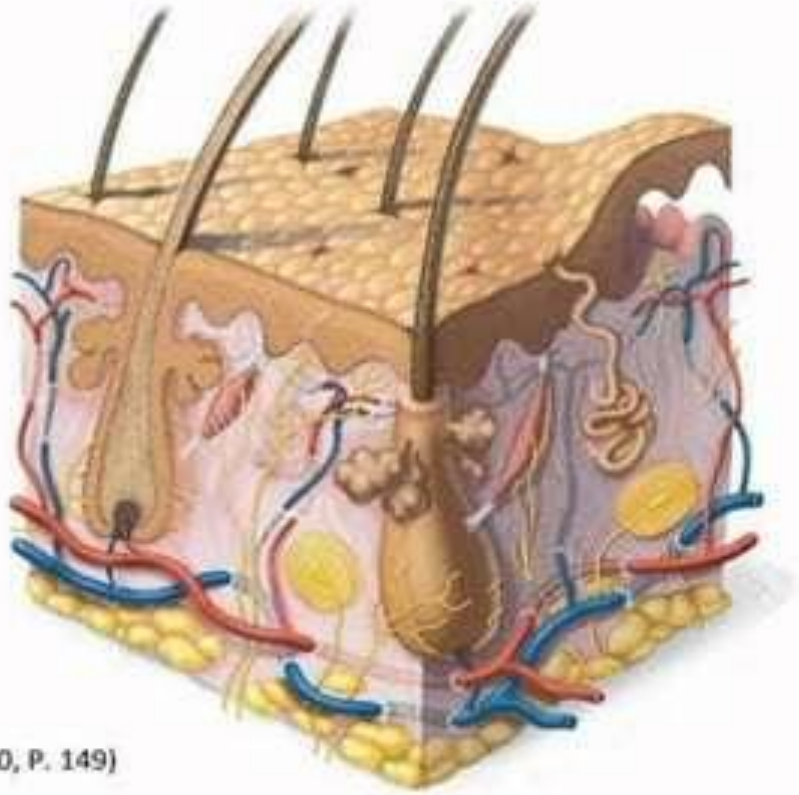
ADVANCED NURSING PRACTICE

M.SC NURSING I YEAR

Dermis



Marieb & Hoehn, 2010, P. 149)

SAVE SUJITH....

ALTERATIONS IN BODY TEMPERATURE

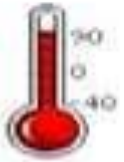
R. RUPPA MERCY
M.Sc NURSING I YEAR.

INTRODUCTION:

- A person's body temperature says a lot about their health. For example,

BODY TEMPERATURE

DEFINITION:



- Body temperature is the degree of heat maintained by the body or it is the balance between heat produced in the tissues and heat lost to the environment.
- Measured in the units of degrees.
- Expressed as C and F
- Normal value is 37degree C and 98.6 F
- Homeothermic

PHYSIOLOGY:

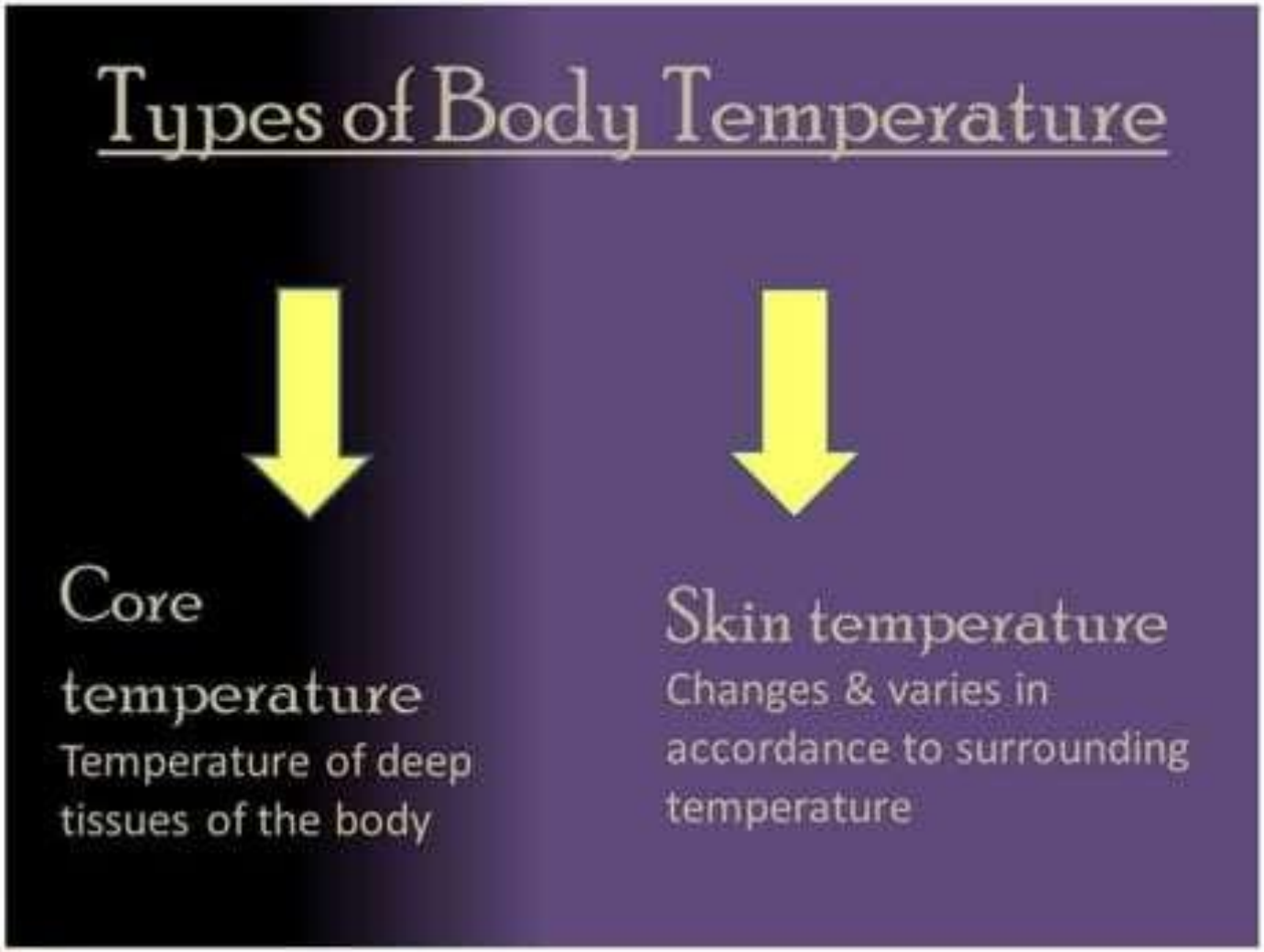
- HEAT PRODUCED – HEAT LOSS = BODY TEMPERATURE

Proportional to:
- Speed (intensity)
- Body mass

Affected by:
- Mech. Efficiency

Influenced by:
- Environmental conditions
  - Temperature
  - Humidity
  - Wind-speed
- Body size (surface area)

TYPES OF BODY TEMPERATURE:



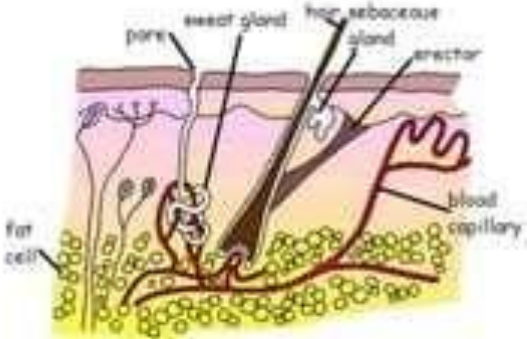
SITES:

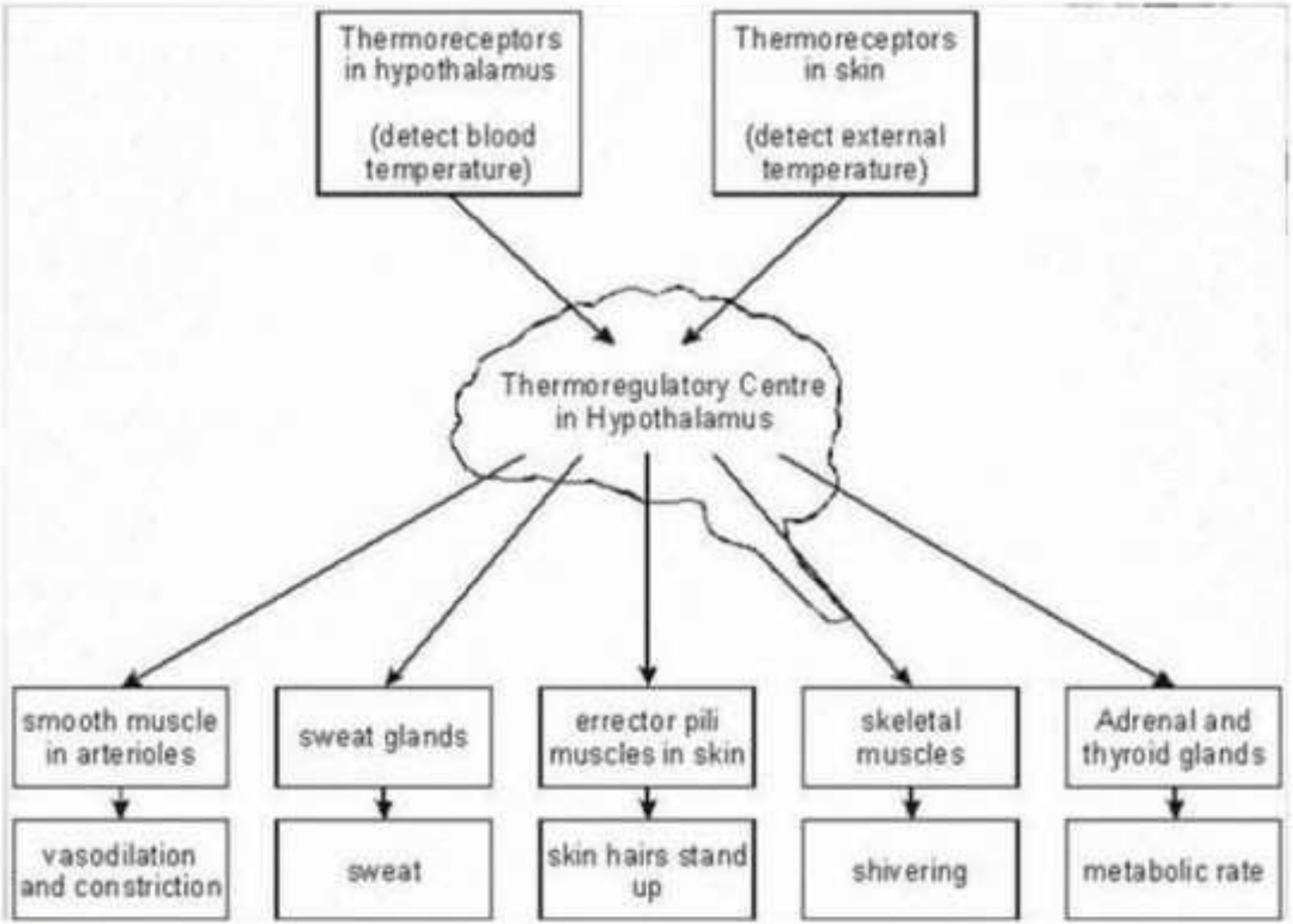
THE MOST COMMON SITES OF MEASURING BODY TEMPERATURE

- Oral
- Rectal
- Axillary
- Tymphanic membrane
- Skin / temporal artery

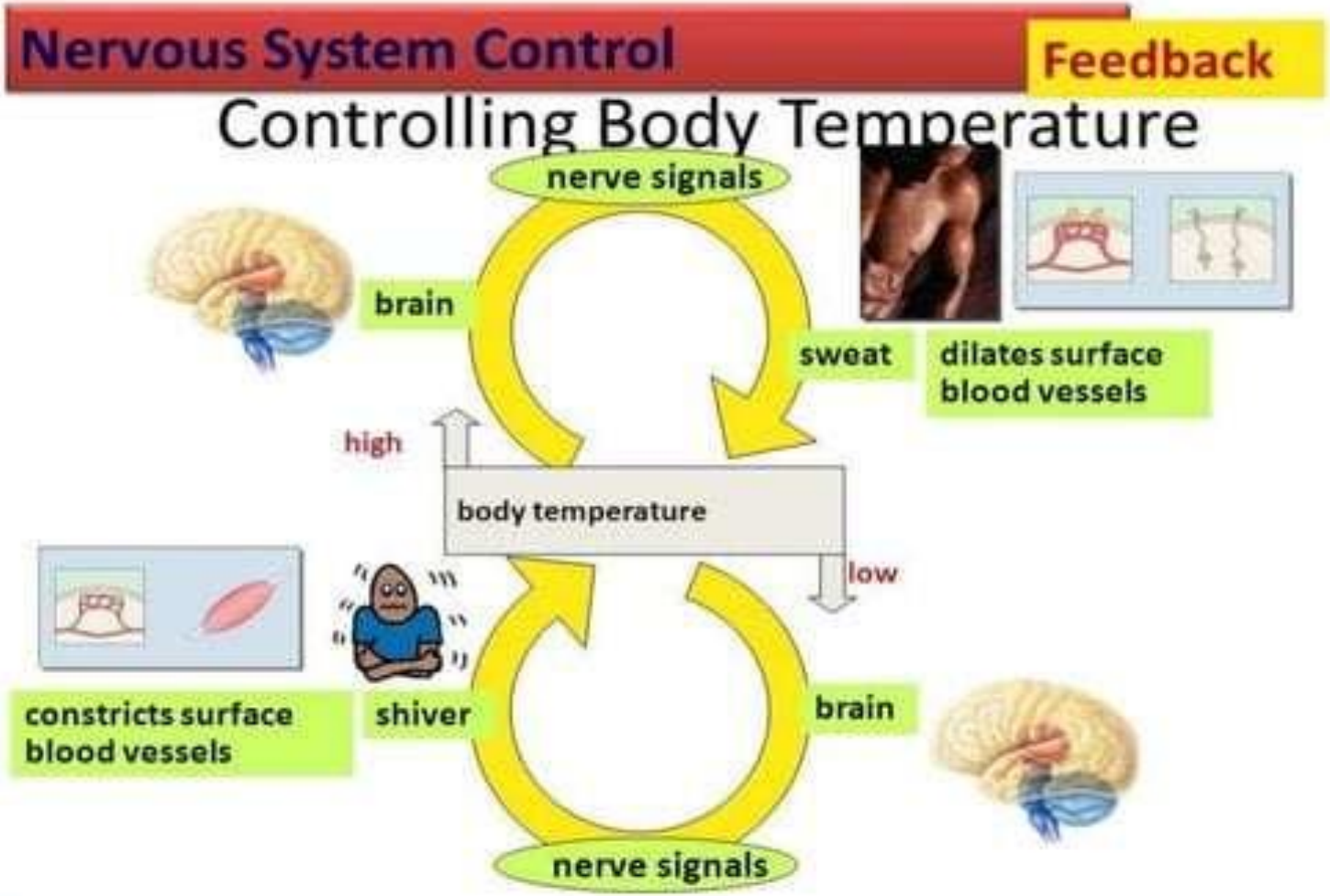
REGULATION OF BODY TEMPERATURE:

- THE BRAIN:
- **Hypothalamus(heat loss and heat gain centre)** is the control centre for temperature. It detects temperature changes in the blood.
- **SKIN:**
- helps in regulating body temperature which has tiny holes or pores on its outer surface. When metabolic rate increases sweat comes from these pores and it is one way to maintain normal body temperature.

