Bailine - The scientific Basis.

Bailine is a system designed for women who have a desire to lose weight and/or reduce their figure measurements. It incorporates the use of an individual training and figure-shaping plan, combined with a personally tailored nutritional programme. In conjunction with these programmes, a computer controlled training simulator specially developed for Bailine is used. The Bailine system is of Scandinavian (Norwegian) origin.

Bailine takes a scientific approach, not only in regards to the electronic training; but also in regards to nutrition, physical exercise and motivational methods. Bailine uses exercises that were initiated by Svein Hetland, a trainer from 'Norges Idrettshøyskole' (Norwegian University of Sport and Physical Education).

A few critics are skeptical about the use of our electronic training simulators. We substantiate this by drawing a parallel to the electro training used by medical personnel to help build up muscle mass on patients.

The training simulators used at Bailine are an integral part of the overall plan as they allow the clients muscles to be activated prior to starting a reduced diet.

The reason why so many people experience a weight gain after slimming is that muscle mass was reduced instead of fat. To demonstrate this, we can refer to a scientific project that showed that unfit people can lose up to 41% of their muscle mass when on a diet, whereas with a little exercise they can lose 23% of their muscle mass. (Ref: Article by Phd. Strømme, 'Norges Idrettshøgskole' (Norwegian University of Sport and Physical Education), in the journal 'Norsk Legeforening' (Norwegian Medical Association)

The use of the electro training, both before and after slimming, will build up and maintain the muscle mass during the period of slimming so that even if the muscle mass increases, the body measurements will decrease and the client will look visibly slimmer. This is because one pound of fat occupies four times as much space as one pound of muscle.

The use of electro training may help break the vicious cycle that obese people find themselves in when trying to fight the metabolic syndrome. A person with an unfit, weak, and obese body, slimming on a meagre diet will easily lose muscle tissue, as there isn't much to begin with. For someone like this, electro training can be a vital start.

There are many research reports that document the fact that electro training builds up the muscle mass on injured patients. The Danish researcher, Dr. Thomas Mohr, has established that the electronic stimulation of paralyzed muscles gives an increase in the maximum oxygen intake of 20-100 % - and an increase of muscle mass of up to 40 % (dadlnet.dk the 10th of April 2000). Patients reported that the electronic exercises gave them a feeling of well-being; similar to the feeling you get during and after exercising. There is also documentation that states that electro training has a pain relieving effect and that it can benefit people with chronic pain.

Surveys in Sports Medicine 14 (2): 1992 show that even healthy people can benefit from the effects of the electronic muscle exercises and gain stronger muscles. J. M. Kots (1971) established the fact that the muscle power can increase from 38 % to 50 % after only 19 days with electro training. Research reports establish that the strength gain is not only achieved by healthy people, but also for trained athletes.

Russian weight lifters made use of Electro training in the Munich Olympics in 1972. Electro training was also used on the personnel onboard military submarines to maintain their muscular systems. NASA has made use of electro training on the astronauts in their space research programme to prevent the loss of muscle mass at weightlessness.

At Bailine, we also recognize the fact that it can act as effective motivation for women who have no time for the gym. Our own surveys show the majority of those who participate in a Bailine programme are self - motivated to be more physically active.

At Bailine we do not disagree with the opinion that it is more effective to exercise and to run for hours in the fields or meadows rather than relying on electro training: but experience shows that this is not desirable for many people.

This is why we regard Bailine as a good alternative for people who do not have the opportunity or the desire to take the time to go to a gym or to go running.

We can also refer to statements of satisfied customers from the Bailine salons worldwide.

How Does Electronic Muscle Training Work

The activity in the nerves and muscles in humans are of an electric nature. The nervous system transports signals from one place to another. Its functions are partly sensory and partly activating. Sensory neurons carry nerve impulses from the sense organs in the body and the brain along the afferent nervous fibres. They are also activating; the brain sends out signals in the form of nervous impulses along the motor nerves to stimulate muscle contraction. No matter how the muscles are stimulated whether it's through the nervous system or through electric or chemical stimulation, each nerve fibre will increase in thickness and strength, if the muscle stimulation is repeated consistently. The musculature is full of veins and the muscle fibre is surrounded by a web of capillary veins. Most of these capillaries will be closed when the muscles are resting and with physical activity these small veins open and blood runs through the muscles. The blood supply increases with physical training. (Ref. Professor Dr. Christian Devon M.D., professor of nutrition at the Nutritional Institute at the University of Oslo.)

