Hydrotherapy Theoretical Background: Physiology of the Skin

By Reinhard R. Bergel, Ph.D.

The skin is the "vegetative nervous sense organ". Water can account for a heat loss twenty-five times greater than possible through air. Stimuli that act on the skin travel from the skin receptors through the segmental reflex (consensual reaction) to the other side of the body, but also through the autonomic centers of the central nervous system (enlarged or distant consensual reaction).

The cold receptors are more frequent in the skin than the heat receptors; for example, in the face the ratio is 11.3 as against 3.3 per square centimeter, and even in the trunk the ratio is 9.7 for the cold as against 0.6 per square centimeter for the heat. The temperature corpuscles are nets of nerve tissue that develop action currents when there is a fall in temperature, that is, when a cold stimulus is applied to a warm skin. Even in very warm environments, such as an overheated sauna, the cold receptors are excited, with a resultant paradoxical goose flesh response.

The temperature-regulating mechanism in the hypothalamus responds to signals by an attempt to avoid cooling of the interior through reduction of the body shell, particularly the cutaneous organ. In the subcutaneous tissue, arteriovenous anastomoses are closed to reduce the amount of circulation; sympathetic innervations, both central and peripheral, produce an initial constriction. The skin cells, in turn, continue to form substances that act on vessels, since brief, cold stimuli increase cellular metabolism. With a reduced blood supply, these H-substances are not excreted in usual quantities, as in the case of other acid products of metabolism such as carbon dioxide and lactic acid. The histamine-like substances block cholinesterase, which inactivates or destroys newly formed acetylcholin, thus permitting a prolongation of acetylcholine action, a dilation (Lewis’ phenomenon) that increases the blood flow through arterioles and capillaries.

Reactive hyperemia occurs after a short, cold stimulus if the skin was previously well supplied with blood. When the blood, cooled during its passage in the skin, reaches the hypothalamus, the nervous center marshals the body defenses to prevent further cooling through action currents and by direct action on neighboring nerve centers, which explains the generalized effect of cold-water applications on the autonomic system. We speak of these responses as vascular training through partial hydrotherapy.

The segmental blood shift that follows cold stimulation of the skin is reflected in the other corresponding side (segmental reflex) and elsewhere in the body - brain vessels, pharynx, coronary vessels, and kidneys - a telereaction. We depend upon this reaction to obtain a slight increase in the coronary artery blood flow by stimulation of the left arm, or where this is not desirable, by a warm or contrast footbath.

The increase in cutaneous circulation also involves the neighboring muscles with a shift from the interior (lungs and abdominal cavity), known as the Dastre-Morat law. We know of no other method that will increase the circulation so much with so mild a lasting
and physiologic effect as hydrotherapy.

Brief hydrotherapy applications to a warm body segment will (a) **shift blood** from the interior to the skin segment (b) stimulate **gastric secretion** through a histamine effect (c) increase the **general metabolism**, particularly of the muscles and liver, through the central heat regulator (d) increase general and cardiac muscle tone and minute **cardiac volume** with lessened pulse rate (e) **reinforce breathing** by deepening respiration (f) **regulate general excitability** of the nerves and (g) increase resistance to the common cold.

Minor hydrotherapy also has a **hardening effect**, by a decreased tendency to upper respiratory infections. A deficient blood supply of the mucosa may result in stasis and even ischemia, which lowers resistance to infection. It is likely that serum globulin, magnesium, and antibodies, the last of which kills the bacteria, coat the surface of the bacteria. **Phagocytosis** as well as humeral properdin depends upon adequate tissue blood supply; stasis may be followed by a perivascular edema, which is in effect a favorable nutrient for infectious organisms. The blood supply of the buccal mucosa is easily evaluated by thermocouple temperature measurement. The amount of flow of blood in the buccal cavity is influenced by distant stimuli through the telereaction of Dastre-Morat, according to which, blood vessels in the head and brain react as skin vessels do rather than as deep vessels of the thorax and abdominal cavity.

The uniform room temperatures gained by central heating or air conditioning lead to a diminution in reactivity of the cutaneous organ as opposed to the hardening in outdoor life. We believe this accounts in part for the greater frequency of colds among people with industrial, or indoor jobs.

If people with a tendency to colds immerse their legs in cool water at 15°C for one to two minutes, we note that, even while still in the bath, there is telereaction and the oral temperature drops from 0.5 to 2.0°C or more. A slowing of the blood flow continues for several minutes in sensitive persons. If a hardened sportsman or those who have completed a hydro treatment are exposed similarly, there is either no change in the buccal temperature or only a transient lowering of a few seconds.

