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Physiology of Body Temperature and its Management - A Review article

*Dr. Mohammad Naseem Mohammad Farooque Ansari [1], Ansari Mohd. Danish Mohd. Naseem [2]

*1 Reader, Dept. Dept. of Manafe-ul-Aza, Iqra Unani Medical Collage and Hospital, Jalgaon 2 M.S. First Year, National Institute of Unani Medicine, Bangalore.

Abstract: The thermoregulatory mechanisms play important roles in maintaining physiological homeostasis during rest and physical exercise. Physical exertion poses a challenge to thermoregulation by causing a substantial increase in metabolic heat production. However, within a non-thermolytic range, the thermoregulatory mechanisms are capable of adapting to sustain physiological functions under these conditions. The central nervous system may also rely on hyperthermia to protect the body from "overheating." Hyperthermia may serve as a self-limiting signal that triggers central inhibition of exercise performance when a temperature threshold is achieved. Exposure to sub-lethal heat stress may also confer tolerance against higher doses of heat stress by inducing the production of heat shock proteins, which protect cells against the thermolytic effects of heat. Current evidence supports the use of oral temperature measurement in the clinical setting, although it may not be as convenient as tympanic temperature measurement using the infrared temperature scanner. Rectal and oesophagus temperatures are widely accepted surrogate measurements of core temperature, but they cause discomfort and are less likely to be accepted by users. In this article we are studies about Temperature regulation, and various Herb used to control the body temperature.

Keywords. Body Temperature; Thermoregulation; Herbal drugs.

A. Introduction of Thermoregulation in Human Body.

Since time immemorial, the human being is inquisitive to know the phenomenon happening inside and outside of the body. Hypotheses are postulated and theories are put forward to explain these happenings. Everything in the Universe is created from four basic constituents (Arkan Arba'a) i.e., fire, air, water and earth, which have different temperaments i.e. cold, hot, wet and dry respectively. So everything including the human body is having the properties of four basic constituents. Buqrat (Hippocrates, 460-377 BCE) said that Tabi'at (Physic) is a managing power that works for the welfare of the human body involuntarily and unconsciously

and is a source of all motion and rest. Practically Tabi‘at is considered as the supreme planner of our body. Ibn Nafis (1210-1288 AD) said in other worlds Tabi‘at is a power which, when found in a natural body itself becomes the first source for its motion and rest. Quwwat-i-Mudabbira-i-Badan has been bestowed by such power up to certain limitations, can control and coordinate the body functions.

When these limitations are crossed, Tabi‘at is unable to control the functions. The temperament/constitution (Mizaj) of the person becomes abnormal.

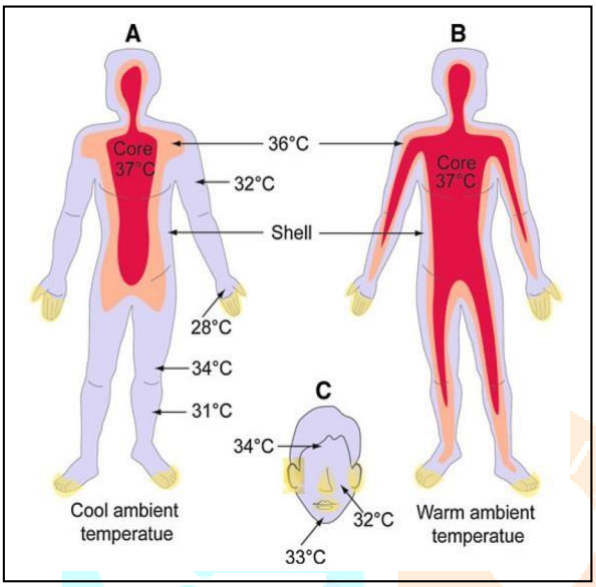

Fig. 1 Cool and Warm Ambient Temp.

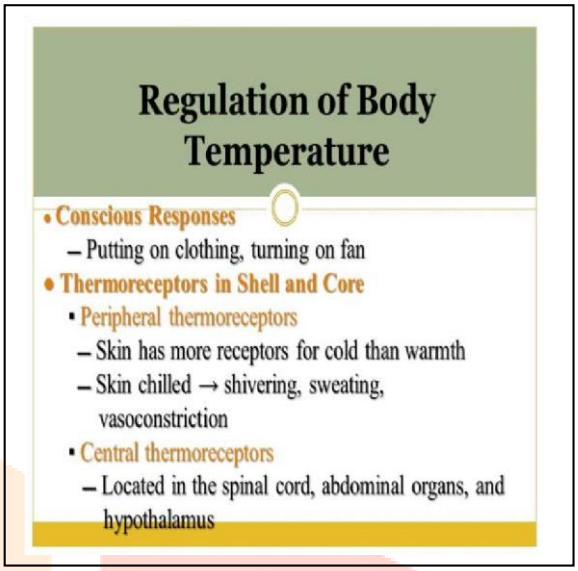

Fig. 2 Regulation of Body Temp.

