FEVER

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Fever and Febrile syndromes

TOPICS of the lecture

- Thermoregulation
- Pathogenesis of fever
- Fever only
- Fever and Rush
- Fever and Lymphadenopathy

Fever of unknown origin (FUO)

- Definition
  - Classic
  - New
- Causes
- Diagnostic strategy

•In a healthy individual, body temperature is kept constant in a very small range despite of big differences in temperature of the surroundings and also those in physical activity.

• Very perfect regulation of body temperature, necessary for optimal progress of enzymatic reactions, is developed in all homoiotermic animals.

Mechanisms of Heat Regulation

To raise Body Temperature

Heat generation

- Obligate heat production
- Muscular work
- Shivering

Heat conservation

- Vasoconstruction
- Heat preference

To lower Body Temperature

Heat loss

- Obligate heat loss
- Vasodilatation
- Sweating
- Cold preference

MAJOR THERMOREGULATORY PATHWAYS I

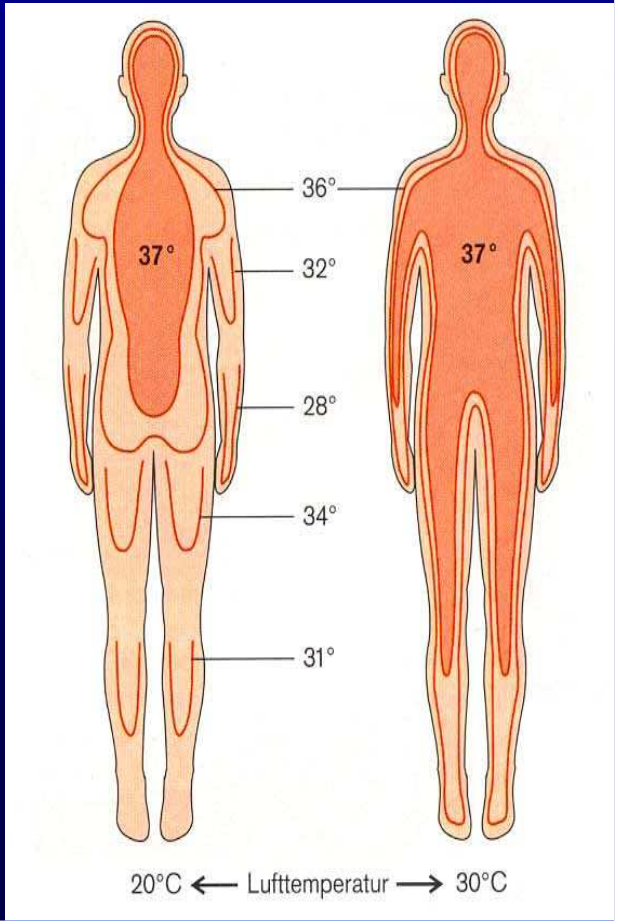
Skin temperature

Core temperature

Peripheral thermoreceptors (in skin)

Central thermoreceptors (in hypothalamus, other areas of CNS and abdominal organs)

Hypothalamic thermoregulatory integrating center



Fever >37.8 °C (100.2°)

Elevated body temperature mediated by an **increase in the hypothalamic heat-regulating set point**

Hyperthermia

Increase in body temp. (>41°) that overrides or bypasses the normal homeostatic mechanisms

Causes of FEVER

1. **infections** caused by bacteria, rickettsia, chlamydia, viruses, and parasites
2. **immune reactions**, including the defects in collagen, immunological abnormalities and acquired immunodeficiency
3. **destruction of tissues**, such as trauma, local necrosis (infarction), and inflammatory reaction in tissues and vessels (flebitis, arteritis), pulmonary infarction, cerebral and myocardial infarction, and rhabdomyolysis
4. **specific inflammations** (sarcoidosis, granulomatous hepatitis)
5. **inflammation** of intestine and intraabdominal inflammatory processes
6. **neoplastic processes** with the participation of lymphoendothelial system and hemopoetic system, solid tumours (Grawitz tumour of the kidney, carcinoma of the pancreas, pulmonary and skeletal tumours, hepatoma) Fever is present in complications of solid tumours, usually in metastases that are associated with necrosis of the tumour, obstruction of ducts, or with infection
7. **acute metabolic failures** such as arthritis urica, porfyria, Addison's crisis, thyreotoxic crisis, and feochromocytoma
8. **administration of some drugs**
9. **dehydration or admistration of salts**.
10. **administration of foreign proteins** (e.g. globulinum antitetanicum-antitoxic fraction of horse serum)
11. **Factitious of self-induced fever**