**Water** can be applied in any of its three physical states **steam, liquid, or solid** or in any combination of them. Because of its high specific heat and versatility, it is an excellent medium for conductive heating or cooling since it absorbs and gives off heat slowly. While an air environmental temperature of 27°C/80°F is comfortable for the nude body, a water environment of the same temperature is cool. For most people, the critical level of temperature sensation is about 34°C/93°F - the average temperature of the skin. Hot and cold are therefore relative terms.

**Hot water** (up to 40°C/104°F) has an initial stimulating effect, but, as the body recovers from the first response to immersion at this temperature, there is a general and muscular relaxation.

**Cold water**, on the other hand, may cause some shivering, goose flesh, increased pulse and respiration, **dilation** of blood vessels, increased muscle tone and metabolism; these are the responses of most healthy individuals. This may be called "**tonic**" stimulating reaction to cold as compared with the "**atonic**" response to heat. The response to hot or cold water varies with the length of application. Cold may be invigorating when used for a short period but is damaging over a longer period. Even in local applications (ice water) the hand may be able to tolerate exposure for more than a minute or two. The skin finds prolonged exposure at 40°C/104°F uncomfortable for more
Hydrotherapy – by Dr Reinhard Bergel

than a few minutes; water at 50C/102F may destroy mucosa in a short application (vaginal mucosa is an exception) and skin in a few minutes.

**Hydrotherapy** is the external application of water for therapeutic purposes. The body or any of its parts may be immersed in the water or the water may be applied to the surface with or without the intermediary of absorbent materials. In prescribing hydrotherapy, it should be specified by type, temperature, duration and frequency.

Types of Hydrotherapy

Full Immersion Bath: One of the simplest forms of hydrotherapy, available in nearly every home because of the bathtub, is the immersion bath. Depending on the temperature of the water, these baths are called neutral or cold, cool, and hot.

Sitz Bath: A sitz bath is a method of applying water to the mid-portion of the body, especially to the perineum and the areas adjacent to it. The temperature of the water may be as low as 8C/46F. and as high as 40C/104F. At these extremes, exposure will be brief. Since one of the chief values of a sitz bath is prolonged application of water at a comfortable temperature, the bath is usually given in the range of 36 to 40C - 96F to 104F.

Neutral Bath: Because the temperature of the major part of the body's surface is about 33C/93F., water at a similar temperature produces comparatively little change in the body's physiology. Likewise, a variation of a few degrees either below or above this temperature exerts but little influence on the body's activity. The range of relative thermal indifference lies between about 90F/32C and 97F/36C.; within this range, the production and loss of heat is relatively small, and there is no definite impression of heat or of cold. For this reason, a bath at these temperatures is particularly suitable for cleansing purposes and also for underwater exercise. Their duration may be fifteen to thirty minutes.

Hot Bath: An immersion bath with the water temperature ranging between 96F/35C and 105F/40C. feels decidedly hot. At such temperatures loss of heat from the body's surface is stopped, except from the protruding head. At the same time, the body is heated by conduction and therefore the temperature of the entire body will rise. The immersion bath is a rapid means of producing artificial fever. Its efficiency is so great that it may prove a dangerous method for the maintenance of prolonged temperature elevation. Short periods of immersion may cause comparatively little dislocation of the temperature level. Baths lasting two to fifteen minutes are employed in the treatment of chronic rheumatic manifestations in joints, fibrous tissue, and muscles; for the relief of muscle spasm, and of colic in the gastric, intestinal, gall bladder, or urinary tracts.

Excellent results are obtained by hot water baths in clients suffering from chronic arthritis. It is recommended that the client be placed in a tub with the water at about body temperature. After immersion the temperature is increased to the point at which it produces maximum muscle relaxation (about 101F/38C to 104F/40C.); it is then gradually lowered to the level found most comfortable for the client (between 96F/35C and 98F/36C.). Underwater massage should be applied while the client is in the tub; motion should also be encouraged; first passive, then active, and later resistive. Because of its severity, this type of bath should not be administered to clients with diseases, such as those involving the heart and arteries or the central nervous system.