Due to Mizaji obligations, deviation in Mizaj results in functional abnormalities and consequently deformities happen.Each individual‟s constitution has a self-regulating capacity or power, called Tabi’at or Mudabbira-i-Badan vis medicatrix naturae. Its function is to keep the factors of existence (Umur Tabi’iyya) in equilibrium. The tool of Tab’iat is Hararat-i-Ghariziyya of all faculties (power) through which all physiological actions and reactions are accomplished.[10] If the innate heat is strong, the natural faculties can work through it, upon the humour and so affect digestion and maturation, and so maintain them within the confines of the healthy state.

According to Thermodynamics, human beings are open system isothermal machine that works in nonequilibrium in which both matter and energy are exchanged. Human calorimetry is unique because of its endothermic nature. Being endothermic it plans to remain in a narrow range of temperature despite wide variance with the external environment. The regulation of this action is achieved by the involvement of vital organs and their subordinates, servant organs (A‘da-i-khadima). Hypothalamus in the forebrain (Dimagh-i-Muqaddam) plays a key role in the action. It involves receptors like skin, spinal cord, abdominal viscera, and blood temperature. Heat and cold are perceived via these receptors and instructions are relayed accordingly to the thermostat centre in the brain for thermoregulation. Normal core body temperature is around 37 °C and controlled within a narrow range (33.2–38.2 °C) and narrowing further when disregarding oral measurements in favour of rectal, tympanic or auxiliary measurements. There are normal fluctuations that occur throughout

the day (circadian rhythm), throughout a month (menstrual cycle), and throughout a lifetime (ageing). The Unani philosophers have established a linkage between the vital organs and their subordinates in explaining the mechanism of this prime important phenomenon of life.

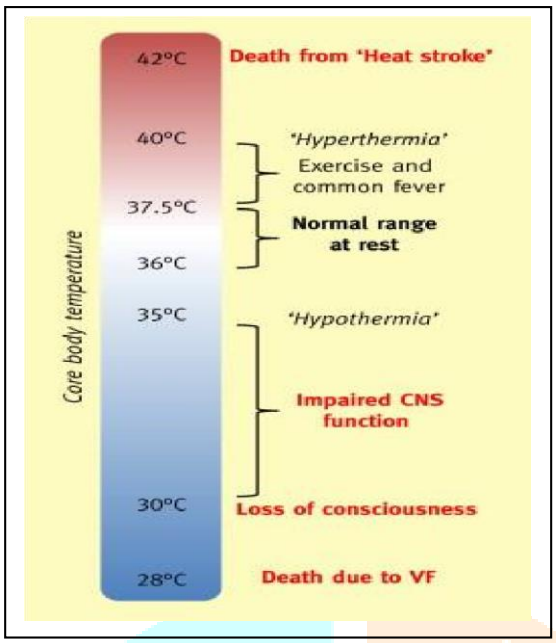

Fig. 3 Hypothermia and Hyperthermia

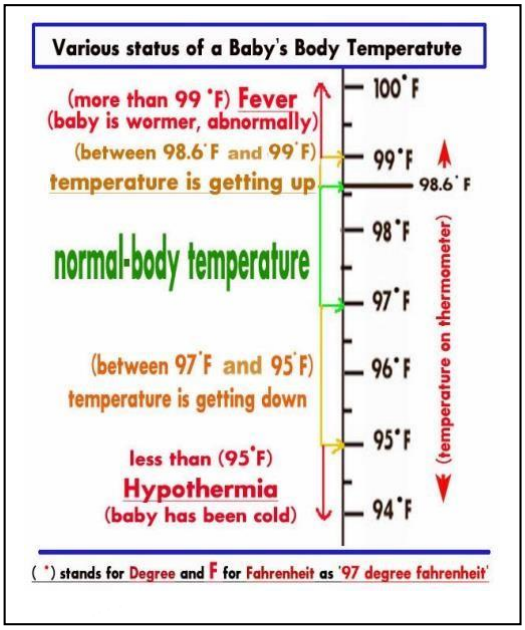

Fig. 4 Various status of Body temp.

