XXXI. SKIN SENSATION AND GENERAL PHYSIOLOGY OF THE SKIN.
XXXII. CUTANEOUS SENSE ORGANS

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Skin performs the following functions:

- *protection*: physical: mechanical protection (elasticity and strength of fibers, subcutaneous fat); protection against UV radiation (melanin)
  biological: keratinization and flaking epithelium, secretion of the sebaceous and sweat glands
  chemical: pH
- *sensation*: warm, cold, pressure or pain
- *thermoregulation*: skin helps to maintain a constant body temperature through the skin blood vessels and sweat glands
- *secretion*: sebaceous and sweat glands
- *resorption*: compound dissolved in fat or fat solvents (e.g. different drugs in the form of ointments)
- *immunity:* nonspecific barrier (biological, chemical, physical)
  specific barriers (cellular components, skin associated lymphoid tissue)
- *storage*: blood, fat, vitamins

XXXI.1 Test of acidity of the skin

There is a hydrolipid layer on the surface of the skin. It consists of products of sebaceous glands, sweat glands and the cells of the skin stratum corneum. Intact skin sheath protects the skin from excessive dehydration, negative effects of external factors and from proliferating germs. Dermal sheath reacts usually weakly acidic, which prevents the propagation of germs. The acid value is expressed with 4, 5-5, 5 pH.

Test of acidity of the skin:

- it is the examination of the skin resistance to alkaline substances
- monitored for how long the skin will be irritated
- the longer the time of irritation is, the better the resistance of then skin

XXX.I.2 Test of dermografism

Dermographism is a vascular reactions of skin occurring in response to mechanical stimuli.

There is:

Red (dermographismus ruber) or dilatator dermografism is a normal skin reaction to the irritation. Amplified red dermographism is a manifestation of increased parasympathetic activity.

White (dermographismus albus) or constrictor dermografism is an abnormal skin reaction to the irritation. Amplified white dermographism is a manifestation of an increased sympathetic activity.

Raised dermographism (dermographismus oedematosus) regularly occurs in contact urticaria. Due to the reactivity of the skin blood vessels is also called transudative. At the point of skin compression also appeared slight rise.

dermographismus ruber

dermographismus oedematosus

dermographismus albus

XXXI.3. Test of Minor

Sweat gland

Sweat glands are used to regulate temperature and remove waste by secreting water, sodium salts, and nitrogenous waste (such as urea) onto the skin surface.

The number of active sweat glands varies greatly among different people, though comparisons between different areas (the palm has around 370 sweat glands per cm^2; the back of the hand has 200 per cm^2; the forehead has 175 per cm^2; the breast, abdomen, and forearm have 155 per cm^2; and the back and legs have 60–80 per cm^2).

The test of reactivity of sweat glands

Before a procedure:
active sweat glands

After a procedure:
inactive sweat glands*

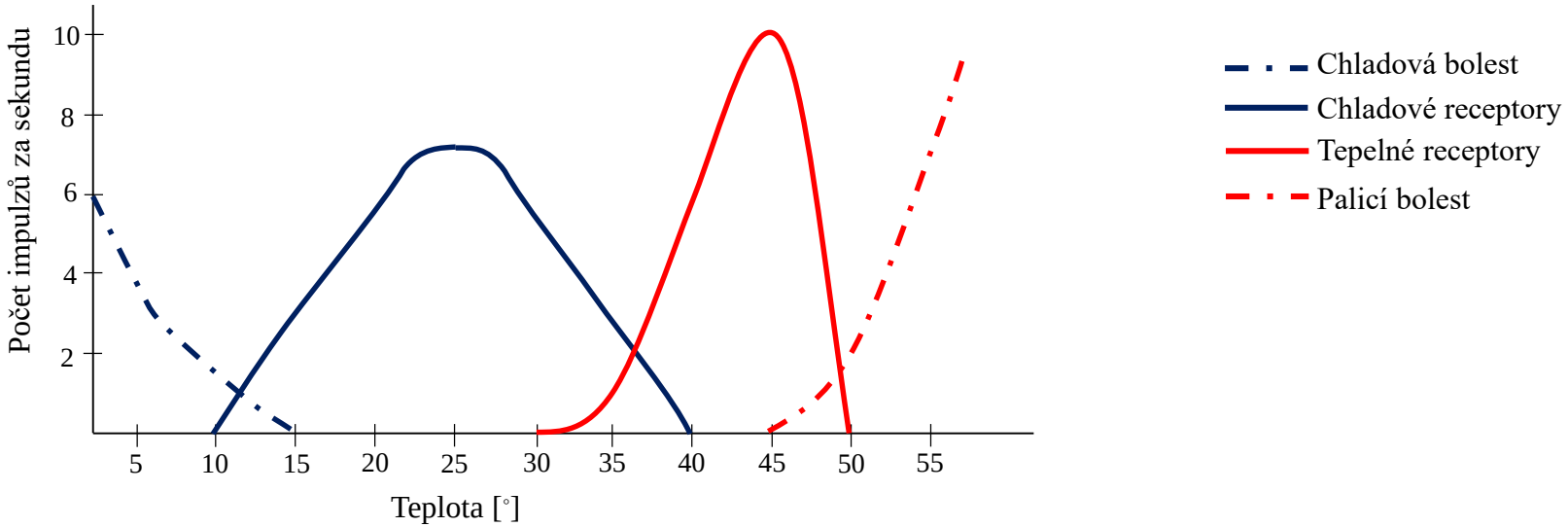
*removal of excessive sweating
with botulotoxin or laser

XXXII.1. Warm and cold spots

Temperature is seen by two types of sensory organs: the first ones react to temperature slightly higher than the body temperature, the second ones react to temperature slightly lower than the body temperature. The first of these sensors are warm receptors and second sensors are cold receptors.

