BALNEOTHERMA

SAUNA for Health
brief guide

Content:

1. General information about sauna and basic types of sauna

All types of sauna bath have the same principle – using different temperature than is temperature of the human body – hot and cold contrast during the sauna bath. Heat environment in sauna cabin and cooling environment in pool with cold water, snow cabin, cold shower, cold air…

In Europe are good known (from historical point of view) 2 main types of sauna bath coming from:

1. **Roman tradition** (also for finnish sauna) - using **hot dry** environment
2. **Russian tradition: hot wet** environment (maximal saturation with hot water vapor, max temperature of air 45-50°C, humidity nearly 100%).

Nowadays are recognised and used mainly:

- **Finnish sauna – typical hot dry air sauna** - temperature of air 75°C - 100°C (depends on bench placement), relative humidity 5-15% at level of second bench, short vapor shock in the end. Cooling phase in cold air, or using cold shower, pool with cold water, very popular is snow rolling or snow shower…
- **Roman bath** – consist from **tepidarium** (temperature of air 45-50°C), **laconium** (60-70°C) and cooling space **frigidarium** consist from pool (alveum) with water temperature 35°C and second pool with water temperature 12°C.
- **Russian Banya – wet/steam saun**a (temperature of air max. 50°C, relative humidity 90%).
- **Infrared sauna** (infrared cabin) is not typical hot air bath. The higher temperature of human body after procedure is not because of high temperature of air in cabin, but it is result of infrared radiation (long IR-

A wave) that heats deeply the humans body directly without warming the air in cabin – we can say that it is type of lighttherapy with thermotherapeutical effect.

2. Requirements and principles/regulations of proper Finnish sauna use

Hygiene and safety regulations for employees and sauna visitors are regulated in each EU country by the relevant legislation.

- The whole sauna session (type Finish sauna: repeated hot, cooling and relaxing phase) take time of 90-120 minutes
- It is very important that people under the influence of alcohol, drugs, with visible injuries, skin defects, with elevated body temperature, direct after exhausting physical activity, with epilepsia, shortly after heavy meal do not enter the sauna procedure. Of course, general and specific contraindications must be respected.

Alcohol Consumption !!!

Drinking alcohol while sauna bathing can create serious health risks and should be avoided. Alcohol consumption increases the risk of hypotension and fainting in the sauna, as well as the risk of arrhythmia and sudden and hyperthermia death, especially in people with coronary heart disease. Almost all hyperthermia deaths in Finland from 1970 to 1986 took place in saunas and were considered accidents. Most of the victims were middle-aged men, 84% were under the influence of alcohol, and 27% had cardiovascular disease. Of the 158 sudden deaths occurring in saunas in the province of Uusimaa (population 1.1 million) in Finland between 1976 and 1983, 80% of the victims were men and alcohol intake was a contributing factor in one third of the cardiovascular deaths and half of the accidental deaths .

- The most important condition is a positive attitude to sauna bath and personal interest of it. Fear or insurmountable fear is a specific contraindication. Before the first sauna experience, education focused

on describing the effects that the person taking the sauna can expect is always necessary.

- Preparation for sauna procedure:
  - remove clothing,
  - remove contact lenses, glasses,
  - remove jewelry
- Before entering the sauna, it is necessary thoroughly clean the whole body with a shower and soap and then to dry the skin perfectly
- Enter the sauna cabin with a clean sheet on which you can sit or lie down. When you sit it is recommended to sit with feet up on the same bench to be whole body in same temperature zone.
- First hot part of sauna session can be 8-10 minutes and can be after cooling followed by second and third that can be longer (12-15, max. 20 minutes). **The practical recommendation is: to leave hot cabin when client have irresistible desire to cool down**.
- The length of stay is individual and can also be modified by the height of the bench (the higher the position, the higher the temperature of the environment).
- Before leaving the sauna cabin, it is necessary to sit up from lying down and remain seated for a short time (hypotension prevention).
- When client do not have experience with sauna, is recommended shorter stay in hot cabin.
- A cooling phase follows after each stay in a hot cabin. It is always necessary after cooling to completely dry the body before entering the sauna again. The cooling down after the last third phase should be longer and is followed by 20-30 minutes rest in the relaxation zone.
- Water infusion to the hot rock is also typical for a Finnish sauna (steam shock). Will increase the relative humidity in sauna cabin for a short time and thus create a powerful heat stimulus for human body. The best way is do it automatically by water dosing system at a precisely determined time, which is known in advance to sauna users.