Thermoregulation is a mechanism by which mammals maintain body temperature with tightly controlled self-regulation independent of external temperatures. Temperature regulation is a type of homeostasis and a means of preserving a stable internal temperature in order to survive. Ectotherms are animals that depend on their external environment for body heat, while endotherms are animals that use thermoregulation to maintain a somewhat consistent internal body temperature even when their external environment changes. Humans and other mammals and birds are endotherms. Human beings have a normal core internal temperature of around 37 degrees Celsius (98.6 degrees Fahrenheit) measured most accurately via a rectal probe thermometer. This is the optimal temperature at which the human body's systems function. Thermoregulation is crucial to human life; without thermoregulation, the human body would cease to function. Thermoregulation also plays an adaptive role in the body's response to infectious pathogens.

Normal Body Core Temperatures

- The normal core body temperature range can vary from individual to individual, and can also be influenced by age, activity, and time of day: 36.1 C (97 F) to 37.2 C (99 F).
- During strenuous exercise, the temperature can rise temporarily to as high as 40 C (104 F).
- When the body is exposed to extreme cold, the temperature can fall below 35.6 C (98 F).
- An unclothed person can be exposed to temperatures as low as 12.8 C (55 F) or as high as 54.4 C (130 F) in dry air and still maintain almost constant core temperature.

Skin Temperature

In contrast to the core temperature, the skin temperature (shell), falls and rises with the temperature of the surroundings.

Issues of Concern

I. Thermoregulatory Impairment

- **Hypothermia**

Hypothermia, defined as a drop in core body temperature below 35 C (95 F), results in initial /mild impairment in the body's thermoregulatory capacity. Greater impairment occurs with increasing severity of hypothermia; Severe hypothermia is defined as core body temperature dropping below 28 C (82.4 F).

Core body temperature below 29.4 C (85 F) impairs the ability of the hypothalamus to regulate body temperature is lost .

Part of the reason for this diminished regulation is that the rate of chemical heat production in each cell is depressed almost 2fold for each 10 F decrease in body temperature.

Extreme symptoms indicative of severe hypothermia include mental status changes, slurred speech, unconsciousness, ventricular arrhythmias, and gross motor skill impairment. Endstage Presentation includes central nervous system (CNS) depression (coma), which ultimately suppresses all thermoregulatory function of the body.

- **Heat Illness Spectrum**

Excessive core body temperature presents along with a clinical spectrum, with heat stroke presenting as an emergent clinical condition defined by a core body temperature exceeding 40 C (104 F). Other conditions along the heat illness spectrum include:

- Heat edema
- Heat syncope
- Heat associated
- cramping
- Heat exhaustion

II. Heat Production

Heat production is determined by metabolism.

- Basal metabolism
- Muscle activity, by shivering and muscle contraction
- Extra metabolism caused by the effect of sympathetic stimulation and norepinephrine, epinephrine on the cells
- Extra metabolism caused by increased chemical activity in the cells, especially when the cell temperature increases
- Extra metabolism caused by thyroid hormone and, to a lesser extent, testosterone and growth hormone on the cells
- Extra metabolism needed for digestion, absorption, and storage of food

- Most of the heat produced in the body is generated in the liver, brain, heart, and in the skeletal muscles during exercise.

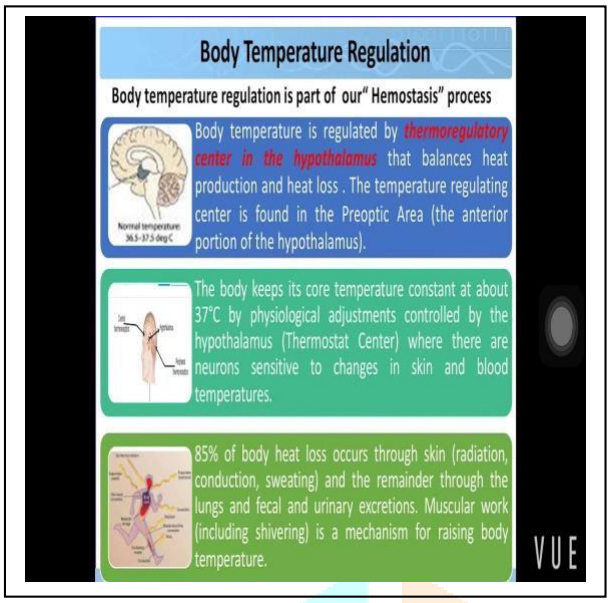

Fig. 5 Hemostasis process

Fig. 6 Normal Body temp. According to age

III. Heat Loss

The rate at which heat is lost is determined almost entirely by:

- How rapidly heat is transferred from the skin to the surroundings
- How rapidly heat is conducted from where it is produced in the body core to the skin

B. Issue related with Body Temperature.

The body's core internal temperature has a narrow range and typically ranges 97-99 F with tight regulation. When the body's ability to thermo-regulate becomes disrupted it can result in overheating (hyperthermia) or being too cool (hypothermia). Either state can have deleterious effects on the various body systems, most significantly reduced blood flow leading to ischemia and multiple organ failure.