The purpose of electric stimulation of nerves and muscles in humans is to imitate the natural process. When a device delivers electronic impulses that correspond to those that normally go through the nerve cell membrane in a nerve impulse, we get exactly the same muscle contraction as normal.

To summarise: Electrodes or 'pads' are placed on the body at certain points, targeting the muscle groups. The device sends out weak electronic impulses that can be regulated in strength and duration, to suit each individual. The impulses create a rhythmic interchange between contraction and relaxation, similar to the effects felt during skilled physical training.

It is important to stress that there is no difference in principle between the normal electric activity in nerves and muscles and the electric stimulation that is created with an electronic simulator.

Electro-treatment Is Nothing New

Electro-exercises were used by the Russian weight-lifters during the Olympic Games in Munich, 1972. Electro-exercises are also used on military submarines to keep the crews musculature fit. NASA has used electro-exercises for their astronauts in space programmes to prevent muscular deterioration during weightlessness.

Ancient physicians used electric fish to provide electric shocks to the head to treat headaches and other ailments. They created static electricity by rubbing amber and applying it to the painful area. In 1600, Elizabeth I's physician, William Gilbert, used the word "electric" for the first time in a paper – derived from "electra", the Greek word for amber; as a term for the power that made the senses quiver and the limbs to move.

The Italian physician and professor of anatomy in Bologna, Luigi Galvani (1737-1798), discovered in 1780 that the muscles in a frog's leg contracted when they were introduced to electricity. Even though, the Greek physician Claudius Galenos, had previously, in 1320, classified the nerve cells by motor nerves and sensory nerves. This was rediscovered by Charles Bell (1174-1842) and Francois Magendie (1785-1855), who initiated the first experiments with electro puncture; electricity through needles into muscles and nerves.

The French physician Guillaume Benjamin Duchenne (1806-1875), researched and improved the electrotherapy throughout the 1830's, and he may well be called the father of electrotherapy. Duchenne was the one who started applying electrodes to the skin.

The development of electrotherapy and technology for a variety of purposes has been fantastic during the past hundred years. Patients with certain paralyses and other nerve injuries have a new and better life; others receive help for chronic pain and epileptic seizures. For those who want to reduce their weight, it has recently become a useful aid. Electro-exercise can also show a skin toning effect.

Thomas Mohr: Electronically Stimulated Muscle Training of the Lower Extremities for People with Injuries to the Spinal Cord.

The following is an extract of a 6 page overview article in dadlnet.dk, April 10, 2000.

(Complied for Bailine by Olav Nøkling, M.Sc.)

An injury to the spinal cord will cause immediate upheaval in the patient's life, usually a young person. Recently, there has been intense research in starting muscular activity through electric exercise, so that the injured can stand, walk, grip and breathe, alone. The development varies from the simple and primitive, to complex computerized stimulation, but there is still a long way to go.

Electrically stimulated bicycle training is used for spinal cord damages all over the world, and is in many ways better than exercising the muscles that are not affected by the injury.

The first months after the injury, we see significant muscle atrophy, hardly any muscle activity, low sensory ability and blood flow and deterioration of the cardiac musculature. More effects include; insulin resistance, usually diabetes II, and loss of minerals in the skeletal tissue.

Electric stimulation of paralyzed musculature provides a sense of well being, increased maximum oxygen intake, increased muscle mass, increased insulin stimulated glucose intake and better mineral status in the lower extremities.