3. Thermoregulation process in human body during sauna (warming up and cooling down phase)

- The human body reacts to the heat load in the sauna by increasing of blood circulation in the skin (opening of functionally closed capillaries) that helps increased sweating and subsequent evaporation of the sweat. Other forms of regulation body temperature at in the hot sauna environment cannot be applied.
- The opening of functionally closed capillaries causes a slight decrease in systolic blood pressure (reduction of peripheral vascular resistance). If a person takes a sauna regularly a certain adaptation occurs, which is manifested by a faster onset of sweating, which maintains a lower body temperature than in people who take a sauna only occasionally.
- In phase of cooling down the body temperature cooling rate depends on the cooling method. Rapid whole-body cooling in a cold pool (8--12 degrees C) causes rapid cooling, which is accompanied by a quick increase in the peripheral vascular resistance of blood vessels and also an sudden increase in systolic blood pressure. Therefore, whole-body cooling in cold water pool is not recommended for the elderly people, children, and people with certain chronic diseases esp. cardiovascular. It is more suitable to cool down in the outdoors air, or by showering gradually from the lower limbs upwards.

There are also some important pathophysiological effects of sauna bath to the circulation:

- **When standing up quickly from lying down in the sauna cabin, a sudden drop in pressure and collapse may occur during the transfer of blood to the limbs.**
- An increase in body temperature can be associated with a significant feeling of fatigue and headache in some people.
- **Rapid whole-body cooling can cause a strong vascular reaction – rapid increase in peripheral vascular resistance by narrowing peripheral vessels with a subsequent increase in blood pressure, in some people risk of severe arrhythmia.**

4. Changes in the internal environment of the human body caused by sauna

- Sweating means fluid loss, the amount can be determined by weighing before and after the sauna. On average, it is 400 to 1000 g.
- 99 % of sweat composition is water and only 0,5-1 % others in water soluble compounds. Sweat is hypotonic solution (1 001-1 008) compared to blood plasma (1 025- 1 029).

	unit	***range***
Water	g/l	990-995
NaCl	g/l	0,1-5
Natrium (Na^+)	g/l	0,54-0,73
Chlorides (Cl^-)	g/l	0,92-1,13
Potassium (K^+)	g/l	0,1-0,12
Calcium (Ca^{2+})	mg/l	7,2-53,7
Magnesium (Mg^{2+})	mg/l	1,7-7,8
Iron	mg/l	-
Urea	g/l	0,71-1,99
Uric acid	mg/l	0,7-2,5
Creatinine	mg/l	1,01-13,0
Lactic acid	g/l	0,5-1,2
Lactic acid after physical activity	g/l	1,7-7,6

Composition of the sweat (table after Fritzsche, 1993)

- Losses of sodium and potassium by sweating after sauna are similar to losses after physical exertion. Magnesium losses by sweating are higher after physical exertion (van Dam, 1990)
- Sauna bath causes temporary short blood concentration, the decrease in blood plasma volume (cca 16%) correlates with the intensity of the heat stress.

Recommendation:

- after finishing the sauna in the relaxation phase, it is recommended to drink fluids in the form of mineral water or fruit juice as a natural supplementation of minerals. Drinking water is possible also during the sauna phases.
- When sauna bath follows physical exertion (for example, sports), it is advisable to take mineral drink before the sauna session.