Viral illness or another infectious disease can cause a person to develop a fever, raising the core temperature above 37 degrees Celsius. Fever is a result of the body releasing pyrogens such as cytokines, prostaglandins, and thromboxane. These pyrogens induce cyclooxygenase 2 (COX2) to convert arachidonic acid to prostaglandin E2 (PGE2). PGE2 binds to receptors in the hypothalamus, increasing the thermogenic set point. This elevated temperature set point results in the body working to achieve a higher internal temperature.

The brain, more specifically the hypothalamus, controls thermoregulation. If the hypothalamus senses internal temperatures growing too hot or too cold, it will automatically send signals to the skin, glands, muscles, and organs. For example, if the body is generating heat during high-level exercise or if the external ambient temperature is elevated enough to cause a rise in the core temperature, afferent signals to the hypothalamus result in efferent signals to the cells of the skin to produce sweat. Sweating is one mechanism the body can use to cool itself as heat is lost through the process of sweat evaporation. In

contrast, when the body experiences a cold environment, a shivering reflex results in skeletal muscles contracting and generating heat; additionally, the arrector pili muscles (a type of smooth muscle) raise the bodily hair follicles to trap the heat generated.

C. Organ involved to regulate the Body Temp.

Multiple organs and body systems are affected when thermoregulation is impaired. During a heat-related illness, insufficient thermoregulation can result in multiple organ and system impairments. (Notice that many of these issues are interconnected.)

- The heart experiences increased work as it increases both heart rate and cardiac output.
- The circulatory system can experience intravascular volume depletion.
- The brain can experience ischemia and/or edema.
- The gastrointestinal tract is vulnerable to hemorrhage and infection as the intestinal mucosa becomes increasingly permeable.
- The lungs become impaired if sustained hyperventilation, hyperpnea, and pulmonary vasodilation lead to ARDS.
- Acute renal failure is an effect of intravascular volume depletion and impaired circulation.
- Liver cells suffer because of the fever, ischemia, and cytokine increase in the intestinal tract. Various organs can become ischemic from microthrombi or DIC.
- Electrolyte abnormalities are likely as well as hypoglycemia, metabolic acidosis, and respiratory alkalosis.

When body temperatures are severely decreased in hypothermia, the body's systems are also adversely affected. The cardiovascular system is susceptible to dysrhythmias such as ventricular fibrillation. The central nervous system's (CNS) electrical activity is noticeably diminished. Noncar diogenic pulmonary edema can occur as well as cold diuresis. Additionally, hypothermia causes preglomerular vasoconstriction which leads to decreased glomerular filtration rate (GFR) and decreased renal blood flow (RBF).

Organ Systems Involved

I. Anterior Hypothalamic Preoptic Area in Thermostatic Detection of Temperature

- The anterior hypothalamicpreoptic area contains cold and heat sensitive neurons central thermo receptors.
- The temperature sensory signals from the central anterior hypothalamicpreoptic area are transmitted into the posterior hypothalamic area.
- When the peptic area is heated, the skin all over the body immediately breaks out in a profuse sweat, and the blood vessels over the whole body surface become dilated.
- Also, any excess body heat production is inhibited.

II. Posterior Hypothalamus Integrates the Peripheral and Central Temperature Sensory Signals

- The temperature sensory signals from the central anterior hypothalamicpreoptic area are transmitted into the posterior hypothalamic area.

- The temperature sensory signals from the peripheral thermo receptors are transmitted to the posterior Hypothalamus.
- These signals are integrated to control the heat conserving and heat producing reactions of the body.

III. Detection of Temperature by Receptors in the Deep Body Tissues

- Deep body temperature receptors are in the abdominal viscera, the spinal cord, around or the great veins in the thorax, and upper abdomen
- The deep thermos sensitive receptors, like the skin temperature receptors, detect mainly cold rather than Warmth.
- It is probable that both the deep body receptors and the skin receptors are concerned with preventing hypothermia that is, preventing low body temperature. **IV. Detection of Temperature by Receptors in the Skin** The skin has both warmth and cold receptors.
- The warmth receptors at the skin are much less than cold receptors. Therefore, peripheral detection of Temperature mainly concerns detecting cool and cold temperatures.
- When the skin is chilled over the entire body, immediate reflexes are invoked that include sweating Inhibition, shivering, skin vasoconstriction to diminish the loss of body heat.