Electro-exercise is now computerized, with sequential stimulation of several muscle groups, so that the movements are similar to those of rowing or cycling. Electrodes are placed on the skin over the muscles due be exercised and have a single-phased, pulsing currency 10-30 Hz(Hertz), with a pulse width of 200-400 micros and a currency of up to 150 mA (Milliampere). Some series have used up to 300 mA, but for safety reasons only 150 mA is used in commercially accessible equipment. A currency of 60-80 mA is very painful to people with normal pain threshold.

Physiological Effects of Electro-exercise

The exercises will often last 15-30 minutes at a time, once or several times a week. After a **few minutes of electro-exercise, the heart rate increases by 30-50%, this is far less than the maximum that an injured person is capable of working. .** The heart's volume is doubled – from 4 to 8 litres per minute – and the blood flow in the legs increases accordingly. The oxygen intake after 5-10 minutes will increase from a normal resting level of .2 litres per minute to 1-1.5 litres per minute. The patients report that the electro-exercise produces a feeling of well being, similar to the way a healthy person feels after exercising. .

Maximum oxygen intake is the usual measure of physical form. After a few weeks of electro-exercise, the maximum oxygen intake increases, and it increases even further if the intensity of exercise increases. There have been reports of increases off 20 to 100 %, precisely like non-injured people.

Electro-exercise has increased the circumference of the thigh by 5 %, but the actual cross section of the thigh has increased by 12 %, as shown in MR scans. Even after 20 years of paralysis, one can achieve almost normal musculature after a few months of electro-exercise. A few studies have looked at the glucose metabolism after electro-exercise, and after a longer

period of exercising, have found increased insulin stimulated glucose intake and increased glucose transport protein (GLUT4) in muscle cells, and therefore diabetes 2 is prevented.

Conclusions and Perspectives of Electro-exercise

Inactivity over years causes serious changes in spinal cord injuries, but many of them can be reversed through electro-exercise. But this exercise takes time and assistance, and the positive effects will only be achieved if the exercise is regular and lifelong. It has been shown that users generally have more of a lasting interest in exercising if it is done in a training centre instead of at home.

There is significant evidence that electro-exercise will be used in many more fields. Therefore, in 1995 an international body was formed: The International Functional Electrical Stimulation Society, which holds annual conferences.

(Thomas Mohr is physician and researcher at the anesthesiological department of the general hospital [Amtssygehuset] in Glostrup, Denmark)

Positive Effects of Electro-exercise With the Bailine Simulator

(Prepared for Bailine by Olav Nøkling, M. Sc.)

Electro-exercise has been used systematically in medicine and sports for at least 40 years, but little has been reported in serious scientific literature until recently. The effects have however been so positive, that the Russian weight-lifters increased their strength even more with electro-exercise in addition to normal exercise, even before the 1972 Olympic Games in Munich.

The Danish physician and researcher Thomas Mohr has written a 6 page article in electro-exercise with spinal cord injured on dadlnet.dk, April 10 2000, where a series of positive effects of electro-exercise – similar to normal strength exercise – are confirmed.

The Norwegian State Council for Nutrition and Physical Activity show in their report 1/2000, chapter 6, and an overview of the research based knowledge about "Obesity and physical activity". It is stressed there for the first time from official Norwegian authorities that strength exercise is of vital importance for the metabolism and those who are overweight, and *not* endurance exercise. That does not mean that one should not go for a long walk also, but for *other* good reasons. The council says: "Musculature that is not stimulated and used sufficiently, will in time become weakened and smaller. Because the muscle mass is the body's largest energy consumer, reduced muscle mass will result in the body using less energy throughout the day, and the resting metabolism decreases. The lower the muscle mass, the lower the resting metabolism."

According to the Council: "The total amount of energy used during physical activity consists of both the energy that is spent during the activity itself and also the energy that is spent in restitution; weight training seems to provide better after- effects than normal aerobic training. This after-effect of physical activity is beneficial in keeping weight down".

The Council continues: "Because the resting metabolism (RMR) normally represents the major part of the energy spent in a day, even a small increase in RMR will be of relatively large importance. As mentioned earlier, the body's total muscle mass has a decisive impact on the size of RMR. Therefore, increased habitual physical activity will lead to increased RMR through increased muscle mass. Most studies conclude that if the fat free body mass (FFM), or muscle mass increases, RMR will increase. The largest effect is found after intense weight training, but normal aerobic training can also stimulate RMR." The Council also states quite clearly: "Weight training can be useful in the treatment of obesity. During such training it might happen that the muscle increase and the decrease of fatty tissue outweigh each other, so that the body weight remains unchanged."