Cold Bath: A cold immersion bath whose temperature varies from 50F/10C to
70F/21C. may be used, but for very short periods of time (four seconds to three minutes) during which the body should be briskly rubbed by the client himself or by an attendant. After the bath, the client should be briskly rubbed with a towel and dried quickly. Because of the vigorous reaction, which it produces, this bath should be given only to robust individuals. In such persons, it causes a feeling of general exhilaration; the circulation becomes more rapid and the appetite is stimulated. If chills develop, the client should be promptly removed from the bath. The cold bath is used as a metabolic stimulant, for obesity, and for atonic states. It should not be administered to very young or very old persons.

Contrast Bath: One way to influence the peripheral circulation is by applying evocative stimuli to the skin. One of the simplest methods is by surrounding parts of the body with water at different temperatures.

A contrast bath consists of two water containers, each large enough to hold two legs. Into one container is poured enough cold water to cover the immersed leg, and the other container is filled with hot water. Since the total duration of treatment is relatively short, thermostatic control of the water temperature is not required. The cold water may be held at a level of about 10C/50F to 16C/61F. and the hot water at 38C/100F to 44C/111F. The leg or legs are first placed in the hot water for four to six minutes and then at once in the cold water for one to two minutes. For the client to end treatment with a feeling of comfort, the final immersion should be in the hot water.

Contrast baths are used to stimulate local circulation in limbs without obstructive vascular pathology.

Chemical Baths

Natural and Artificial Baths; Carbon Dioxide Baths: The immersion bath can be modified by mixing various gases and solid substances with the water. Such mixtures sometimes occur naturally and furnish the raison d'etre for spas throughout the world. Waters containing large amounts of carbon dioxide are found in certain places; for instance, at Bad Nauheim (FRG) and Saratoga Springs (USA). Effervescing carbon dioxide baths may be made artificially by means of a special carbon dioxide mixing apparatus;

1. by permitting carbon dioxide gas to flow from a cylinder through perforated tubes placed in the bottom of the tub;
2. or by adding chemicals to the water. None of these baths is as effective therapeutically as
3. natural carbon dioxide water.

To make the third type of bath four to eight pounds of salt are placed in a tub containing about forty gallons of water. One-half pound of sodium bicarbonate is added, then six to eight large tablets of acid sodium sulfate are placed at equal intervals at the bottom of the tub.

The special beneficial action of these baths is attributed to the bubbles of carbon dioxide gas which are liberated in great quantities. The client should lie quietly in the bath, without unnecessary motion, to avoid dissipating the layer of bubbles next to his skin.

Baths are administered every other day, with progressively increasing percentages of
carbon dioxide. At the start, 25 percent is used; this is increased to 50, 75, and 100 percent. If dyspnea is relieved, the temperature of the baths is reduced to as low as 86 F.

The number and frequency of baths are arranged in accordance with the results achieved. When the cardiac insufficiency is relatively recent or the compensation is good, full-strength saline and carbon dioxide baths are administered in a series of three. The temperature of the first bath is held at 95F/35C. Subsequent bath temperatures are reduced, 80F/26C. being the lower limit. The duration of the baths is increased up to a period of twelve minutes. If there is no disturbance of compensation, the first baths may be a combination of carbon dioxide and saline in their strongest concentration, at a temperature of 90F/32C., for a period of ten minutes. The time may be gradually extended up to fifteen minutes.

In cases of high blood pressure, the temperature of the bath should not be reduced below 95F/35C. In "nervous or functional heart conditions", the baths are first administered for five minutes at 93F/33C.; thereafter the temperature is reduced at each bath until a level of 85F/29C. is reached. The time for taking these baths is in the morning, two hours after a light breakfast. It is important that they be followed by a rest period of two hours; otherwise, much of the benefit is lost. The carbon dioxide in the bath enters the body through the skin. The skin becomes red, indicating increased circulation not resulting from temperature influence. Corresponding diminution takes place in the circulation of the deeper organs. The heart is slowed, possibly by reflex excitation of the vagus nerve.

The carbon dioxide bath has an action similar to digitalis on the blood pressure; if high, the blood pressure is lowered; if low, it is raised. Respiratory and pulse rates are slowed. There is increased elimination of urine. The cardiac muscle becomes trained without increasing the frequency of the heartbeat. **CONTRAINDICATION:** heart disease with decompensation and marked arteriosclerosis.

Oxygen Bath: Oxygen may be introduced into the water of a bath from perforated tubes lying at the bottom of the tub and connected to an oxygen tub. In an oxygen bath the temperature of the water should be held between 91F/32C and 95F/35C. The duration of the bath should be ten to twenty minutes. Its effect is soothing. Its use is in the treatment of hypertension, advanced cardiac disease, nervous irritability, and insomnia.