5. Physiological effects of Finnish sauna (hot phase)

Effect	*Direction*	*Magnitude*
Skin temperature	↑	**Within few minutes up to 40°C**
Rectal temperature	↑	**By 0,2 °C at 72°C for 15 min.** **By 0,4°C at 92°C for 20 min.**
Sweating	↑	**Total secretion an average 0,5 kg during typical sauna bath**
Skin blood flow	↑	**From5-10% to 50-70% of cardiac output**
Blood flow internal organs	↓	**Renal blood flow decreased by 0,4 l/min** **in splanchnic organs by 0,6 l/min**
Blood flow to muscles	↓	**Decreased by 0,2 l/min**
Heart rate	↑	**Up to 100/min in accustomed people** **Up to 150/min in unaccustomed people**
Cardiac output	↑	**From 5-6/l/min to 9-10 l/min**

6. Absolut contraindications for people with cardiovascular diseases

- Status after AIM in 1. and 2. phase of rehabilitation (6 month after attack)
- Hypertension 3. stadium ESH/ESC
- Unstable angina pectoris
- Decompensated heart failure and cardiac arrythmias
- Severe aorta stenosis
- Thromboembolic diseases
- History of stroke or transient ischemic attacks

- By other cardiovascular disease or in seniors age medical recommendation is needed – some of them are relative contraindications.

7. Sauna effects on healthy and damaged organ systems of the human body

Respiratory system

- Regular use of sauna decreases pulmonary congestion and increases total vital capacity in first phase of sauna bath
- Stimulation of sympathetic may leads to bronchial dilatation
- Increasing minute ventilation
- Hot environment in sauna causes a reduced partial pressure of gases in sauna cabin air, i.e. oxygen (corresponds to an altitude of 2500 meters above sea level) and the binding of oxygen to hemoglobin, which is also dependent on temperature, is slightly reduced, this is a limiting factor for some people with severe chronic respiratory diseases.
- Increased resistance to upper respiratory tract infections is associated with changes in the immune system. Regular sauna bathing may reduce the incidence of acute respiratory infections (in acute phase sauna must be avoided). Several authors confirmed an increase in IgA and interferon in regular sauna visitors.

Indications:

- Rhinitis allergic
- Sinusitis and sino-bronchitis
- Chronic nasopharyngitis
- Chronic laryngitis
- Early stages of hypertrophic upper respiratory tract infections
- Chronic bronchitis nonspecific
- Astma bronchial
- Stage after pneumonia
- Pneumoconiosis
- Rhinitis chronic atrophic

Contraindications:

- Acute stages of respiratory diseases
- Bronchiectasis
- Cancer and metastases in lungs
- decompensated stages of obstructive and restrictive lung disease

Diseases of locomotory apparatus: inflammatory and noninflammatory

- Myorelaxation
- Improving joint mobility
- Pain relief, also neuropathic pain (increased production of β-endorfine)

Indications:

- Algodystrofic syndrome
- vertebral pain syndrome
- extra-articular rheumatism
- status after injuries, surgeries (after 4 weeks)
- osteoarthrosis deformans
- rheumatic arthritis in remission (not active inflammatory process)
- spondylarthrosis ancylopoetica
- fibromyalgia

Contraindications:

- active rheumatic arthritis
- lupus erythematodes
- polymyositis, sclerodermia
- discopathia and radiculitis
- injuries in acute stage
- therapy with corticoids

Sauna and skin

- In general sauna is harmless for the skin
- In some clients with atopic eczema or urticaria may cause itching of the skin
- In general is not used for therapy of skin diseases

Sauna and hormonal changes

- Activates the sympathetic nervous system
- Activates renin-angiotensin-aldosterone system
- Activates hypothalamus-pituitary-adrenal axis
- All hormonal changes related to sauna use are brief and reversable without permanent effect

HORMONE	*CHANGE*
Adrenocorticotropic	unchanged
Aldosterone	↑ 2-5x
Angiotensin II	↑3x
Atrial natriuretic peptide	↑1,5-3x
β-endorfine	↑2-3x
Insulin	unchanged
Growth hormone	↑2-5x
Renin activity	↑1,5-2x
Testosterone	unchanged
Thyroid hormone	Unchanged -increased 1,5x
Prolactine	↑ 2-5x

For cortisol, epinephrine are different data in literature
Hormone levels returned to normal within a few hours

Sauna and reproductive system

- Sauna does not influence fertility.
- In men serum concentration of testosterone and gonadotropins do not change even after oft repeated sauna use

Pregnancy

- Experimental studies suggest that sauna is safe during the uncomplicated pregnancy of healthy women who are accustomed to regular sauna use. In Finland majority of pregnant women use regularly sauna until birth.