Since Thomas Mohr has established that electro-exercise works in the same way as normal strength training, we can assume that muscle activation with the Bailine simulator has the same positive effect as those mentioned by the Council. Nevertheless, the Bailine simulator must only be regarded as an aid – a flying start – for healthy but obese women, to start normal strength training and also some endurance training. However, experience shows that people with a sedentary life-style need all the help possible and motivation to become more physically active in their everyday lives. Therefore, electro-exercise will be a valuable supplementary training for many, in addition to their own physical exercise.

Strength training has a number of disease-preventing effects, especially against diabetes; electro-exercise might be just the means to set things moving.

The History of Electro-exercise

The Pioneers

The history of electricity combines with the history of electrotherapy. Ancient physicians used electric fish – especially the electric ray, or torpedo fish – to give electric shocks of 100-150 volts to the head to treat headaches and other ailments. They created static electricity by rubbing amber and applying it to painful areas. In 1600, Elizabeth I's physician, William Gilbert, used the word "electric" for the first time in a paper – derived from "Electra", the Greek word for amber – as a term for the power that made the senses quiver and the limbs to move. This was static electricity, which was later used by Benjamin Franklin and many others to treat paralysis.

But in the 18th and 19th centuries, there came a whole new systematic approach to electrotherapy. The Italian physician and professor of anatomy in Bologna, Luigi Galvani (1737-1798), discovered in 1780 that the muscles in a frog's leg contracted when it was introduced to electricity. And during the next six years, he discovered that it was not necessary to introduce electricity from the outside; the muscles contracted when two different metals that were in contact with each other were connected to a nerve and a muscle. Galvani had in reality discovered electric current, but he was not aware of it himself. His interest in neuro-physiology led him to view his experiments as a proof for the existence of *animal electricity.*

It was professor of physics in Pavia, Alessandro Volta (1745-1827), who came to realize what Galvani had discovered, because in 1795 Volta demonstrated how to make electricity without using animals at all, by simply connecting two metal pieces through a liquid or a damp cloth, creating the first electric battery, called Volta's column. Galvanic batteries soon became a necessity in all well-equipped laboratories, even though they were expensive.

The English chemist and physicist Michael Faraday (1791-1867), must also be mentioned, because he devised the modern science of electricity through his great work, published between 1831 and 1856: *Experimental Researches in Electricity*. Thus electricity was something that could be produced in adequate quantities and forms for many different electrotherapeutical (medical therapy using electric currents) ends:

- Galvanic currency to what was called galvanisation or galvanotherapy.
- Induction currency for faradisation (to stimulate a muscle with faradic current).
- High frequent currents for diathermy – heat treatment.
- Treatment due to static electricity - franklinisation.

Even though the Greek physician Claudius Galenos had in 1320 classified the nerve cells into *motor* and *sensory*, this was rediscovered by Charles Bell (1174-1842) and Francois Magendie (1785-1855), who initiated the first experiments with *electro-puncture* – electricity through needles into muscles and nerves, which resembles today's acupuncture. They achieved the intended muscle contractions, but also pain and they really didn't know how to use the discovery.

The French physician Guillaume Benjamin Duchenne (1806-1875), did not give up electro-puncture, but researched and improved it throughout the 1830's; he may well be called the father of electrotherapy. It was Duchenne who started with electrodes applied *on* the skin, and his source of electricity was the generator for alternating current that Faraday had constructed

in 1831. Duchenne let his patients sit half naked and bare-footed with their feet on a copper plate which was connected to one of the poles on the generator, whereas the other electrode was a wet sponge or the therapist's hand on the area of the body that needed treatment.