TYPES OF FEVER

1. **febris continua is fever in which the temperature changes are less than 1 C in 24 hours**

2. **febris septica-hectica is fever in which the swings are 3 C**

3. **febris remittens is fever with big temperature swings**

4. **febris intermittens is fever characterized by several hours lasting apyretic periods**

5. **febris recurrens is fever that reccurs after several days**

6. **febris inversa means that fever is higher in the morning than in the evening. This is typical for patients suffering from tuberculosis.**

In fever, important changes occur in the function of organism

•tachycardia ,extrasystols
•Blood pressure increases than decreases→bradycardia
•Oliguria caused by evaporation and sweating
•defect in secretion of digestive juices is observed associated with motor disorder
•Hyperglycemia
•Metabolic acidosis
•Changes in mental conditions
•Herpes

Utility of fever

•increases immune reactions, increases chemotactic, phagocytic, and bactericidal activity of polymorphonuclear leucocytes, stimulates the processes of antibody production.

•body defendes itself against microbes but also against replication of viruses

Harmfull effects of fever

•Increased basal metabolism, minute heart volume, and water and salt loses may complicate other basic illnesses.

•Very high temperature suppress immune mechanisms.

•Longlasting fever causes dysfunctions of parenchymal organs. It is so in malignant (extreme) fever, febrile spasms, epilepsy, cardiac problems, and the disease of the central nervous system.

Infections producing Fever and Rush

Maculopapular Erythematous

Enterovirus
EBV, CMV, Toxoplasma gondii
HIV
Colorado tick fever
Salmonella thyphi
Leptospira interrogans
Measles virus
Rubella virus
Hepatitis B virus
Treponema pallidum
Parvovirus B19
Human herpesvirus 6

Vesicular

Varicella-zooster
Herpes simplex virus
Coxackie A virus
Vibrio vulnificus

Distinctive rush

Ecthymia gangrenosum – Pseudomonas aeruginosa
Erythema chronicum migrans – Lyme disease

Cutaneous petechiae

Neisseria gonorrhoea
N. meningitidis
Rickettsia rickettsii (RMSF)
Ehrlichia chaffeensis
Echoviruses
Viridans-streptococci (endocarditis)

Diffuse erythroderma

Group A streptococci (scarlet fever, toxic shock syndr.)
Staphylococcus aureus (toxic shock syndr.)

Mucous membrane lesions

Vesicular pharyngitis – Coxackie A virus
Palatal petechiae – rubella, EBV, Scarlet fever
Erythema – toxic shock syndr.
Oral ulceronodular lesion – Histoplasma capsulatum
Koplik's spots – measles virus

Infections with Fever and Lymphadenomegaly (generalized)

Viral	Measles
	Rubeola
	Hepatitis B
Bacterial	Scarlet fever
	Brucellosis
	Leptospirosis
	Tuberculosis
	Syphilis
	Lyme disease

Infections with Fever and Lymphadenomegaly (regional)

Pyogenic infection	Sta. aureus, Stre.
Tuberculosis	Scrofula (tbc. Cervical adenitis)
Cat-scratch disease	Bartonella
Ulceroglandular fever	Tularemia
Oculoglandular fever	Tul., sporotrichosis, etc.
Inguinal lymphadenopathy	Syphilis, herpes
Plague	Yersinia pestis

DIAGNOSTIC EVALUATION

Comprehensive history

- Illness,medical intervention,medication
- Journey
- Profession
- Age
- Animal contact
- Season
- Contact infection

Physical examinations

- skin and bellies
- lymphnodes
- respiration
- splenomegalia
- rectal digital exam.
- sore when touched muscles,bones and articulations
- nervous system

LABOR

X-Ray,CT,MRI,PET,ultrasonic exam.

FUO

Definition changed

1961 Petersdorf RB et al.
1991 Durack DT et al.

More than 200 diseases
Major diagnostic challenge

1. **Fever ≥ 38.3°C** (>101°F) **on several occasions**

2. **Duration ≥ 3 weeks**

3. **Failure to reach a diagnosis** despite
   1 week appropriate in-hospital investigation
   or 3 outpatient visits

Classical FUO
Nosocomial FUO
Neutropenic FUO
HIV-associated FUO

Algorythm for the Diagnosis of FUO

Complete history and physical assesment

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Positive findings → Order appropriate and specific diagnostic testing

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blood culture, urinalasysis, urine culture, PPD skin test, chest radigraph

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Positive results → Order appropriate follow-up diagnostic testing

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No

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CT of abdomen / pelvis with contrast

Assign most likely category

Infection **Malignancies** **Autoimmune**

THANK YOU FOR YOUR ATTENTION!