Brine or Salt Bath: Brine waters occur naturally at certain spas. Artificial brine baths can be made by adding from five to eight pounds of sodium chloride to 40 gallons of water. The temperature of the water should be between 90F/32C and 105F/40C.; the duration of the bath, ten to twenty minutes. Where higher concentrations of salt are employed, the increased buoyancy may make it necessary to hold the client down with weights. Artificial sea water baths are made by mixing seven pounds of sodium chloride, one pound of magnesium chloride, and one half pound of magnesium sulfate in 30 gallons of water. **INDICATIONS** for saline baths include osteomyelitis, fractures, dislocations, arthritis, myositis, fibrositis, gout, chronic sciatica, and obesity. **CONTRAINDICATIONS** are arteriosclerosis, cardiac disease, hypertension, and inflammations of the skin.

Mud Peloid Baths and Packs

Physical and Chemical Aspects: Peloids are substances which originate in nature by
biological and geological processes and when in a finely divided state are mixed with water and applied as baths and packs. Peloids may vary greatly in composition:

1. peat (sphagnosum),
2. moor (uliginosum),
3. earthy moor (terra uliginosa) and
4. mud (limus).

Peats are formed by oligotrophic plant associations growing above ground water level, usually as high moors. Peats consist mostly of plants of the Sphagnetalia family, the most common of which is sphagnum or bog moss. Moors are formed by mesotrophic or eutrophic plant associations growing in surface water and filling shallow reservoirs. Moor plants belong to the order of Phragmition (reed), Magnocaricion (sedge), Molinientalia and Alnion. Earthy moors consist of mixtures of moors and mud with a considerable amount of lime. They are acid or sub neutral. Muds are inorganic sediments originating in a neutral or alkaline environment. The inorganic component consists of finely disintegrated rocks and the minor organic component is composed of algae (Chlorophyceae and Cyanophycae). For medical purposes, the physical characteristics of peloids are far more important than the chemical.

The Chemistry of Peloids

Peats are composed of organic matter and plant debris; their reaction is acid. Moors are mainly organic but when they arise in connection with mineral waters and are prepared with them they are acid. Earthy moors contain vegetable and inorganic components. The earthy part can reach up to 80 per cent of the whole. Muds are largely inorganic with only a small mixture of organic debris.

Physical Properties of Peloids

Physical properties of peloids, which are ready to use (rather than as they occur in their natural state).

The specific gravity of peats and moors as prepared for clinical use does not differ much from that of water—it is 1.02 on the average. The specific gravity of mud is considerably higher—about 1.6. The sediment volume is the space which one-gram of dried peloid occupies after sedimentation from an excess of pure water after 14 days. In peats and moors, it amounts to about 33 cm; in mud it is only 1.8 to 2.3 cm.

SWELLING CAPACITY is the ratio of the sediment volume of the peloid in its native state to the sediment volume of the finely ground dried peloid. It is about 6-12 in peats, about 5-9 in moors and between 1.3 and 3 in muds.

The WATER CAPACITY of a peloid is the maximum weight of water which one gram of total solids of a peloid is able to hold permanently when it is allowed to remain at room temperature for a week with evaporation prevented. Peats exhibit the highest water capacity - about 14 to 25 g of water; moors show a lower and muds the lowest - about 1 g.

The THERMAL CONDUCTIVITY is the number of calories transmitted through a slab of peloid 1 cm thick, presenting a surface of 1 cm². in one second when the thermal
difference between both surfaces is 1C/33F. In peat and moors it is about 0.00112 and in mud applications between 0.00118 and 1.00169C/33F.

The **specific heat** is the amount of heat expressed in calories needed to warm one gram of peloid 1C/33F. It is about 0.93 for peats and moors and between 0.6 and 0.87 for muds. The **heat capacity** equals the specific heat multiplied by the specific gravity. The **heat retentivity** is the power of the peloid to retain its heat. It indicates how many times slower heat is transmitted by the peloid to the body than by water of the same temperature. For peats and moors it is 7.3, for earthy moors it is 5 and for muds 4. **Thus a peloid bath or pack is a much gentler procedure than water application of the same temperature.**