Duchenne was the most gifted neurologist of his time; his determined and time consuming methods of experiment set a standard in neurology, which still prevails. It would take many pages just to list his most important contributions to neurology, but in his book on electrophysiology, *De l'Electrisation localisée,* he writes a model clinical description of poliomyelitis (viral disease), which has been of great help for physicians to this day. The academies of Rome, Madrid, Stockholm, St. Petersburg, Geneva and Leipzig honoured him with fellowships and other signs of respect, and he was invited to King Philip IV of Spain and to Queen Victoria. But in France, he never experienced anything like this, even though the other neurologists called him their friend and mentor. He preferred academic independence and the intense discussion welcome at all clinics, but not tied to anyone.

In the 1840's, some researchers started to observe injured muscles and electricity, and discovered that paralysed muscles reacted to galvanic currents, but not to faradic. And it was also discovered that duration and intensity of current was decisive if the muscle contracted. It was only in 1916 that the English physician, professor and later Nobel Prize laureate Edgar Douglas Adrian (1889-1977) drew duration/intensity graphs for intact muscles in humans and for muscles with different degrees of injuries to the nerves.

The heart muscle was also studied and stimulated electrically. Previously, in 1887 Augustus Waller (1856-1922) proved electromotoric changes in the heartbeats, which he later published in the form of electro cardiograms. And in 1931, the cardiologist Albert Hyman did the pioneering work that lead to the pacemaker, by showing that animals with cardiac arrest could be saved by electricity. In 1952 Paul Zoll showed that an artificial pacemaker could keep a human heart running, at least for a limited period of time. And in 1958 Seymour Furman and John B. Schwedel managed to help a patient with a pacemaker for 96 days, without complication. Today millions of people walk around with implanted pacemakers – living proof for one of electrotherapy's greatest triumphs.

Electrotherapy Today

The last century has seen a formidable development of electrotherapy and electro technology. Paralysed patients and others with injuries to the nerves have a new and better life, others are helped with chronic pain and epileptic seizures, lots of examples could be mentioned.

The Danish physician and researcher Thomas Mohr has written a six-page article for the Danish association of physicians (dadlnet.dk, April 10 2000) about "Electronically stimulated muscle training of the lower extremities for people with injuries to the spinal cord", and the following is an excerpt from it:

An injury to the spinal cord will cause immediate upheaval in the patient's life, usually a young person. In the past few years, there has been intense research in starting muscular activity through electric exercise, so that the injured can stand, walk, grip and breathe alone. The development has included the simple and primitive, to complex, computerized stimulation, but there is still a long way to go. This article only deals with muscular training.

After an injury to the spinal cord, we see degenerative changes in several tissue and organ systems that resemble ageing. The first months after the injury, we see significant muscle atrophy and a shift in the relation between muscle fibres of type I and type II, with a large loss of the slower type I fibres and an increase in mass of the glucose and fast type II fibres. The

muscle atrophy, the lack of muscle work, decreased sensibility and blood flow increase the risk of sores from pressure and lying down; decubitus. The heart muscle also becomes smaller and the ability to take in oxygen to the blood gets worse with the paralysis, similar to other inactive people. Cardiovascular diseases are common among the paralysed and at a younger age than in the rest of the population. Several of the metabolic parameters that are seen as risk factors for cardiovascular diseases are alarmingly high in physically inactive people with injuries to the spinal cord: High levels of cholesterol lower HDL-cholesterol, low glucose tolerance, weakened insulin resistance and several cases of diabetes 2. The injured will also have their skeletal tissue halved during the year, with subsequent heightened risk of bone fractures.