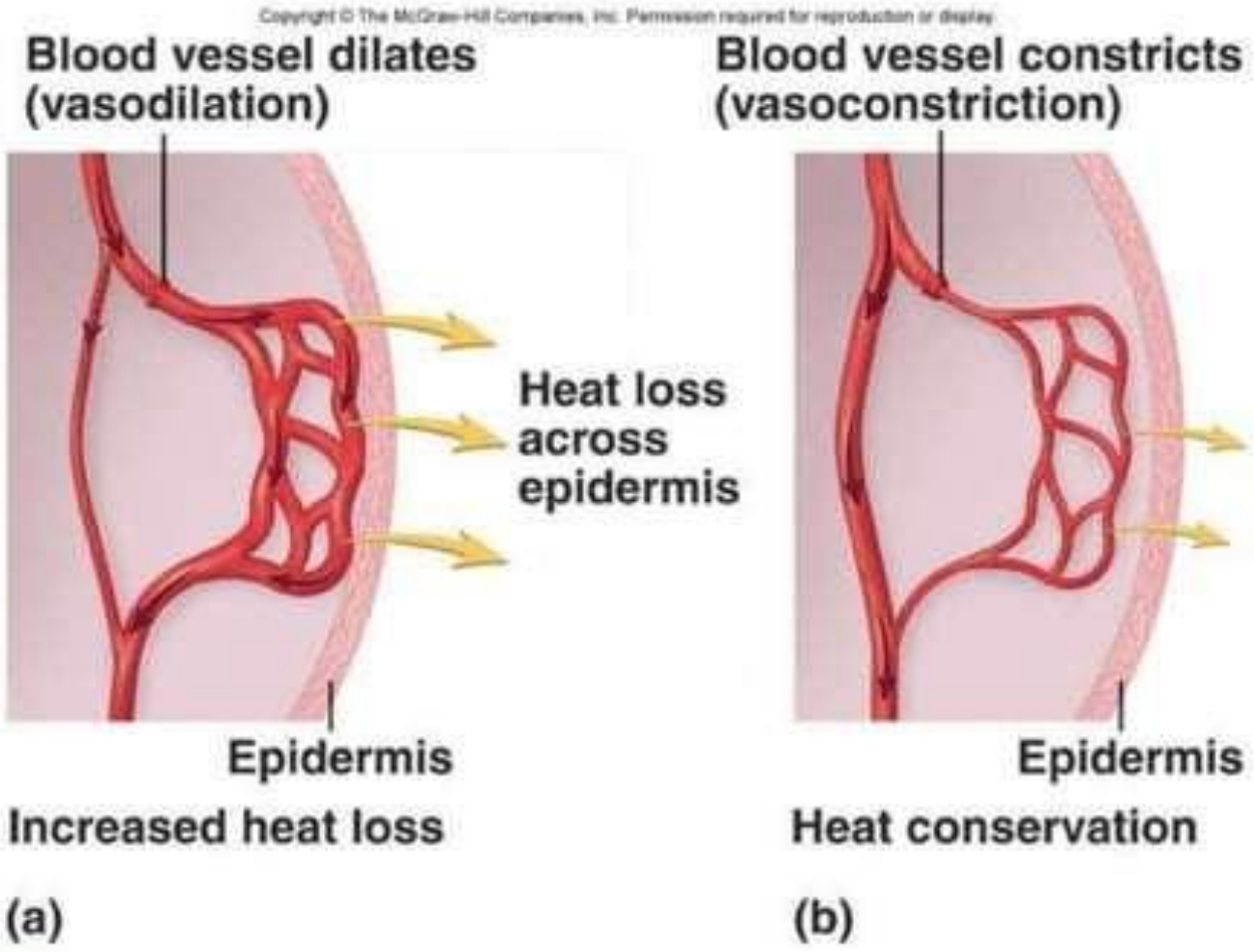



Thermoreceptors in hypothalamus
(detect blood temperature)
Thermoreceptors in skin
(detect external temperature)
Thermoregulatory Centre in Hypothalamus
smooth muscle in arterioles
sweat glands
erector pili muscles in skin
skeletal muscles
Adrenal and thyroid glands
vasodilation and constriction
sweat
skin hairs stand up
shivering
metabolic rate

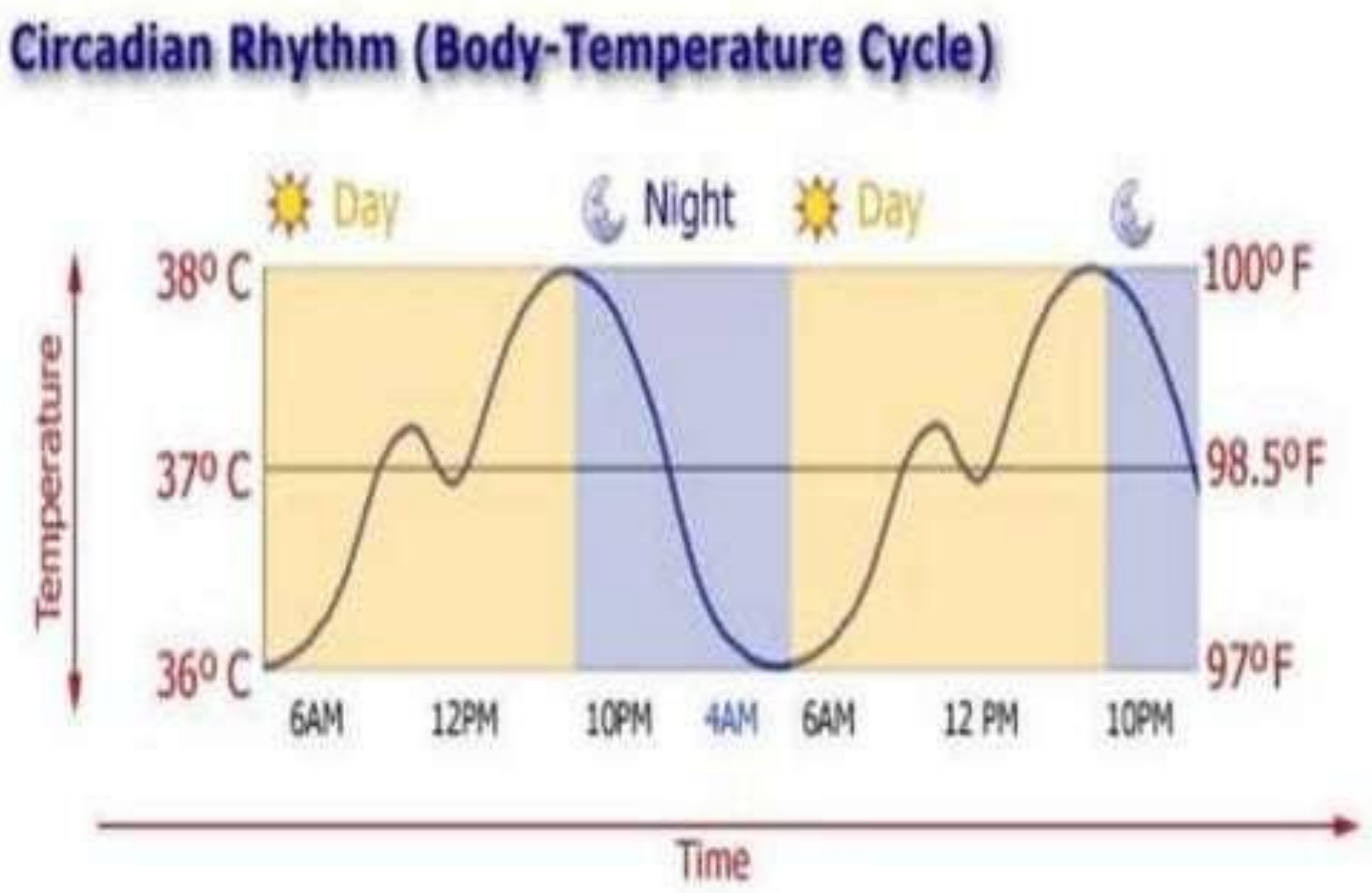
A. NEURAL CONTROL:



B. VASCULAR CONTROL:

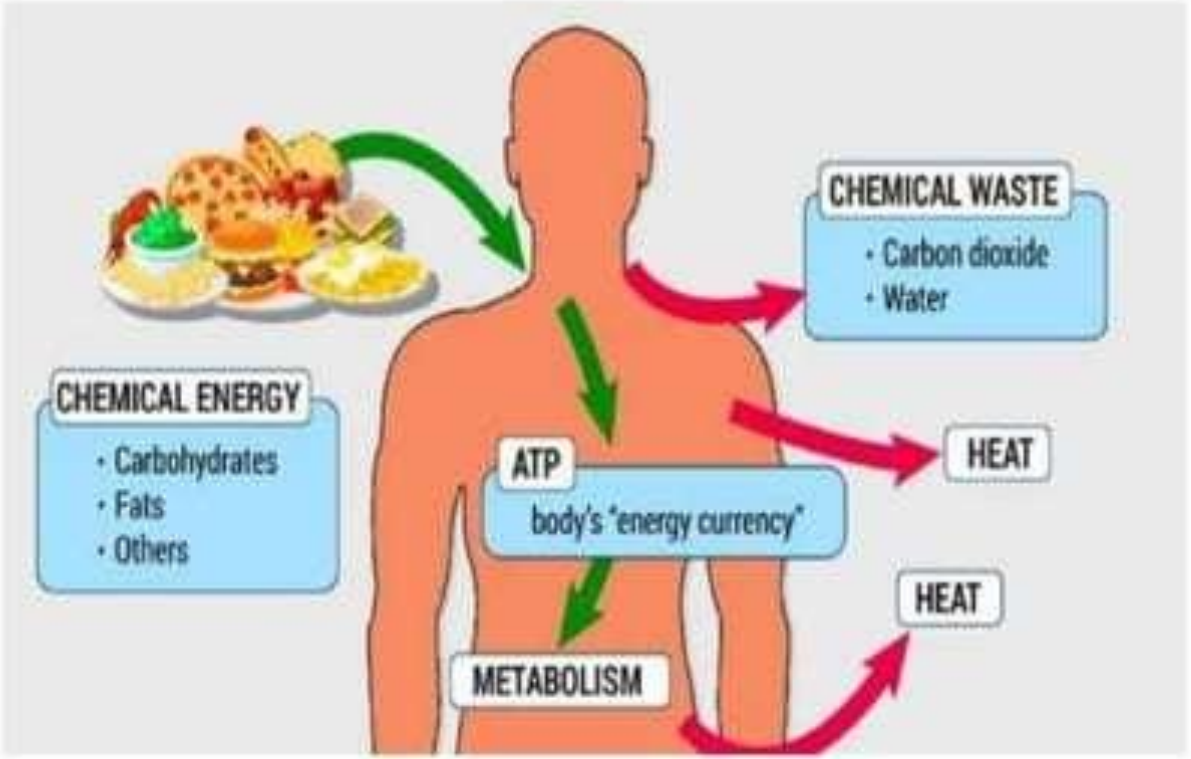


AT REST:

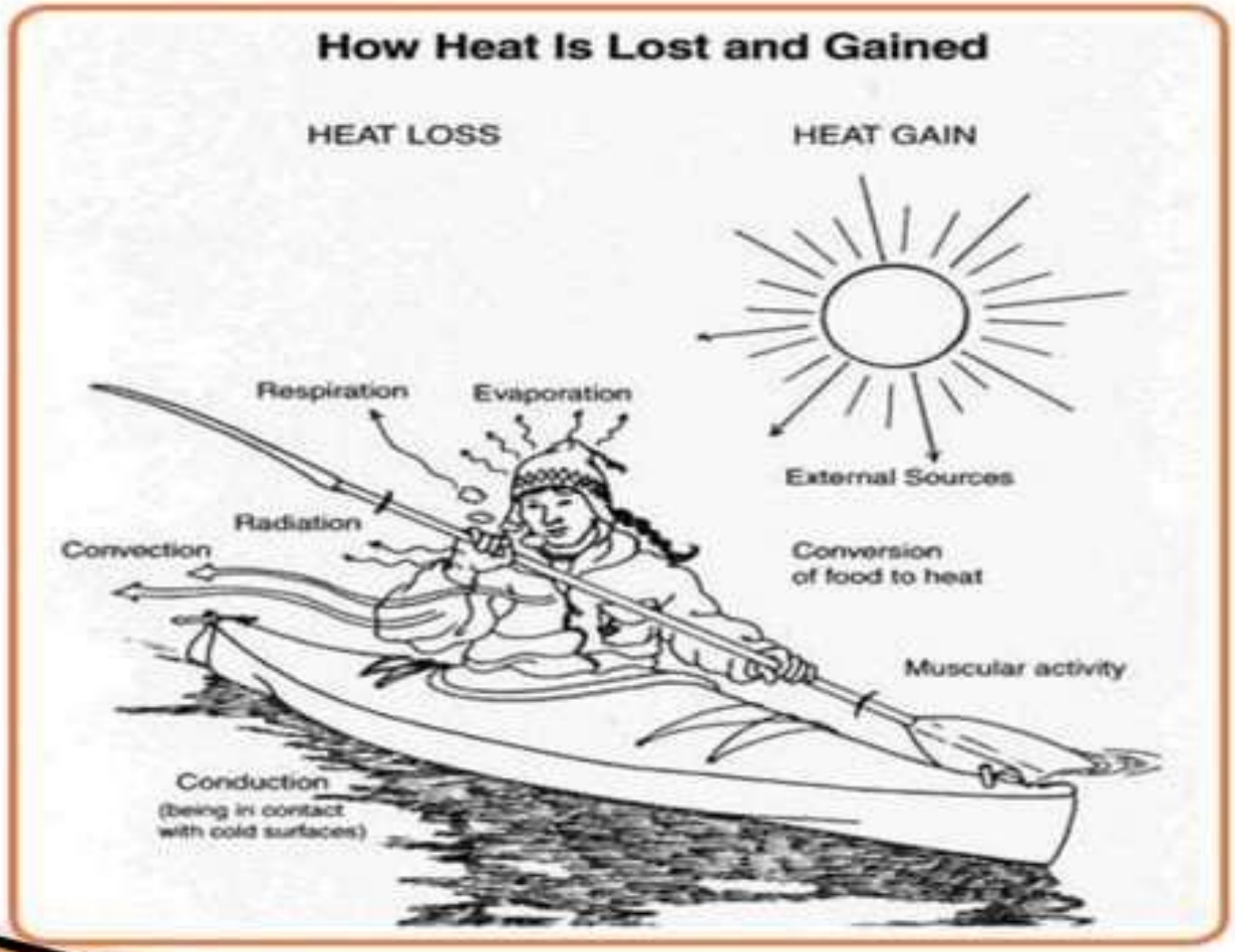

Circadian Rhythm (Body-Temperature Cycle)
Day
Night
Day
38° C
37° C
36° C
100° F
98.5° F
97° F
Temperature
6AM
12PM
10PM
4AM
6AM
12 PM
10PM
Time

HEAT PRODUCTION:

- Heat is continually produced in the body as a by-product of the chemical reactions called metabolism.