**Biologic action of peloids**

Peloids are administered as a semi-fluid poultice. In a water bath, the body is buoyed by a force equal to the weight of the water displaced, hence most movements are facilitated. In a peloid bath, the subject must overcome the resistance which the semi-fluid environment offers to every movement. The most important property of peloids is their ability to transmit heat since they are used only as warm or hot applications. Heat is transferred by (a) convection, (b) conduction or, (c) radiation. In a water bath, heat is conveyed to the immersed body mainly by convection whereas conduction and radiation are relatively unimportant. In a peloid bath, transfer from the bath to the body takes place chiefly by conduction since there is no motion of the peloid particles. **Compared to water, peloids are poor heat conductors.** As heat exchanges between the body, and the warm peloid mass occurs first only in a thin layer of the bath medium adhering to the skin. This layer forms an isolating stratum and through this further heat is transmitted to the body. This means that the peloid bath may be employed in higher temperatures and that in it, heat is imparted to the body in a more uniform and steadier way than in a water bath. The point of thermal indifference (tepid bath) is 93 F. for water but 100.4 F. for peloids.

**Topical applications of peloids** induce local hyperemia and hyperthermia. General elevation of temperature does not occur unless the local application is followed by a full dry blanket pack. In a full peloid bath at a temperature of more than 107.6 F., the systemic temperature may rise in half an hour to 100 F., the respiratory rate increases and may become irregular. For this reason, full peloid baths should be given for less than 25 minutes. In a bath, the **perspiration** can evaporate only from the head but as soon as the client leaves the bath abundant sweating appears on the entire body, the more so if he is wrapped in a dry blanket pack. In such a case, the client can lose up to 1.5 liters of water through perspiration. The **pulse rate** rises and the blood pressure falls. The initial production of goose flesh which occurs at the beginning of a hot water bath does not appear. There is a dilatation of peripheral vessels and the **hyperemia** increases the local metabolism and thus the activity of old chronic inflammatory processes which contribute to their healing. **Heat exerts an analgesic and spasmolytic action,** both useful in the treatment of rheumatic diseases. As mentioned, the chemical composition of peloids is secondary since most of the compounds are incapable of penetrating the skin. Greater significance is often attributed to sulfur.
and its incompletely oxidized compounds such as hydrogen sulfide, alkaline sulfides and polysulfides. They can be RESORBED and incorporated easily into the chondroitin sulfate of the articular cartilages.

**ESTROGENIC SUBSTANCES WHICH HAVE BEEN DEMONSTRATED IN ORGANIC PELOIDS MAY BE ABSORBED THROUGH THE HUMAN SKIN.** This is probably one reason why peloids help in degenerative arthritis. As a result of the whole spa treatment, it has become popular to emphasize the alteration of the organism. The body, which before the "cure" was unable to master a chronic disease develops the capability of overcoming it. At any rate, a series of peloid baths is a stress which may act strongly on the pituitary-adrenal system.

Dry Brushing: With a skin-massaging brush, a sisal massage-glove or - as a substitute - a Turkish towel or a rough towel, the body is brushed from the feet upward. One begins at the right leg, then brushes the left leg, then the abdomen, which is brushed in clockwise spirals from the outside to the inside. The **purpose of brushing** is to improve the blood circulation of the skin. The brush should not be too stiff and should not be handled with force, because the skin should only be slightly reddened and should not show abrasions or welts.

Dry-brushing the whole body takes about 3 to 5 minutes. It is best when done in the morning. If one is used to it, one can do it with the windows wide open, but a draught should be avoided. If the body is brushed every day, it becomes dependent on this stimulus. Therefore, it is better to brush it only on some days a week, or to interrupt the brushing for a few days.

Dry-brushing is an excellent procedure for skin care. The thorough blood circulation to the skin, thus achieved, keeps the skin firm and youthful. Those who especially want the skin of their faces to look youthful and fresh through careful treatment are referred to the face affusions mentioned in connection with the water applications.

A full or partial bath with herb bath-oil is also an effective skin care for the whole body. The face is bathed by immersion in a basin, filled with a suitable herb infusion, for as long as one is able to hold one's breath. It is repeated several times for a total of about 8 to 10 minutes.

One can also cover the face with herb extracts or infusions. Yarrow and sage are suitable herbs. The face may be immersed, alternately, into two basins filled with infusions of both these herbs. A mixture of St. John's wart, pine, and eyebright is recommended for oily skins.

Impurities of facial or body skin (acne) can be successfully treated with plasters of healing clay. A paste of healing clay is prepared with cold or warm water and applied to the skin to be treated in a layer of about half a centimeter. The skin is then covered with a sheet, which is left on until the plaster has dried. The plaster can be easily washed off with warm water. Healing clay can also be prepared with the above mentioned herb mixtures.