Many people with spinal cord injuries train their upper bodies to keep fit, but this is not enough to improve the condition of the whole body, especially not on the paralysed lower extremities and electro-exercising this area has more benefits than normal training. Many types of electro-exercise have been tried, both stimulation of a single muscle group and computerized stimulation of several muscle groups. In the USA, one test has concentrated on electro bicycle training, with electrodes applied to the skin over the muscle groups in question with feedback from a sensor on the bicycle's crank, so that the paralysed lower extremities can make cycling motions to varying resistance. These electro-exercises take place one or more times a week, 15-30 minutes each time, and after a few minutes exercise, the pulse rate goes up by 30-50% - which is far less than with the same kind of exercise in a non-paralyzed body – and the heart's volume per minute increases from 4 to 8 litres. Both blood flow and oxygen intake is highly improved in the paralyzed body during exercise. The electro-exercise gives the paralyzed person enormous joy and happiness – not least by seeing the legs move and work – and by the good feeling of being tired afterwards. Such bicycle training has increased the cross section of the thigh by 12 %, and even after 20 years of paralysis and inactivity, some patients have regained normal musculature after only a few months of training. The persevering type II A fibres increase, as do capilarisation (high oxygen utilisation) and several aerobes, persevering type I fibres. The glucose metabolism also improves, resulting in a lower risk for diabetes 2

This exercise takes time and assistance and the positive effects will only be achieved if the exercise is regular and lifelong. It has been shown that the users have more of a lasting interest in exercising if it is done in a training centre, instead of at home.

We see today that electro-exercise will be used for an increasing number of purposes, and therefore an international organisation: *The International Functional Electrical Stimulation Society* was formed in 1995, to hold annual conferences. Today, there are commercial devices for stimulating completely intact musculature, sold under the slogan "no more sit-ups", and they promise visible and tangible results after 30 days. Is this perhaps the way forward for that part of the population who are prone to inactivity related life style diseases for some reason or other?

Thomas Mohr worked at the council hospital in Glostrup, Denmark, when he wrote this article: "There is every reason to believe that more directed *strength training* would have increased both muscle strength and volume far more than the reported 12 % increase in thigh-diameter, and in connection with weight-loss and obesity, which is an important factor. The reports of the safe and health-bringing effects of electro-exercise are the main points in Mohr's article, based on new and scientifically proven research. His pioneers could report positive effects of electrotherapy on their patients also, but they were clinical accounts and bear a resemblance of anecdotes to us today. With the new, international organisation for electrotherapy, we can expect more research, publications and specialist development, also regarding intact musculature with the overweight and obese.

From 1945 and well into the 1970's, it was commonly thought that electrical stimulation could not make healthy people or patients stronger. But, since working with weight lifters, we know better. "During the Olympic Games in Munich in 1972, I was psychologist for Leif Jenssen, the Norwegian gold-medallist in weight-lifting. I cooperated with the psychologist for the Bulgarian weight-lifting team, an ardent anti-communist. He told me in detail how the Soviets used electricity in addition to normal strength training to achieve their fantastic results, and although he didn't say it in so many words, it was clear that the Bulgarians did the same. Bulgaria was the best weight-lifting nation in Munich, and that didn't make my interest in electro-exercise any less!"

According to the nature of the problems and challenges we work with and dream of solving, we tend to see the *different* parts of the jigsaw-puzzle in the world around us. The weight-lifter wants to become even stronger, and concentrates on everything that can contribute to just that in research and training. But at the same time he doesn't want his competitors to become as good as he is. The weight-lifter and his team will *not* write enthusiastic articles for their colleagues about their last ingenious discoveries. The results of the effects of electro-exercise in weight-lifting and other power consuming athletic disciplines seldom leak from the leading research institutes in this field. In Norway the weight-lifters are those who know most about strength training, but they have actually never tried electro-exercise.

The physician, physiotherapist and the neurological patient dream of regaining as much of the normal strength and functions as possible, so that the patient can manage everyday life. They have written about their discoveries in prestigious specialised publications. Maximal strength has *not* been their foremost interest; neither has coordination of movement.

New Challenges

Now that the obesity-epidemic rolls from country to country, with the metabolic syndrome diabetes 2 in its wake, it is becoming important to people other than just weight-lifters to know how to obtain strong, powerful muscles through electro-exercise. Not because they want to break world records, but to get out of the vicious circle that obesity and metabolic syndromes draw around their victims. Stubborn exercise of an untrained, weak body – on a lean diet – will take its toll on the muscle tissue, which the obese person doesn't have too much of to begin with. Correct quantities of electro-exercise of the large muscle groups can be the remedy and a flying start to get along on one's own with a well-founded and tailor made strength training.