HEAT GAIN and HEAT LOSS:



FACTORS AFFECTING:

- **Age :** For new born, the temperature - control mechanisms are immature. An infant' s temperature may respond drastically to changes in the environment.
- **Exercise:** Muscle activity causes increased metabolism by increasing carbohydrate and fat breakdown. Any form of exercise can increase heat production and thus body temperature.

CONTD…

- **Hormone level:** Women generally experience greater fluctuations in body temperature than men. Hormonal variations during menstrual cycle cause body temperature fluctuation.eg, Menopause.
- **Circadian rhythm:** Body temperature normally changes 0.5  to 1  C during 24 hour period. The temperature is usually lowest between 1.00 AM and 4.00 AM.

Contd…

- **Stress :** Physical and emotional stress increases body temperature through hormonal and neural stimulation. These physiological changes increase metabolism, which increases heat production.
- **Environment:** Environment influences body temperature. In a very warm room, the body temperature will be elevated. In a cold weather , the body temperature may be low because of extensive radiant and conductive heat loss.

ALTERATIONS IN BODY TEMPERATURE:

- A condition in which the normal regulation or exchange between heat produced by the body and heat lost by the body is disturbed in such a condition either body temperature increases above the normal or decreases below the normal set of point.

OUTLINE:

- Fever – (100.4F)
- Hyperthermia – ABOVE 105F
- Heat stroke – 104F AND HIGHER
- Hypothermia – 95F AND BELOW
- Frostbite – BELOW 92F

FEVER:

- Fever is defined as having a temperature above the normal range due to an increase in the body's temperature set point.

PATHOPHYSIOLOGY:

Pyrogens

(endogenous and exogenous)

↓

Release prostaglandin E2

↓

Acts on hypothalamus

↓

Heat – generating effects

↓

New higher temperature

TYPES:

- SEVERITY
- A fever can be:
- low grade, from 100.5–102.1°F or 38.1–39°C
- moderate, from 102.2–104.0°F or 39.1–40°C
- high, from 104.1–106.0°F to or 40.1-41.1°C
- hyperpyrexia, above 106.0°F or 41.1°C

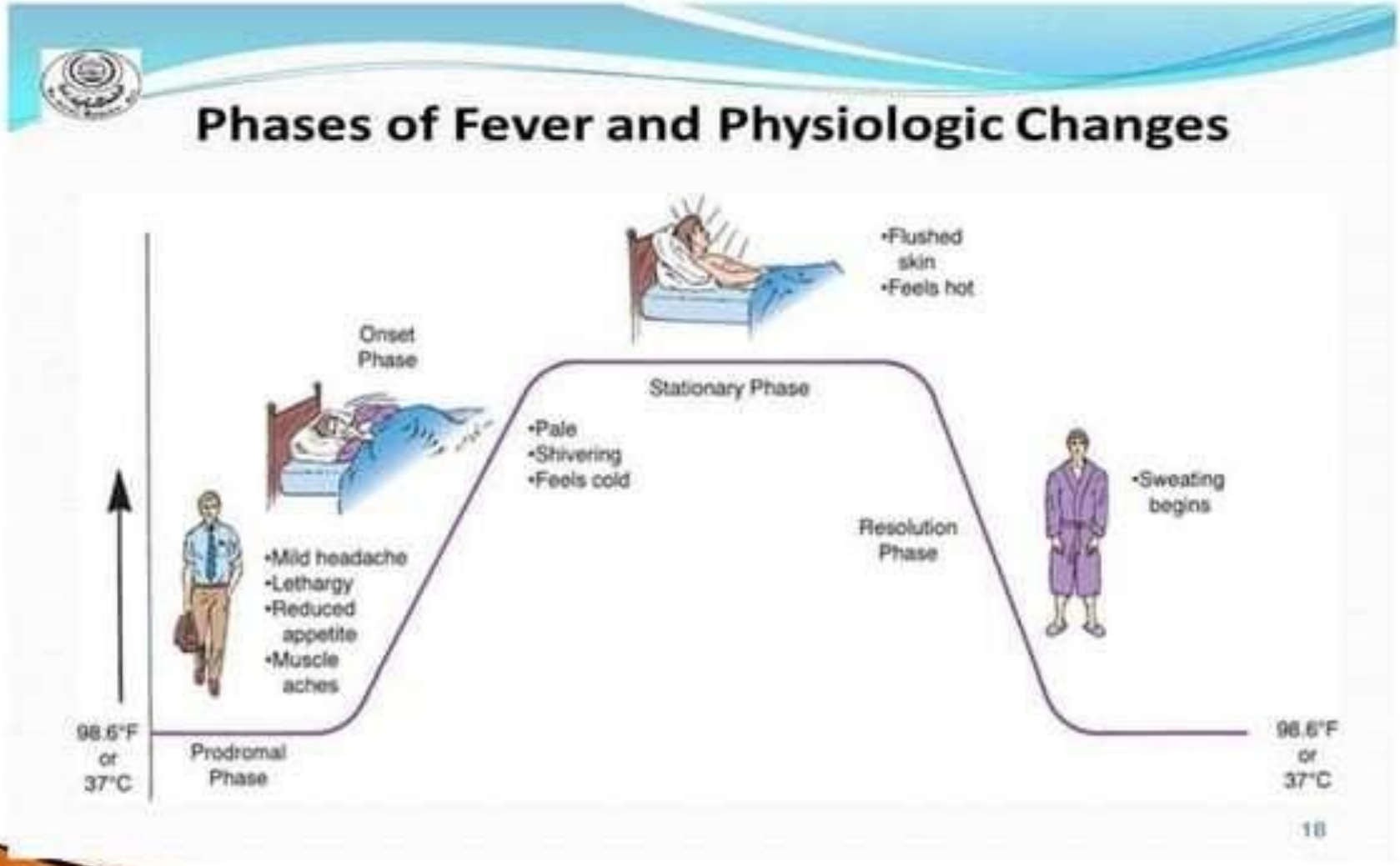
CONTD..

- **Length of time**
- A fever can be:
- acute if it lasts less than 7 days
- sub-acute, if it lasts up to 14 days
- chronic or persistent, if it persists for over 14 days
- Fevers that exist for days or weeks with no explanation are called fevers of undetermined origin (FUO).