D. Function.

The core body temperature is tightly controlled in a narrow range although slight changes in core body temperature occur every day, depending upon variables such as circadian rhythm and menses. When a person is unable to regulate his or her body temperature, various pathologies ensue. The human body has four different methods for maintaining core temperature: vaporization, radiation, convection, and conduction. To keep the body functioning, it must be at its ideal temperature. This requires sufficient intravascular volume and cardiovascular function as the body must be able to transport the rising internal heat to its surface for release. Elderly people are at increased risk for disorders of thermoregulation due to a generally decreased intravascular volume and decreased cardiac function.

E. Mechanism of Thermoregulation.

Thermoregulation has three mechanisms: afferent sensing, central control, and efferent responses. There are receptors for both heat and cold throughout the human body. Afferent sensing works through these receptors to determine if the body core temperature is too hold or cold. The hypothalamus is the central controller of thermoregulation. There is also an efferent behavioral component that responds to fluctuations in body temperature. For example, if a person is feeling too warm, the normal response is to remove an outer article of clothing. If a person is feeling too cold, they choose to wear more layers of clothing. Efferent responses also consist of automatic responses by the body to protect itself from extreme changes in temperature, such as sweating, vasodilation, vasoconstriction, and shivering.

Temperature Decreasing Mechanisms

- Inhibition of the sympathetic centers in the posterior hypothalamus (that control blood vessel tone), cause vasodilation of skin blood vessels.
- When the body core temperature rises above the critical level of 37 C (98.6 F), there is an increase in the rate of heat loss by sweating.

- Shivering and chemical thermogenesis are strongly inhibited. **Temperature Increasing Mechanisms**
- Stimulation of the posterior hypothalamic sympathetic centers causes vasoconstriction of skin blood vessels.
- Also, piloerection will take place, which means hairs "standing on end." This mechanism is not important in humans.
- Increase in thermogenesis by promoting shivering, sympathetic excitation of heat production, and thyroxine secretion

F. Heat And Temperature: The Advantages Of Homeothermy

1. Homeothermy enables an organism to maintain its activity over a wide range of environmental temperatures

The ability to regulate internal body temperature has provided higher organisms independence from the environment. Because the rates of most physical and chemical reactions depend on temperature, most physiological functions are sensitive to temperature changes. Thus, the activity levels of poikilotherms (species that do not regulate internal body temperature) generally depend on environmental temperature, whereas those of homeotherms are relatively stable over a broad range of ambient conditions. A lizard, for example, is capable of relatively less movement away from its lair on a cold, overcast day than on a hot, sunny day, whereas a prairie dog may be equally mobile on either day. An arctic fox acclimatizes to the extreme cold of winter by maintaining a thick, insulating coat that enables it to resist body cooling and minimizes the necessity to increase metabolic heat generation, which would require increased food intake.

The thermoregulatory system of homeotherms creates an internal environment in which reaction rates are relatively high and optimal. At the same time, an effective thermoregulatory system avoids the pathologic consequences of wide deviations in body temperature. The thermoregulatory system incorporates both anticipatory controls and negative feedback controls. The components of this system are as follows: (1) thermal sensors; (2) afferent pathways; (3) an integration system in the central nervous system (CNS); (4) efferent pathways; and (5) target organs that control heat generation and transfer, such as skeletal muscle (e.g., shivering to generate heat), circulation to the skin.

Table. Consequences of Deviations in Body Temperature

Temperature (°C)	Consequence
40-44	Heat stroke with multiple organ failure and brain lesions
38-40	Hyperthermia (as a result of fever or exercise)
36-38	Normal range
34-36	Mild hypothermia
30-34	Impairment of temperature regulation
27-29	Cardiac fibrillation

The focus of this chapter is temperature regulation in homeotherms. I examine the physical aspects of heat transfer both within the body and between body and environment, as well as the physiological mechanisms involved in altering these rates of transfer. Finally, I look at the consequences of extreme challenges to the thermoregulatory mechanism, such as hyperthermia, hypothermia, and dehydration.

