## LESSON № 5

## Topic: THERMAL REGULATORY DYSFUNCTION. FEVER. HYPERTHERMIA. HYPOTHERMIA

**Aim of the lesson**: to study causes and mechanisms of fever development, its biological role, etiopathogenesis and consequences of hypertermia and hypothermia influence on the organism.

QUESTIONS:

1. Notion of temperature regulation. Heat production and heat return mechanisms.
2. Definition of fever. Fever categorization.
3. Etiology of fever. Types of pyrogens (exo- and endogenous). Pyrogen's action mechanism.
4. Pathogenesis of fever. Stage of fevers, their features. Thermoregulation at different stages of fever.
5. Metabolism changes in the organism in fever.
6. Functional changes in the organism in fever.
7. Types of fever based on the extent of temperature rise.
8. Types of temperature curves.
8. The biological significance of fever.
9. Hyperthermia. Causes. Disturbances in the organism in hyperthermia.
10. Differences between fever and hyperthermia.
11. Hypothermia. Causes. Disorders in the organism in hypothermia. Hypothermia in medicine.

## LABORATORY WORKS

**Laboratory work 1**. ***Experimental fever in rats***

**Description of the work:** The students estimate rats rectal temperature by electric thermometer. Then rats taking pyrogenal (Salmonella typhi endotoxin) 100 Un/100g intramuscularly. Students measure rectal temperature every 15 min during 1,5 hr, make graph of rat rectal temperature curve.

Students analyze, draw and make conclusions.

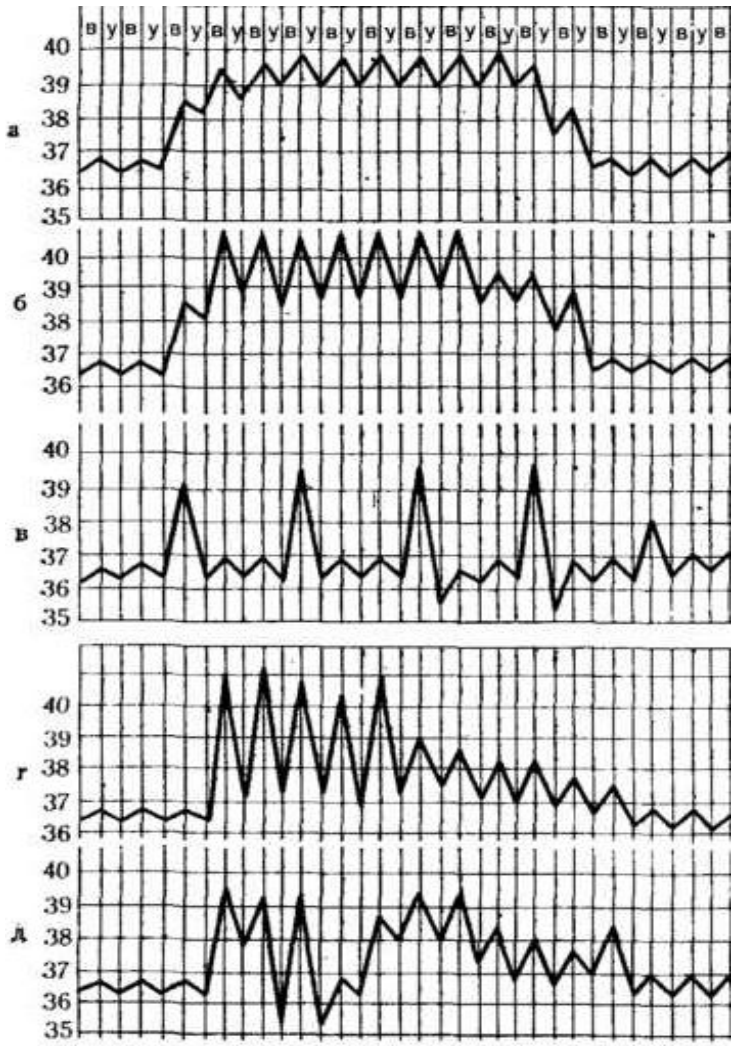
| Temperature curves | The name fever | Daily fluctuation t ºC |
|---|---|---|
|  | f. continua | day variation <1 ºC |
| | f. remittens | day variation 1,5-2 ºC |
| | f. inter-mittens | fever after 1-2 days |
| | f. hectica | day variation >3 ºC |
| | f. athypica | unstable changing |



**Fig. 5.1.** – Types of temperature curves

## Tasks

### 1

A 25-year-old HIV-positive female patient was admitted to hospital with the body temperature 38.9°C, cough with rales. She complained of pain in her right chest during breathing. Laboratory tests showed leukopenia due to a decrease of lymphocytes and monocytes; bronchial secretions contained large amounts of desquamating epithelium, leukocytes, various strains of bacteria; blood was positive for treponema antigens.

- What were the possible sources of pyrogens in this case?
- How can you explain the development of fever in the patient suffering from leukopenia?
- Can fever in this case be associated with AIDS?

### 2

A patient was admitted to the hematologic department of the hospital two weeks after he had started treatment with cytostatic drugs for chronic myelogenous leukemia. The reason of admission was worsening of condition and increase in the body temperature up to 39°C. Examination of the patient revealed a moderate hypochromatic anemia and marked leukopenia. Bacteriological analysis of his biological fluids showed the absence of pathogenic strains of microorganisms.

If you believe that the patient suffers from fever, or if you believe that he has hypothermia, explain its possible causes and mechanisms?

### 3

An 18-year-old patient M. felt weakness, dizziness, throbbing headache, hills and nausea when he returned home from the beach where he had spent 6 hours. Thirty minutes later he developed vomiting, and his body temperature increased up to 39 °C. He ingested aspirin but it had no much effect. Despite a moderate decrease of body temperature down to 37°C his condition continued to worsen, and he called in an ambulance. On the way to hospital he lost his consciousness and was brought to the intensive care.

- Define the type of the pathological state developed in the patient.
- What are the most likely causes, stages, and mechanisms of this

pathological state?

• Why did the patient's state continue to worsen despite a decrease in the body temperature? What was the cause of loss of consciousness in this patient?

**4**

A 79-year old male is found apparently dead in the snow following a winter storm, where all traffic was arrested by snow. His muscles are stiff, and the heart rate is not palpable. The tendon reflexes are depressed, and the pupillary and other brainstem reflexes are lost.

The body is placed in a chapel at the hospital until the funeral. The next day the personnel are disturbed by noises from the chapel. Obviously, the man is alive.

1. What has awakened the man?
2. Suggest a likely core temperature, at the time where the man was admitted to the hospital.

**LITERATURE:**


1. Lecture material.
2. General and clinical pathophysiology / ed. by A.V. Kubyshkin. – Vinnytsa: Nova Knyha Publishers. – 2011. – P. 33-45, 257-280.
3. Litvitsky P.F., Pirozhkov S.V., Tezikov E.B. Pathophysiology: Concise Lectures, test, clinic- pathophysiological situations and clinic-laboratory problems. Students manual / Moscow «Geotar-Media». – 2012. – P. 37-39.
4. Pathology / ed. by E. Rubin and J.L. Farber, 2nd ed. – 1994. – P. 64, 313-317, 399.