Plasters of healing clay are also suitable for the treatment of oily skin. Dry skin treated with healing clay should be slightly moistened with pure, unperfumed skin oil after removing the plaster.

Moistening the skin with oil is a general part of skin care. Even in ancient times it was known that oil keeps the skin healthy, smooth and tight. However, one should only use pure vegetable skin oil. The oil is rubbed into the skin after dry-brushing in the morning or evening. One should not use more oil than the skin is able to absorb. An oily layer on the
skin should be avoided.

It is beneficial to rub in the oil by slightly massaging the skin (i.e. by stroking and kneading). This is recommended particularly for the daily skin-care of the face. With the forefinger and the middle finger of both hands, the skin below the eyes and at the lower jaws is kneaded in opposite directions while standing in front of a mirror. Then the skin of the face is firmly stroked upward, from the middle of both sides. Special attention should be paid to the outer corners of the eyes in order to avoid or to remove the undesirable “crows feet”.

As this shows, little time is needed for applying proper cosmetics which are simple, natural materials that do not cost much. Natural skin care not only gives better health, it also improves self confidence and makes us attractive to others.

Wet Brushing: Ablution: An ablation is a sponge or towel bath. A basin of water at 22C/71F. is used. The operator dips a cloth or towel in the cool water and, with the client lying on the side at the edge of the bed, which has been protected with a waterproof covering, sponges the face and neck. The operator then proceeds to sponge all parts of the body with as much water in the "sponge" as it will hold. The client turns onto the abdomen, and the back is sponged from occiput to coccyx; then turns onto the back for sponging of the chest and abdomen. It is also recommended that the "sponge" remain on the abdomen for as long as an hour after the ablation. Still another plan is to start sponging with the water at 22C/71F. and on successive spongings to use lower temperatures of water. The chief rationale for ablation is the reduction of temperature in fever.

Water "Hosing": Affusion: An affusion is the procedure in which water is poured from a pail or hose or is thrown or falls on the client seated or standing in an empty bathtub. The water may be given within the temperature range of 13C/55F to 22C/71F. It was the precursor of the shower and remains a part of the so called Kneipp Hydrotherapy procedures.

Wet Pack: Cloth wrung out of cold, neutral, or hot water may be applied to areas as small as the eye or as large as the body. Smaller applications are usually called compresses and have been used on the forehead, eye, throat, chest, or abdomen or around any joint of the body. When almost the entire body is encompassed, it is called a full wet pack. Until the advent of tranquilizing drugs, this and the continuous tub bath were remarkably effective ways to achieve sedation, without drugs, in the mentally stressed.

Steam Bath: Steam bath, or Sauna, are largely hyperthermic procedures earning a special place in Balneology. They are meant for the healthy rather than the sick, their purpose being prevention of disease and physical strengthening. Sweat baths were very popular in central and eastern Europe among the Slavs as described by the Moslem merchant Jbrohium Jakub in the tenth century.

The popularity of sweat baths spread to the West, where they appeared in German and Swiss villages. Heat was produced in a live place where water was cast on heated stoves. People rubbed their skin with scarves and whipped themselves with birch or oak branches to produce a hyperemia of the skin. The procedure was ended by a cold drenching, a cold bath or by lying in some cool place.

Arab and Turkish baths developed from Roman baths. After sweating had been induced, running water was poured on the body. The pools, exercises and gymnastics used by the Romans were not as common. After Napoleon’s Roman campaign in the
second half of the nineteenth century, sweat baths spread throughout Europe from France. In 1856, an Irish physician installed the first "Roman Irish" (or "Turkish") Bath in York, Ireland; they were hot air baths with cold and warm showers. The heat baths of JAPAN are not taken for cleansing, as washing with soap and a swimming precede the bath, but they are employed as treatment for rheumatism.