2. Body core temperature depends on time of day, physical activity, time in the menstrual cycle, and age

Temperature scales are relative scales of heat content. The centigrade scale is divided into 100 equal increments, referenced to the freezing (0°C) and boiling (100°C) points of water. The "normal" body temperature of an adult human is approximately 37°C (i.e., 98.6°F), but it may be as low as 36°C or as high as 37.5°C in active, healthy people. Body temperature usually refers to the temperature of the internal body core, measured under the tongue (sublingually), in the ear canal, or in the rectum. For clinical purposes, the most reliable (although the least practical) among these three is the last, because it is least influenced by ambient (air) temperature. Measurement devices range from traditional mercury-in-glass thermometers to electronic, digital read-out thermistors. Nearly all such instruments are accurate to 0.1°C. The least invasive approach uses an infrared thermometer to measure the radiant temperature over the temporal artery.

Body core temperature depends on the time of day, the stage of the menstrual cycle in women, the level of the person's activity, and the individual's age. All homeotherms maintain a circadian (24hour cycle) body temperature rhythm, with variations of ~1°C. In humans, body temperature is usually lowest between 3:00 to 6:00 am, and it peaks at 3:00 to 6:00 pm. This circadian rhythmicity is inherent in the autonomic nervous system, independent of the sleep-wakefulness cycle, but it is entrained by light-dark cues to a 24-hour cycle. In many women, body temperature increases approximately 0.5°C during the postovulatory phase of their menstrual cycle. An abrupt increase in body temperature of 0.3°C to 0.5°C accompanies ovulation and may be useful as a fertility guide. Physical activity generates excess heat as a byproduct of elevated metabolic rate. Infants and older people are less able to maintain a normal body temperature than are the rest of the population, particularly in the presence of external challenges. Newborns do not readily shiver or sweat and thus behave more like poikilotherms than like homeotherms. These properties, along with a high surface-to-mass ratio, render infants more susceptible to fluctuations in core temperature when exposed to a hot or cold environment. Older people are also subject to greater fluctuations in core temperature. Aging is associated with a progressive deficit in the ability to sense heat and cold, as well as a reduced ability to generate.

3. The body's rate of heat production can vary from ~70 kcal/hr at rest to 600 kcal/hr during jogging

The body's rate of heat production is closely linked to the rate of metabolism, the rate of O_2 consumption. Minor variations occur, depending on the mixture of fuels (foods) being oxidized, a process that determines the respiratory quotient. Because of their inherent inefficiency, metabolic transformations generate heat. Ultimately, all the energy contained in fuels appears as heat, mass storage or growth, or physical work done on the environment.

The body's metabolic rate, and thus its rate of heat production, is not constant. The resting metabolic rate is the rate necessary to maintain the functions of resting cells; these functions include active transport as well as cardiac and respiratory muscle activity. Voluntary or involuntary (e.g., shivering) muscular activity adds to the overall metabolic heat production. Even digesting a meal increases the metabolic rate. An increase in tissue temperature itself raises the metabolic rate, according to the van't Hoff relation (i.e., a 10°C increase in tissue temperature more than doubles the metabolic rate). Furthermore, certain hormones, notably thyroxine and epinephrine, increase the cellular metabolic rate. Because the body's heat production rate is variable, the rate of heat loss must match it closely if the body temperature is to remain constant. During physical exercise, the rate of energy production—and hence, heat generation—increases in proportion to the intensity of exercise. An average adult can comfortably sustain an energy production rate of 400 to 600 kcal/hr for extended periods (e.g., a fast walk or a modest jog). Nearly all this increased heat generation occurs in active skeletal muscle, although a portion arises from increased cardiac and respiratory muscle activity. A thermal load of this magnitude would raise core temperature by 1.0°C every 8 to 10 minutes if the extra heat could not escape the body. Physical activity would be limited to 25 to 30 minutes, at which time the effects of excessive hyperthermia (>40°C) would begin to impair body function. This impairment, of course, does not occur, primarily because of the effectiveness of the thermoregulatory system.

G. Body Heat Causes:

There are many reasons and causes as to why Body heat can happen inside our bodies, of which some are-

1. When the clothes you wear are too tight and clingy which can trap water and trap heat too
2. Infections and fevers can cause body heat to rise
3. Imbalance in the thyroid gland can make the metabolic activity run amok and force the body to produce more heat
4. Hard labour, strenuous workouts and plenty of physical labour can make the body heat soar
5. Muscular disabilities and seizures can be reason for the body heat to increase
6. Certain medications and stimulants make the body heat rise
7. Neurological disorders

So here were some of the causes that cause body heat rise inside the body, and now we shall move on to what the symptoms for the same are- take a look!