Mapping experiments showed that there are separate skin places sensitive to cold and warm. There are 4-10 times more places sensitive to cold than warm. Cold receptors react in the temperature range between 10-40 ° C and warm receptors react in the temperature range of 30-49 ° C.

Pain receptors also react to a temperature change. Pain receptors are stimulated only at extreme hot temperature or extreme cold temperature, and therefore are responsible, together with the warm and cold receptors for sensations of burning and freezing.



* Guyton & Hall, Textbook of Medical Physiology, 2001

XXXII.1. Warm and cold spots

Krause's corpuscles are :

- tiny cylindrical oval bodies with a capsule formed by the expansion of the connective tissue sheath of a medullated fiber.
- cold receptors

Ruffini bodies (Bulbous corpuscle) are:

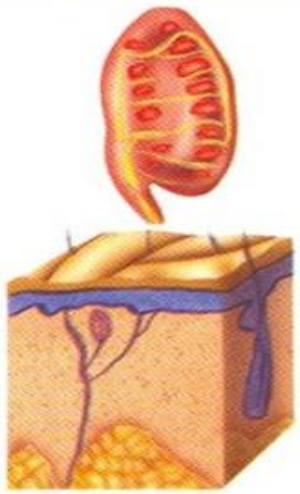
- enlarged dendritic endings with elongated capsules
- warm receptors

The ratio of warm receptors to cold is 1: 3-10, and in different parts of the body, the density of receptors is different (15-25 of cold receptors on 1 cm2 of the lips; 3-5 of cold receptors on 1 cm2 finger).

* Thermoreceptors (general) are also located in the hypothalamus, in the organs of the abdominal cavity and around the large vessels in the upper abdomen and chest, contributes to thermoregulation. Similarly, chemoreceptors (glomus caroticum) detect changes of blood temperature.

XXXII.2. Tactile and pain spots

Tactile and pressure receptors



Meissner's corpuscle. It is highly adaptive mechanoreceptor especially for touch on the fingers and lips. It is special pressure-sensitive sensory end organs with a connective tissue capsule and tiny stacked plates in the dermis of the hand and foot, the front of the forearm, the skin of the lips, the mucous membrane of the tongue, the palpebral conjunctiva, and the skin of the mammary papilla. A single nerve fiber penetrates each oval capsule, spirals through the interior, and ends as a globular mass.

Lamellar corpuscles, or Pacinian corpuscles. The Lamellar corpuscle is approximately oval-cylindrical-shaped and 1 mm in length. The lamellae are in fact very thin, flat, epithelial cells inside the capsule and modified Schwann cells inside the inner core of the corpuscle. They are characterized by the ability to almost immediate adaptation, so it can stimulate only a very rapidly changing mechanical stimulus (e.g. compression).

XXXII.2. Tactile and pain spots

Merkel cell

Merkel cells are epidermal cells located in the basal layer of the epidermis and the epithelial sheath of hair follicles. Friedrich Sigmund Merkel referred to these cells as "touch cells" but this proposed function has been controversial and hard to prove. However, genetic knockout mice have recently shown that Merkel cells are essential for the specialized coding by which afferent nerves resolve fine spatial details.

Pain

Pain is a physiological perception serving as protective mechanism, its task is to prevent further tissue damage.

There are two type of pain:

• Fast pain develops during tenths of a second. It is also known as a sharp pain. This term most often arises during a mechanical skin injury like stings or cuts.

• Slow pain starts after a few seconds from causing a painful stimulus. Intensity of pain slowly develops and increases.

XXXII.2. Tactile and pain spots

Pain receptors or nociceptors are free nerve endings stratified throughout the body - in the skin, in the periosteum, in the walls of large arteries, in joints etc. Nociceptors react to stimuli, which can be divided into three types: mechanical, chemical and thermal. All three types are able to induce a slow pain, but only mechanical and thermal types cause fast pain.

Unlike any other receptors, they are non-adaptive. Sensitivity of nociceptors under certain conditions increases and as well as the sensation of pain. This sensitivity increase is called hyperalgesia.

XXXII.3 Simultaneous spatial discrimination

Sensitivity to a particular initiative is not the same everywhere on the body. Reception areas may overlap and in these parts the sensitivity is higher. Also, the receptor density in different parts of the body is different. Tongue and fingertips on hand have more touch receptors than skin on the back. The number of receptors for each sensations is not the same.

Determining of spatial threshold:

- simultaneous spatial threshold (esteziometrs is attached simultaneously)
- successively threshold (esteziometr is attached successively)

Assessment: The patient is asked to report whether one or two points was felt. The smallest distance between two points that still results in the perception of two distinct stimuli is recorded as the patient's two-point threshold. Performance on the two extremities can be compared for discrepancies.