CLASSIFICATION:

- Sustained – constant body temperature
- Intermittent – once in 24 hrs
- Remittent – spikes and falls but without returning to normal limits
- Relapsing – fever and return to normal limits

PHASES OF FEVER:



CAUSES:

- A virus
- A bacterial infection
- Allergies
- Heat exhaustion
- Certain inflammatory conditions such as rheumatoid arthritis
- A malignant tumor
- Some medications, such as antibiotics and drugs used to treat high blood pressure or seizures or alcohol withdrawal.
- Some immunizations, such as the diphtheria, tetanus and acellular pertussis (DTaP) or pneumococcal vaccine

SIGNS AND SYMPTOMS:

- Headache, bodyache
- Vomiting
- Chills
- Sweating, shivering
- Tachycardia, palpitations
- Tachypnoea
- Weakness
- Loss of appetite
- Irritability
- Dehydration
- unconsciousness

DIAGNOSIS:

- History collection
- Physical examination
- cbc/electrolytes/LFT/blood c/s / sputum c/s / urine analysis/ urine c/s/ ESR
- Chest radiograph
- Miscellaneous

MEDICAL MANAGEMENT:

- Acetaminophen every 6 hrs
- Ibuprofen every 6 hrs
- Naproxen (NSAID)
- Aspirin should not be used for fever in children and adolescents especially during chicken pox (cause reye's syndrome)

FEVER OF UNKNOWN ORIGIN:

- **Fever of unknown origin** (**FUO**), refers to a condition in which fever of at least 101F and that lasts for about more than three weeks or occurs frequently without explanation.

TABLE 1

COMMON CAUSES OF **FEVER OF UNKNOWN ORIGIN**

Bacterial infections	Osteomyelitis, pyelonephritis, abscess, infective endocarditis, tuberculosis, cat scratch disease, typhoid fever
Viral infections	Epstein-Barr virus, cytomegalovirus, enterovirus, adenovirus
Malignancy	Leukemia, lymphoma, neuroblastoma
Autoimmune	Juvenile idiopathic arthritis, systemic lupus erythematous, inflammatory bowel disease
Miscellaneous	Kawasaki disease, drug fever, periodic fever

Adapted from Antoon JW, et al.[2]

Classification of FUO:

- CLASSIC:
- 3 outpatient visit or 3 days in hospital without elucidation of a cause.
- NOSOCOMIAL:
- Fever develops on several occasions in a hospitalized patient who is receiving acute care and in whom infection was not manifested on admission. 3 days of investigation and at least 2 days incubation of culture

Contd…

- NEUTROPENIC:
- Neutrophil count <500/ml
- 3 days of investigation
- 2 days of incubation of culture
- HIV ASSOCIATED FUO:
- >4 weeks for outpatients or >3 days for hospitalized patients
- Approp. Investigation over 3 days and 2 days incubation of culture.

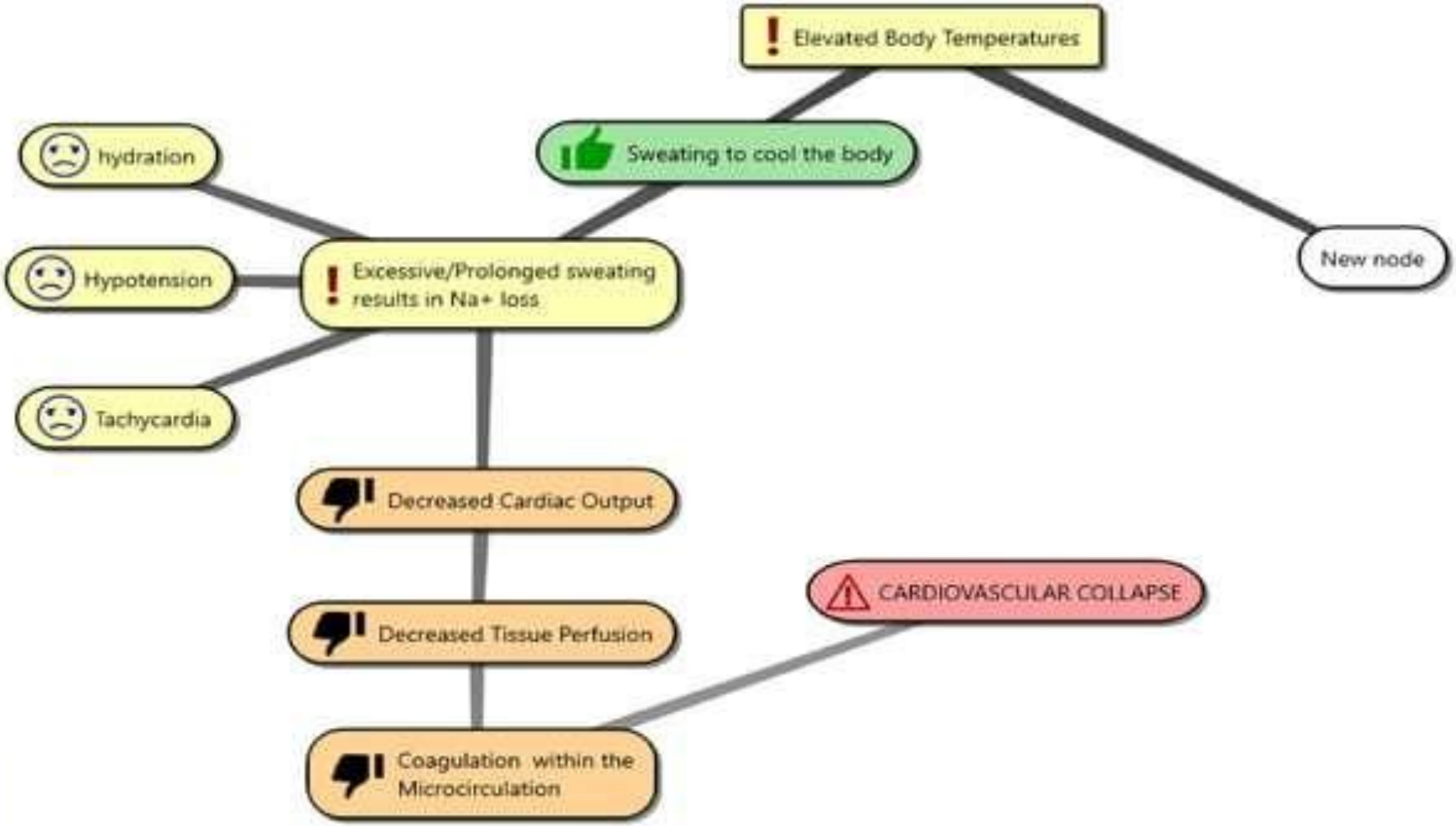
MANAGEMENT:

- History collection and physical examination
- CBC/CRP/ESR/SERUM PROTEIN ELECTROPOROSIS/TIBC total iron binding capacity /VDRL venereal disease related lab test
- Vancomycin/pipercillin/tazobactum/imipenem/meropenem

HYPERTHERMIA:

- **Hyperthermia** is a condition where an individual's body temperature is elevated beyond normal due to failed thermoregulation.
- Hyperthermia is a true medical emergency with rapid progression to multiple organ system failure and death

PATHOGENESIS:



Differences between fever and hyperthermia

	Fever	Hyperthermia
Temperature adjusting point	Higher than normal	Normal
Thermoregulation	Normal	Impaired
Symptoms	Depends on the stage	Don't depend on the stage but severity increases with time
The role for the organism	Both positive and negative	Only negative
Treatment	Antipyretic medicines	Physical cooling

CAUSES:

Hyperthermia is caused from overexertion or extended periods of time spent in hot conditions.

A. HEAT STROKE
B. DRUG INDUCED HYPERTHERMIA
C. ENDOCRINOPATHY
D. CENTRAL NERVOUS SYSTEM DAMAGE

A.HEAT STROKE:

- also known as **sun stroke**, is a type of severe heat illness that results in a body temperature greater than 40.0 °C (104.0 °F) or prolonged exposure to sun or high environmental temperature.
- HEAT EXHAUTION:
- Heat exhaustion is a condition whose symptoms may include heavy sweating and a rapid pulse, a result of your body overheating.