Symptoms:

The normal body temperature for humans would be 98.6 degrees, with variations on a very slight note that is found to be acceptable. But if the temperature is above or below the same, it needs correction. This is the time when remedies are to be taken, so that the body functions well. Some of the symptoms let out by the body when the heat is high inside would be-

1. Sleeplessness
2. Ulcers in the stomach
3. Burning sensation in the feet and the hands
4. Heartbeat being too rapid

5. Cramps due to heat increase
6. Eyes feel as though they are boiling
7. Boils and rashes on the skin
8. Overtly perspiring
9. GERD, heartburn and acidity
10. Confusion

Here were some of the symptoms let out by the body when the heat inside runs amok and goes out of control. Now let's take a look at how to be more aware of body heat.

H. How To Reduce Body Heat:

Body heat can be reduced by a number of things such as the clothes we wear, the hydration levels in our body, what we eat etc. This points to the fact that most of the body heat is a result of the diet we are on. Let's take a quick look into the areas where body heat could be a huge concern – Pregnancy & Toddlers/Babies.

1. How To Reduce Body Heat During Pregnancy:

Being pregnant already comes with extra care and anxiety. Body heat doesn't require medicines to combat it if you follow these steps right from the start. Let body heat not add on to the troubles and instead opt for these simple tips:

- Wear light and breathable fabric day and night.
- Stay hydrated and avoid the sun.
- Opt for expert guidance on pregnancy yoga.

2. How To Reduce Body Heat For Babies:

Babies and Toddlers are a stage where they need to be watched at every step. From what goes into their mouth to where they're sneaking out to play. The 3 golden rules you could follow are :

- Make the kid wear as less clothes as possible.
- Fluids to Solids. Remember this rule.
- Less sun. More shade.

The food you eat plays an important role from a baby to an old man. Correcting this, could help you deal with body heat better too. While you would love to eat anything and everything, here are a list of food items to control body heat quite immediately within the human system. Oh and a few DIYs too.

I. Food used to control the Body Temperature.

A. Buttermilk

For many centuries, and it is even mentioned in the ayurveda, body heat can be controlled by consuming buttermilk. This is best for those that have very high metabolism levels and especially for women suffering from hot flashes. While you sweat, the body loses a lot of vitamins and minerals, which is what the buttermilk restores.

How to consume:

- Drink a glass of buttermilk every morning while you have your breakfast, which helps maintain the heat levels in the body.
- Do this by mixing a pinch of salt to a cup of sour curd and mixing it with two tablespoons of water into a frothy mix.

How frequent: Daily

Fig. 7 Curd used to control body temp.

Fig. 8 Watermelon control body temp.

B. Coconut Water

You can also have coconut water or daab paani every morning on an empty stomach which helps bring down the levels of heat in the body. The electrolyte composition of coconut water can help with rehydration and brings in nutrients into the body for more energy needs. **How to consume**

- Cut open a fresh coconut and drink the contents within

How frequent: Daily

C. Lemon

Lime juice can help bring down illnesses related to high body heat and keeps the body cool as well. Thanks to the presence of vitamin C in lemons, the temperature is brought down for sure, but also the body stays nourished, and there is plenty of oxygenation that happens within the body, keeping it hydrated too. This means, you stay fresh and energized all through the day while the heat beats on outside.

How to consume

- A pinch of salt should be added to a quart glass of concentrated lime juice.
- Mix a tablespoon of honey in it and a cup of water. Mix well and enjoy.

How frequent:

- Thrice a day, everyday

D. Watermelon

Thanks to the high levels of water available in watermelon, body heat can be brought down to a large extent, and your body stays hydrated too. **How to consume**

- Cut open and piece up the fruit to have it whole

- Spice it up as a smoothie mixing herbs and spices in it in a blender and then consuming the smoothie
- Juice it up in a blender and consume with a dash of lime **How frequent:**
- Once in the morning with breakfast and once in the evening at tea time

E. Cucumber

While the summer months are on, cucumbers would be one of the healthiest foods to consume. Not only does it rehydrate the body, but also cools the body inside out.

How to consume:

- Peel the cucumber and slice it, add pepper to spice it with a pinch of salt and have it as a salad.
- You may also eat it raw and whole, sans the spices.
- You can juice it up too!

How frequent:

- As much as you want

F. Aloe vera

Since time immemorial, aloe vera has been used as a popular DIY remedy to bring down body heat. All thanks to the soothing and cooling properties it has, which keeps the body heat under control.

How to use/consume:

- Apply the gel of the plant all over the skin and wait for half an hour before having a cold shower. • A quart cup water should be mixed with a tablespoon of aloe vera and drunk **How frequent:**
- The gel on the body routine can be done twice a day, while drinking the juice of aloe vera should be done just once a day on an empty stomach.