Organisations such as Bailine have vast experience in training overweight individuals; with its many salons in several countries through 25 years – and combined with the knowledge of weight-lifters, this can become a strong combination. A professor in sports – former Nordic champion in weight-lifting and a couple of first rate Dutch muscle physiologists, who can research the correct amounts of electro-training for the obese, will be the my ultimate dream of efficient training and electro-exercise for all overweight persons caught in the metabolic syndrome.

This is more than a dream, because Professor Rolf Ingvaldsen and his physiologists are alive and well at NTNU in Trondheim, and so are the weight-lifters and their organizations. Through 25 years, I have worked on and off with Kurt Bai and Bailine, and I see no reason to end that co-operation, not only because Kurt Bai is a pioneer in computerised electro-exercise for thousands of overweight ladies, but because the clients in Bailine are a far more interesting and relevant target group in this context than the ever slimmer sports students I taught during my 31 years at The Norwegian University of Sport and Physical Education. And

the future – which always marks the end of history up to now – starts every day, right at this moment!

Healthy and Slimming Exercise

Fad diets *without* exercise have never worked over a longer period of time. You get hungry, slack and lethargic, and you give up time and again. And you grow fatter and fatter, with increasingly less food. American researches have studied the connection between calories, obesity and physical activity, and have identified something they call *set point*, a kind of fat-thermostat that keeps the fat percentage in the body more constant than the food intake should signify. Set point is connected to a control centre in the brain, in hypothalamus. What is it that affects this set point, and what can we do ourselves to come down to a healthy and low level, so that the fat percentage is less than it is when we are overweight?

There is a connection between obesity and diabetes 2. Diabethologists (a specialized field of endocrinology) can have an interesting approach to excess weight and physical exercise. Richard K. Bernstein is a ground-breaking diabethologist, and his book - *The Solution to Diabetes*, is now available also in Norwegian. Bernstein has had diabetes I for over 50 years, he was an engineer before he became a physician, and he has an experimenting and tough approach to diabetes treatment and physical exercise. We can draw on his experience, his insight and his training advice.

The Significance of Physical Activity

The physical activity itself does not have much effect on the rolls of fat. When we walk, we only use 5 calories a minute, and because there are 7000 calories in one kilo of fat, we have to walk a little over 23 hours to get rid of that amount of fat, or 1 hour 40 minutes every day for two weeks. But the effect of physical activity is much larger than that, because in addition to the direct energy consumption, physical activity has other benefits, such as:

- a lower set point
- enhanced metabolism
- maintained and increased muscle mass
- better health and extra energy to *even more* physical activity.

If you diet *without* doing any physical activity, you lose the same amount of muscle and fat, through a process called *glykoneogenesis*, which means converting protein to glucose. This process breaks down the muscle tissue – instead of sugar – in order to get enough energy when you are not eating enough. When you go on the scales to weigh yourself, it looks good, but it is a double disaster: You lose valuable musculature, which you probably had too little of already, and the ability to burn fat diminishes. Both carbohydrate and protein can be transformed into fat and stored, but fat can't be transformed the other way. Fat can only be burned in active, working musculature.

What kind of physical activity is good for excess fat? It is normal to recommend light endurance training, like slow jogging in easy terrain. But if you study the bodies of those who have done this – *and only this* – consistently for a long time, you will see that they lack muscle fibre and are far too weak. The worst thing is that they run themselves to neuter and their legs suffer fatigue fractures at a young age. When so-called experts only recommend this kind of exercise, you can be quite sure that they have no experience with strength training and heavy manual labour. An obese and untrained person needs *both* endurance and strength.

If you plan to get rid of your fat quickly and brutally, by eating less and exercising more, you have to start with strength training *first*, especially strengthening the large muscle groups; legs, buttocks, back and stomach, because it takes time to adjust the muscles, sinews and tendons to proper strength training – six weeks for the back-stretching muscles.