Physiologic Effects: The body tries to increase its heat loss through the skin and lungs. If the environmental temperature exceeds that of the body, the only way to have heat is through sweating. As the cutaneous circulation increases, heat is accepted more readily by the body from the environment. Body temperatures range from 37.6C/99F. to 40C/104F., thus the physiologic changes that occur during the sauna are due to the rise in body temperature and due to the influence of the reflexes of hormonal and nervous systems which attempt to increase the heat loss. METABOLIC RATE: 12% to 20% increase CIRCULATION - PULSE RATE: 30% to 40% increase pulse rate increases less in persons accustomed to sauna than in those taking it the first time. ARTERIAL BLOOD PRESSURE: Systolic blood pressure FALL of 10.4 mmHg INCREASE of 5 to 20 mmHg when water was thrown on the stones; DECREASE to starting values when effect of steam passed; DIASTOLIC BLOOD PRESSURE ONLY SLIGHTLY DECREASES. VENOUS BLOOD PRESSURE: Increase by 60 percent in healthy clients. Increase by 40 percent in hypertensive clients. Due to dilation of skin vessels and the opening of arterio venous shunts.

Sweat: No marked LOSS OF FLUID occurs through the lungs, since high humidity saturates the inhaled air with water vapor as the air cools in the respiratory passages, great individual variations in MEAN WEIGHT LOSS AND ELECTROLYTE CONTENT OF SWEAT. (Sodium, Chloride, Potassium)

Finnish Sauna: Its single and important purpose is HYGIENIC CHANGES:
1. Immediate rise in body temperature
2. Influence on reflexes, hormones, and venous system, which tries to help the body lose heat.

Hydrotherapy Showers

Shower: It is an application of water by an apparatus that drives or throws water upon the surface of the body or any part of it. It permits variations in the striking pressure, the number of streams of driven water, the total quantity of water, and the temperatures of the different streams of water used.

Jet Shower: The simplest form of shower is a single stream of water applied through a device identical with a garden hose and having an adjustable nozzle. The operator stands at a distance of three meters (nine feet) from the back of the client and directs the flow of water between the shoulder blades, up and down the back, and up and down the extremities. The operator may start with the water at a neutral temperature and lower or raise the temperature. The operator may also raise or lower the pressure of water or increase his distance from the client for more or less stimulation.

Fan Shower: The fan shower differs from the jet shower only in the shape of the projected stream. Although this can be accomplished with a fan-shaped nozzle, in practice it is usually achieved by placing the thumb over the water as it emerges from the fully opened nozzle opening so that the water "fans" out. Some operators like to alternate
the fan and jet shower during its application by using the finger control. Rain Shower: Water pipes can be arranged in many ways and with many outlets in a circular, triangular, or quadrilateral fashion so that water may be thrown against the body at many different levels and at different intensities and temperatures. Such a shower has been called the horizontal rain or needle shower.

Scotch Shower: This is another way of saying alternate shower. The operator works at a distance of three meters (nine feet) or more from the client near a water control panel. The operator holds a water hose and is able to vary the pressure and the temperature of the water. The usual procedure is to throw hot water at the client from one to three minutes and follow it by cold water for one fourth to one sixth the time of the warm application. The temperature range of the hot water is from 38°C/100°F to 50°C/122°F., and that of the cold water is from 13°C/55°F to 22°C/71°F. The Scotch Shower begins with hot water at only 38°C/100°F. applied for one minute, followed by cold water at 27°C/80°F. applied for ten seconds. Each day the hot water can be made a degree hotter until 40°C/104°F. is reached and the cold water 1.5°C/34°F. colder until 11°C/51°F. is reached. The duration and rate of change must be guided by the response of the client.

The Scotch Shower is usually given to persons for whom an increase in mental alertness is desired or to those who feel the need of a "tonic" shower.

Vichy Shower: This is a technique developed in Vichy France, which is given in the recumbent position (the Aix-les-Bains is given in the sitting position). The client is supine on a canvas cot, which is covered with a sheet of perforated rubber and an air pillow to support the head. The Shower may be prescribed as tonic or sedative. For the tonic shower, a fan spray is applied to the sides of the trunk and the abdomen, avoiding as much as possible the gall bladder area, at a temperature of 36°C/97°F. at the beginning, which is raised in three to five minutes to 41°C/105°F. The shower is followed by a short, partial jet spray in the standing position. For the sedative shower, the water is applied to the abdomen at a temperature of 36°C/96°F to 37°C/98°F. with virtually no pressure for two to four minutes in a circular or spiral motion. This shower is usually followed by one in the standing position, as mentioned for the stimulating type.

Methods and Recommendations of Spa Therapy

Indication Example: Rehumatism, Arthritis

There was a time when the principal treatment at a spa for rheumatic diseases was waters and peloids. This has changed. Spas use all other recommended methods including all forms of physical and drug therapy simultaneously. This complex spa treatment is especially indicated in more serious cases. The term cure (French) and Kur (German) in connection with spa therapy does not mean "healing", but as in Latin, TREATMENT or therapeutic course.