Fig. 9 Cold water control body temp. Fig.10 Mint used to control body temp.

G. Cool Water

One of the easiest ways to bring down body heat and to help the body recover from the high temperatures would be to have cool water.

How to consume:

- An ice cold bath can be done
- You can enjoy a tall glass of ice water
- You can soak your feet in a bucket of ice cold water **How frequent:**
- For the ice bath, it should be done before you leave home, once a day.
- For the ice water feet soaking ritual, it should be at the end of the day, once a day. And for consuming ice water, it should be done at least five to eight times a day.

H. Sandalwood

One of the most holistic ways to reduce body heat and to cool and soothe the body would be to use sandalwood paste.

How to use:

- Mix a tablespoon of sandalwood powder and a few drops of cold milk to form a paste.
- Apply it on the forehead and the arms and the legs.
- Wait for half an hour and then wash off
- Dab a few drops on sandalwood oil onto cotton balls and freeze them.
- Rub the same on the forehead and then relax **How frequent:**
- The sandalwood paste for the body should be done once a day at the end of the day. The sandalwood oil method can be done anytime, but once a day

I. Peppermint

Peppermint is nature's way to cool and soothe the body, and to bring down body heat too. This is why, we use peppermint oil mostly to soothe headaches and migraines.

How to use:

- A few drops of peppermint oil should be added to a mug of cold water.
- Dip cotton in the same and dab around the face and the body.
- This will make the latent heat escape and also cool and soothe the skin too.

How frequent: Thrice a day

J. Indian Gooseberry

Amla or Indian gooseberry has a lot of cooling and soothing properties apart from being a nourishing agent, which is why we shall use it as a body coolant too.

How to take or How to do:

- Mix a quart cup of amla concentrate juice to four parts of water and add a dash of honey to it. Consume it cold thrice a day
- Mix a quart cup of amla concentrate to four parts of water with a pinch of salt and consume it cold, twice a day

How frequent: Twice or thrice a day

Fig. 11 Amla used to control body temp. Fig. 12 Fruit used to control body temp.

These foods will naturally bring down the body heat and pimples which are caused by it. Now that we have given you the various ways on how to bring down body heat naturally, here are some of the dos and the donts to abide by. Please check them out very well.

References.

1. Lim CL, Byrne C, Lee JK. Human thermoregulation and measurement of body temperature in exercise and clinical settings. Ann Acad Med Singap. 2008 Apr;37(4):347-53.
2. Charkoudian N. Mechanisms and modifiers of reflex induced cutaneous vasodilation and vasoconstriction in humans. J Appl Physiol (1985). 2010 Oct;109(4):1221-8.
3. Kurz A. Physiology of thermoregulation. Best Pract Res Clin Anaesthesiol. 2008 Dec;22 (4):627-44.
4. Coon EA, Fealey RD, Sletten DM, Mandrekar JN, Benarroch EE, Sandroni P, Low PA, Singer W. Anhidrosis in multiple system atrophy involves pre- and postganglionic sudomotor dysfunction. Mov Disord. 2017 Mar;32(3):397-404
5. Romanovsky AA. Skin temperature: its role in thermoregulation. Acta Physiol (Oxf). 2014 Mar;210(3):498-507.
6. Boulant JA. Role of the preoptic-anterior hypothalamus in thermoregulation and fever. Clin Infect Dis. 2000 Oct;31 Suppl 5:S157-61.
7. Zhao ZD, Yang WZ, Gao C, Fu X, Zhang W, Zhou Q, Chen W, Ni X, Lin JK, Yang J, Xu XH, Shen WL. A hypothalamic circuit that controls body temperature. Proc Natl Acad Sci U S A. 2017 Feb 21; 114(8):2042-2047.
8. Boulant JA. Hypothalamic mechanisms in thermoregulation. Fed Proc. 1981 Dec;40(14):2843-50.

9. Schieber AM, Ayres JS. Thermoregulation as a disease tolerance defense strategy. Pathog Dis. 2016 Dec;74(9)
10. Illigens BM, Gibbons CH. Sweat testing to evaluate autonomic function. Clin Auton Res. 2009 Apr;19(2):79-87.
11. Cheshire WP. Thermoregulatory disorders and illness related to heat and cold stress. Auton Neurosci. 2016 Apr; 196:91-104.
12. Díaz M, Becker DE. Thermoregulation: physiological and clinical considerations during sedation and general anesthesia. Anesth Prog. 2010 Spring; 57(1):25-32; quiz 33-4