Finnish authors that report a faster, less painful course of childbirth in women who regularly take saunas.

- In hypertensive pregnant women is sauna not recommended.
- Sauna in first trimester – consultation with physician is recommended

8. Sauna and children

Healthy children can use sauna from age 2 years. They tolerate it well when their parents supervise bathing time and temperature.

- Children have usually shorter sauna bath (5-10 minutes) and they sit or lay on the lower bench where is the temperature not as hot
- If the child is afraid or averse to the environment, it is not appropriate to forcibly keep the child in the sauna.
- If the child suffers from heart disease or other chronic diseases and is set to be treated with pharmaceuticals, sauna use can only be recommended by the child's attending physician.
- For healthy children, sauna use is recommended as a prevention of upper respiratory tract infections.
- The cooling phase for children should be in the open air or with a shower.

9. Sauna and seniors

Regular sauna visits undoubtedly have many health benefits also for old-age people, even if they start with the sauna late. Particularly important for seniors is the effect of strengthening the immune system, relief joint pain in case of osteoarthrosis, or vertebral pain syndrome.

- **Start with a health check-up by physician**

  If senior do not taken sauna before and want to start using it at an advanced age, he must **start with health-check up by physician**. Sauna has a strong influence on blood circulation, and can be risk to people with cardiovascular problems. While for some diseases or ailments sauna can be beneficial, it is strictly forbidden for the others.

- **Start slowly**

  If senior do not suffer from the risks related diseases, the slow start in the sauna world is particularly important for all sauna beginners. First of all, take part, only when you feel really good. Consider mild types of saunas, such as a **tepidarium**. Due to the gentle procedure, the tepidarium is suitable for seniors who want to do something good for their health. After some weeks it can be Finnish sauna but on the lowest or middle benches for up to 10 minutes.

- **Avoid dehydrating**

  Especially for seniors is important not forget to drink, to compensate loss of fluids in the sauna by drinking water. If is ignored this rule there is the risk of dehydration which can lead to blood thickening and thus blood clots formation.

- **Cool down gradually**

  The cooling method after stay in hot cabin in the elderly can be very risky for a sudden increase of peripheral resistance for the blood stream linked with increasing of blood pressure. Therefore, it is recommended to gradually cool down on the air outdoors, or gradually cool down with a shower from the lower limbs, first with lukewarm and only later with cold water. Sudden whole-body cooling in a pool with cold water is risky for seniors and must be avoided.

10. Summary

The sauna for its positive effects on human health are traditionally used in Europe as a part of physical therapy in spa facilities, rehabilitation treatment facilities and in children's reha-hospitals. As a prevention of repeated respiratory infections and strengthening the immune system the sauna is also available in many school facilities and sports clubs. In recent years, the sauna world has grown with many modifications, especially with regard to various forms of aromatic additives in steam in wet saunas, or combinations with light effects, or various rituals during sauna use. The forms of cooling also brought various novelties in wellness facilities in order to draw the attention of clients. However, the principle of the sauna has remained unchanged for

centuries - the alternation of hot and cold stimuli causes changes in the human body that are expected and can bring certain preventive benefits for a healthy person and also specific benefits for people with certain health disorders.

Very important for the safe operation of the sauna world is compliance with operating instructions, sufficient information for clients about the effects of safe sauna use, and behaviour in sauna. Very important are warnings when it is not possible to use the sauna. Sauna workers must have enough experience to possibly anticipate possible complications. A health worker must always be present in the sauna facility to provide qualified first aid in case of a sudden deterioration in the client's health condition. If the sauna is used in medical spas, it is always prescribed by a doctor - its form, length of stay and form of cooling.

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