TYPES:

- Heatstroke can be divided into two forms;
- Classic heatstroke or (nonexertional) - It develops over a period of days (usually coinciding with a heat wave) and typically presents with nausea, vomiting, headache, and a deteriorating mental status.
- Exertional heatstroke- usually develops rapidly in a young, vigorously exercising individual who have not acclimatized to a hot environment leads to severe headache to seizures and collapse

SIGNS AND SYMPTOMS:

B. DRUG INDUCED HYPERTHERMIA:

Due to increased use of psychotic

drugs

C. ENDOCRINOPATHY:

Thyrotoxicosis and pheochromocytoma

can lead to increases thermogenesis

D. CENTRAL NERVOUS SYSTEM DAMAGE:

Cerebral hemorrhage, status epileptics, hypothalamic injury.

DIAGNOSIS:

- ASSESS FOR Rectal or core temperatures greater than 104 degrees;
- hypotension; mental changes,
- severe headache,ataxia, seizures, and coma;
- tachycardia; tachypnea;
- and profuse or absent (usually) sweating can all be seen.
- In severe heatstroke disseminated intravascular coagulation may occur.

MANAGEMENT:

- removal from the heat, clothing removed and if possible should be immersed in cool water.
- If immersion is impossible the patient should have ice packs applied to the groin, axilla, and neck area
- patient should be fanned. Fanning the patient while sprinkling with water may increase evaporative losses until the patient's temperature is below 39 C (102.2 F).
- Massaging the extremities may be helpful.
- These patients are severely dehydrated and should be bolused with 20 mg/kg of NS. Further replacement of fluids and monitoring should reflect the patient's condition.

OTHER HEAT ILLNESSES:

- **Heat syncope**: This is characterized by sudden dizziness in hot weather.
- **Heat rash**: The body physically manifests red bumps and the skin becomes itchy and irritated.
- **Heat cramps**: The muscles tighten in the stomach, arms, and legs as a result of elevated temperatures. At this point, it's time to drink water, rest, and try to cool off.
- **Heat edema**: The ankles and feet swell due to the body retaining fluids. Try to elevate the legs to relieve symptoms.

SIGNS AND SYMPTOMS OF HYPERTHERMIA:

- muscleCramps, fatigue, dizziness, headache, nausea, vomiting, and weakness.
- The heart rate may be elevated, and the skin is reddened.
- The skin may be moist if sweating is still occurring, or it may be dry if sweating has stopped.
- Confusion and mental changes may develop, and seizures can occur with brain damage.
- Ultimately, coma and death may ensue.

DIAGNOSIS OF HYPERTHERMIA:

- History collection
- Physical examination
- Investigations
- CLINICALPATHOLOGY: CBC, differential leukocyte count, esinophils, urine analysis
- Hb
- CRP
- WBC
- X – ray
- Sometimes USG

TREATMENT:

- Round the clock monitoring
- Over the counter medications
- Acetaminophen
- Ibuprofen
- Indomethacin
- Naproxen
- Antibiotics
- Antipyretics
- Iv medications

NURSING MANAGEMENT:

- Monitor continuous body temperature
- Assess for skin color
- Provide adequate nutrition
- Monitor intake and output chart
- Reduce physical activity
- Tepid sponging
- Remove excess blankets
- Perform hygienic practices
- Administer medications

CURRENT TRENDS:

- INTERNAL COOLING TECHNIQUES: Ice water gastric or rectal lavage associated with complications.
- EXTERNAL COOLING TECHNIQUES: external application
- CONDUCTIVE COOLING TECHNIQUES: hypothermic blanket, ice bath or ice packs to neck, axilla and groin.
- CONNECTIVE COOLING TECHNIQUES: use of fans and air conditioning
- EVAPORATIVE COOLING TECHNIQUE: misting the skin with tepid water or apply a single layer to bare skin.

HYPOTHERMIA:

- Hypothermia is a medical emergency that occurs when your body loses heat faster than it can produce heat, causing a dangerously low body temperature, occurs as your body temperature falls below 95 F (35 C).
- your heart, nervous system and other organs can't work normally.
- can eventually lead to complete failure of your heart and respiratory system and eventually to death.
- Hypothermia is often caused by exposure to cold weather or immersion in cold water.

CAUSES:

- Exposure to cold environment
- Occupational exposure

eg. Hunters,sailors,climbers

- Neurologic injury
- Sepsis
- Endocrine dysfunction
- Medications like ethanol,barbiturate antidepressents anaesthetics.

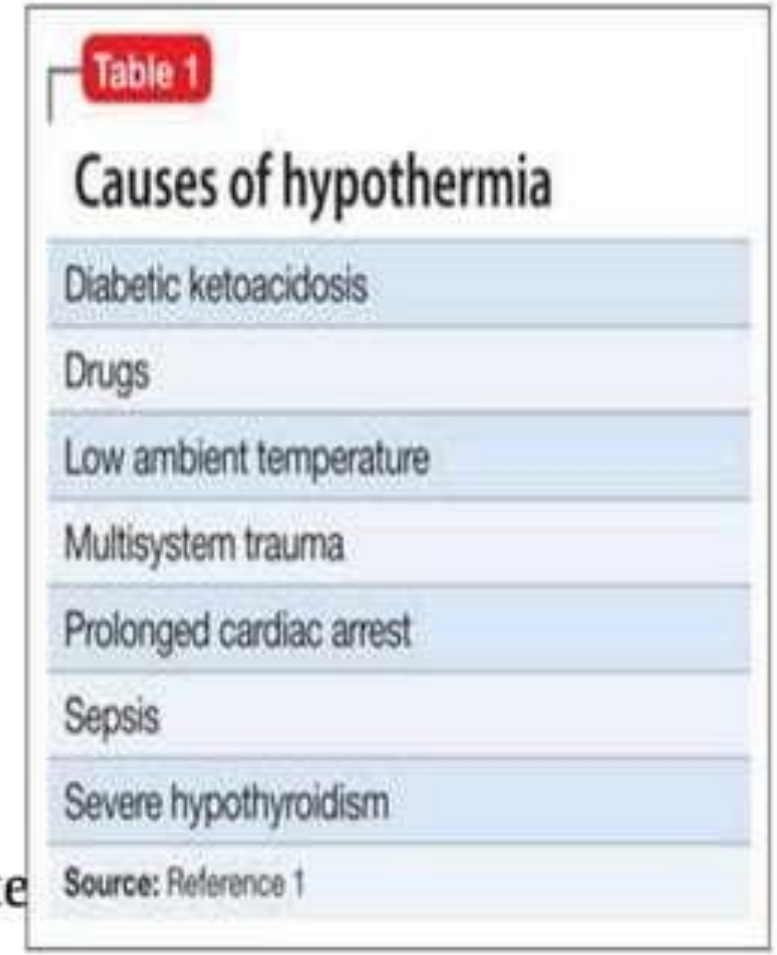


Table 1

Causes of hypothermia

Diabetic ketoacidosis
Drugs
Low ambient temperature
Multisystem trauma
Prolonged cardiac arrest
Sepsis
Severe hypothyroidism

Source: Reference 1

SIGNS AND SYMPTOMS:

- FIRST STAGE: Shivering, reduced circulation
- SECOND STAGE: Slow, weak pulse, slowed breathing, lack of coordination, irritability, confusion and sleepy behavior
- ADVANCED STAGE: Slow, weak or absent respiration and pulse the person may lose consciousness.

