has minimal effect but, in some people, and most mammals the hair is a great insulator.

Other functions of the integumentary system include: the production of Vitamin D, a key factor in the regulation of blood calcium; detection of external stimuli (i.e. touch, hot and cold, vibration, etc.); and elimination of wastes. Although there are other systems that play a much more important role in removing wastes (the kidneys and liver), small amounts of waste (urea) are eliminated in the sweat.

Have you ever wondered why your fingers get wrinkled after taking a bath? It's likely that your parents told you your skin soaks up water like a sponge. We might scientifically attribute the movement of water into the outer layers of skin to the process of osmosis. Why then, do we only observe this response in our fingers and toes? Perhaps a clue can be found in the observation that individuals with nerve damage do not demonstrate the wrinkling effect when exposed to water. The current hypothesis is that water moves into the sweat glands of the fingertips and toes, changing the electrolyte balance and subsequently activating peripheral sympathetic neurons to fire, resulting in vasoconstriction of the blood vessels. While this partly explains why individuals with nerve damage in their fingertips don't get wrinkled fingers, it does not adequately explain why wrinkling only occurs on fingers and toes.

Even more confusing is the observation that fingers wrinkle at different rates under changing water conditions (temperature, pH, tonicity). For example, decreasing the temperature of water increases the time it takes for fingers to wrinkle. Mechanistically, we can attribute this to the differential stimulus of peripheral sympathetic neurons, but we still don't know the purpose. One prevailing hypothesis states that finger wrinkling in response to water allows for better grip in wet conditions. Although there is supporting data for this hypothesis as of 2011, another group of scientists in 2014 published a paper showing no significant differences between the grips of wet fingers vs. dry fingers. Apparently, the verdict is still out as to the purpose of finger wrinkling!