Acute rheumatic diseases are not suitable for spa treatment. A client who suffers an attack of acute rheumatic fever must not be admitted to a spa "cure" until three months after all clinical and laboratory tests show no signs of activity.

The most important INDICATIONS for spa treatment are inflammatory and degenerative disorders of the locomotor system. Spa therapy must be considered as a
more or less significant part of the overall therapeutic plan and by no means as a medication which can replace or make superfluous all other forms of after-care. Chronic rheumatic diseases usually require medical care for years to avoid deterioration. The spa "cure" must be extended to at least four weeks and some times to seven weeks; shorter periods are usually unrewarding.

Of the inflammatory joint diseases, RHEUMATOID ARTHRITIS is most often referred for spa therapy. Its management consists of administration of thermal baths daily or every other day, according to the general condition of the client. Similarly, the duration and temperature of the baths must be adapted to the individual or delayed since vigorous treatment given too early can provoke an exacerbation. The reaction of the rheumatoid arthritic to the first baths must be followed as a guide to prescription changes. The first week of treatment is a kind of touchstone for the entire "cure". The reaction of the client decides whether further treatment will be mild, moderate or intensive. If there is an elevation of temperature, elevation of the sedimentation rate or fatigue, further treatment is at a relatively low temperature for short periods. Dry blanket packs after the bath are shortened or omitted completely and bed rest is prescribed for the whole morning.

On the other hand, when the baths of the first week were for no more than twenty minutes at a temperature of about 99F/37C., the DURATION and TEMPERATURE are INCREASED. Baths are often alternated with peloid applications on a part of the whole of the body. Even if the client tolerates the strongest treatment, at least one day of rest, free of any treatment is ordered. A thermal pool where REMEDIAL EXERCISES are done under supervision is indispensable to the program. The integration of all forms of treatment based on clinical and laboratory responses will attest to the skill of the consulting physician.

In spas where only peloids are available, peat or moor baths and topical packs are applied alternately.

THERMAL MUDS ARE FOUND ONLY IN AREAS WHERE THERE ARE NATURAL THERMAL SPRINGS. Ankylosing spondylitis is another inflammatory joint disease which can be benefited by spa treatment. The management of this disease in the spa is similar to that of rheumatoid arthritis, the difference being that even more attention must be devoted to therapeutic exercises in this condition, for these reasons: A. Ankylosis of the spine can be delayed and possibly prevented by exercise, B. Atrophy of the dorsal muscles can be avoided by daily remedial exercise, and C. Dorsal kyphosis can be prevented or halted by a good exercise program. Sufferers of this ailment should be referred only to those spas where there is a competent staff of physical therapists, a pool of the right temperature, size and construction for underwater exercises.

Complex Spa Therapy

Spa therapy is an institutional program which combines regular treatment with the natural remedial resources of a health resort. The sojourn at the watering place is no longer a distraction and relaxation combined with some baths, mud and drinking. It is a serious attempt to enable the man who cannot undergo a systematic course of treatment at home, owing to the haste of twentieth century living, to devote a period of four weeks to receive thorough medical care. During that period, he is asked to follow a prescribed diet, to take regular meals, walks, and in short, to lead a healthy, ordered life with sufficient sleep. The client should also learn what to do in the months to follow. The client should accept a schedule of daily exercise. preventive positioning during sleep. and the
need for a sensible diet.

Spa Programming: Spa therapy is a complex procedure resulting in many different stimuli acting on different joints of the body through thermal, chemical, medicinal and last but not least psychological functions.

At every spa, there is a variety of material agents supplemented by artificial conditions. The natural factors which are always important are the directic and balneolgic. In addition, there are the pools and (physical) spa-therapy departments which not only offer hydrotherapy but also all other physical agents. Just as there is no routine prescription for drugs and diet, there is no routine prescription for spa therapy-programming. The program must be adapted to the condition of the client and then modified, depending upon their response to it.

It is often practiced that clients are given a booklet that indicates instructions for the spa program - bath, drinking of water, if any, duration of rest period, the occurrence of bed rest, sleep, a detailed diet, the recommended sports and recreational activities.

The booklet also contains a regimen to be followed at home.

It is not possible to give a general since it is a composite, which is related to a knowledge of the program participant, the person's level of activity, and a thorough understanding of the natural therapeutic agents of the spa combined with the programmer's skills to use them.