DIAGNOSIS:

- Rectal temperature should be monitored
- Lab: glucose testing to rule out hypoglycemia
- Electrolyte levels
- Potassium levels
- Coagulation factors
- Arterial blood gas
- White blood cell count

MANAGEMENT:

- Passive rewarming: cover with heated blankets
- Blood rewarming: blood may be drawn warmed and recirculated in the body (hemodialysis machine)
- Warm IV fluids: a warmed iv solution of salt water put in to a vein help warm the blood
- Airway rewarming: use of humidified oxygen will raise the body temperature
- Irrigation: a warm salt water is introduced into the affected parts of the body (pleura, peritoneal cavity)

Contd…

- Thiamine administration
- Wet clothing should be removed
- Excessive movement and nasogastric tube should be avoided.
- Intravenous medications should be withheld until the patient is warmed.
- Use of amidarone is needed.

FROSTBITE:

- Frostbite is damage to skin and tissue caused by exposure to freezing temperatures – typically and temperature below -0.55C (91F)
- Frostbite can affect any parts of the body but the extremities such as hands, feet, ears, nose and lips are most likely to be affected.

STAGES:

- **Frostnip.** Frostnip is a mild form of frostbite. As

your skin warms, you may feel pain and tingling. Frostnip doesn't permanently damage the skin.

- **Superficial frostbite.** Superficial frostbite appears as reddened skin that turns white or pale. Your skin may begin to feel warm at this stage, the surface of your skin may appear mottled.
- **Deep (severe) frostbite.** As frostbite progresses, it affects all layers of the skin, including the tissues that lie below. Your skin turns white or bluish gray and losing all sensation of cold, pain or discomfort in the affected area. Joints or muscles may no longer work. Large blisters form 24 to 48 hours after rewarming. Afterward, the area turns black and hard as the tissue dies.

CAUSES:

- exposure to cold-weather conditions.
- direct contact with ice, frozen metal or very cold liquids.
- Specific conditions that lead to frostbite include:Wearing clothing that isn't suitable for the conditions you're in — for example, it doesn't protect against cold, windy or wet weather or it's too tight.Staying out in the cold and wind too long.
- Touching materials such as ice, cold packs or frozen metal.

SIGNS AND SYMPTOMS:

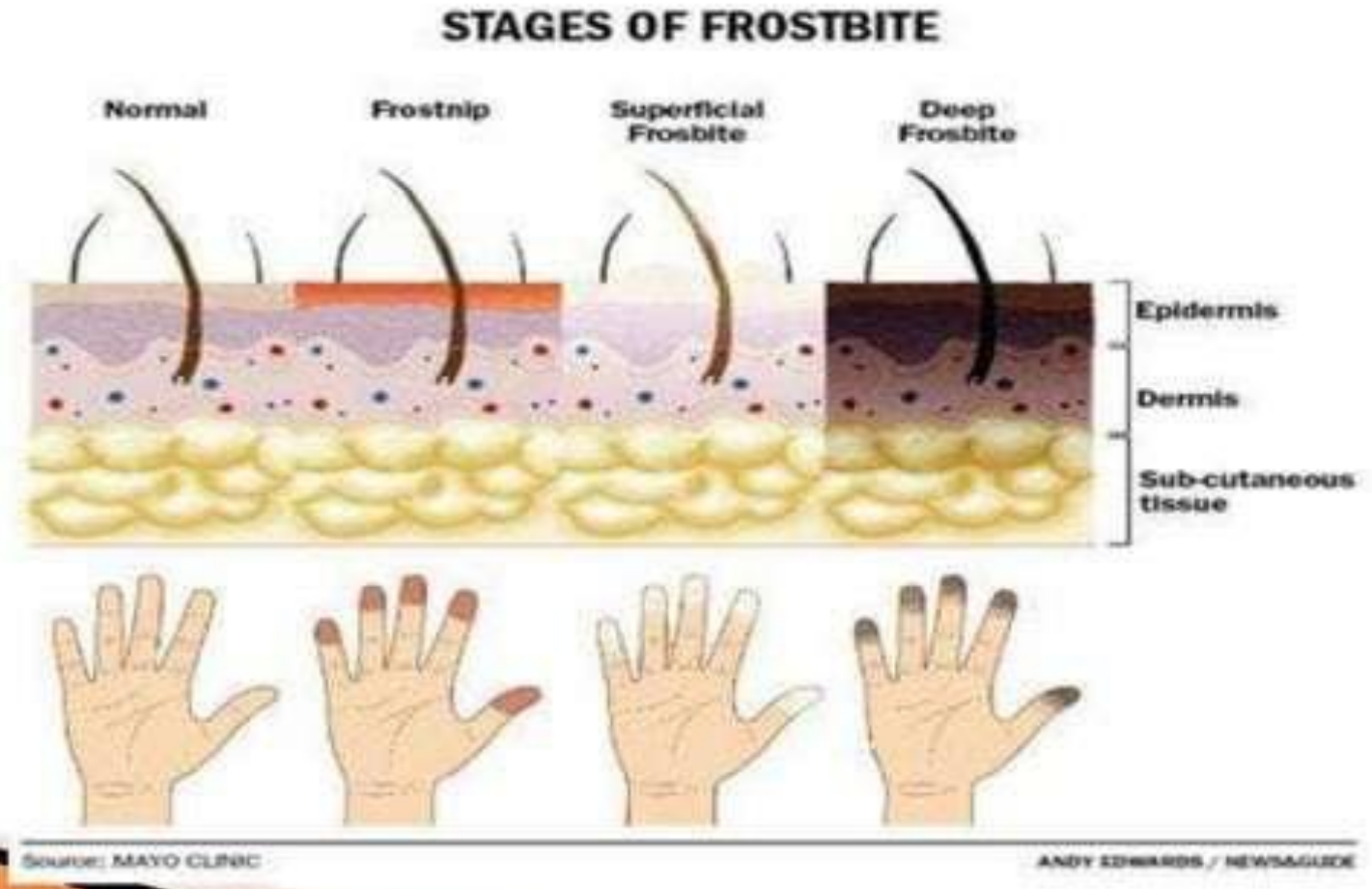
- Signs and symptoms of frostbite include:
- At first, cold skin and a prickling feeling
- Numbness
- Red, white, bluish-white or grayish-yellow skin
- Hard or waxy-looking skin
- Clumsiness due to joint and muscle stiffness
- Blistering after rewarming, in severe cases
- Frostbite is most common on the fingers, toes, nose, ears, cheeks and chin.

COMPLICATIONS:

- Increased sensitivity to cold
- Long-term numbness in the affected area
- Excessive sweating (hyperhidrosis)
- Changes in skin color
- Changes in or loss of nails
- Joint stiffness (frostbite arthritis)
- Growth defects in children, if frostbite damages a bone's growth plate
- Infection
- Gangrene
- Tetanus

DIAGNOSIS:

- Appearance of the skin



MANAGEMENT:

MANAGEMENT OF FROST BITE:

- **Before thawing:** remove client from cold environment, stabilize core temperature, treat hypothermia, protect the frozen part and do not apply friction or massage.

MANAGEMENT OF FROST BITE:

- **After thawing:**

i) gently dry and elevate it.

ii) Apply pledges between toes; if macerated.

iii) If clear vesicles are intact aspirate the fluid or the fluid will reabsorb in days; if broken then debride and dress with antibiotic.

MANAGEMENT OF FROST BITE:

- **During thawing:** provide parental analgesia e.g. keratolac & Provide ibuprofen 40 mg PO. Immerse part in 37-40 C circulating water containing an antiseptic soap for 10-45 minutes. Encourage patient to gently move the part.

NURSING MANAGEMENT:

- Rapid rewarming of injured tissue
- Topical antimicrobial cream application
- Antibiotics
- Pain management.
- Wound care.
- Surgery - Removal of damaged tissue (debridement)
- Monitoring of digits to evaluate perfusion until amputation of the affected areas.

ANY QUESTIONS?????

RECAPTUALIZATION…..

THANK YOU....