Strength Training

For an untrained and overweight person, the heavy body is itself a good enough weight to lift, in exercises such as knee-bend. But many exercises will be far more efficient with a weight bar and we highly recommend one. Few PE-teachers and other people with athletic education know a lot about strength training, but *weight-lifters* have great knowledge.

The muscles are the largest energy consumers in the body. One kilo muscle tissue requires about 100 calories a day, but one kilo fat tissue requires only 4 calories. That's why the obese benefit doubly from exercising the muscles: They make you strong, and they are cannibals on your fat if you eat properly and avoid carbohydrates. Stop moaning that you don't want muscles! It is rolls of fat on top of your weak muscles you *don't* want. Your sexual hormones will make sure that the fat under your skin adjusts itself nicely around your well-trained muscles, and give you the *female* curves that can't be mistaken.

When you strength train – with or without a weight bar – you will achieve different results with different weights on the bar. We talk about how many repetitions – or *reps* – you can manage, and if the bar is heavy, you will of course not manage as many reps. We can use the following table:

Very large load/weight	Gives maximum strength	3-5 reps
Large load/weight	Gives larger muscles and strength	6-8 reps
Medium load/weight	Gives strength and endurance	8-10 reps
Light load/weight	Gives endurance	10-15 reps

Slow and thorough warm-up, at least 15 minutes, is important to avoid injuries, and always the same movements that we shall do with the weight bar or another load later. Then the cartilage in the back, knees and other places will have time to swell and form an extra thick and supple buffer between the bones in the joints. Running or cycling is a misunderstood form of warm-up for strength training; weight-lifters warm up with the bar! In the intervals between the warm-up exercises, we can do some knee-bends.

In exercises such as clean and jerk and snatch we must relieve the spine by up to 40 % by largely increasing the abdominal pressure. We do this by drawing the breath – up to 75 % of maximum – and holding the breath to keep the abdominal pressure up both when we lift and when we break down. When the bar is up, we breathe out, draw a new breath and keep the same abdominal pressure when we break the bar down as we did when we lifted it up. It is a greater strain on the knees and spine to break the bar down than it is to lift it up, but it gives even better strength training.

When we lift something heavy, such as a clean and jerk or a snatch, it is important, but difficult, to keep a small sway in the back. By looking up at the ceiling in front of you, that is to say to keep a sharp angled neck, it is easier to keep the back swayed. And by protruding your bottom – like Donald Duck – it becomes even easier. The world's best weight-lifters do both.

Novices to 'clean and jerk' have a tendency to use their arms too early and then the lift is unsuccessful. Weight-lifters say that the arms are only there to hold the bar, and that all the work is done with shins, thighs and buttocks – except a small jerk with the arms at shoulder height at the end of the lift. To learn to *not* use the arms too early, we can stand upright with a relatively light weight on the bar and jump resiliently two to three times without stopping, and then jerk the bar in the same rhythm, also without stopping. "Look how easy it was *now*," is the spontaneous reaction. And hence, the road to *more* resilience and strength with heavier weights lies open, in the finest and most difficult of all strength exercises.

For the novice, it is important to lift *correctly*: First with the bar itself, and after a while with weights attached. Think of speed and resilience – not toil. When the technique is reasonably good, it's time to move on to heavier loads, but that will put your performance to the test. With a lighter weight on the bar again, it will be easier to repeat the correct technique, before you move on to heavier weights again.

Strength training with heavy weights is *anaerobe* exercise, which leaves you out of breath, craving for a pause. Take that pause! We are *not* training endurance and fitness with the weight-bar. Breathless, unceasing lifting is misunderstood as strength training, but rather common in endurance sports, where the athletes lack both strength and the knowledge of how to achieve it.

After half an hour with concentrated lifting, you will start to get the right agility and resilience, and at the same time it starts getting easier and easier to lift the bar. Then you can keep on at bit longer – this is the enjoyable part of the exercise. But stop training whilst the going is good, before you are fatigued, and always with a successful lift.

Anaerobe and Aerobe Exercise

Strength training is *anaerobe* exercise, where you don't take enough oxygen through the lungs, so you have to take some oxygen through the muscles as well. So the muscles tire quickly and the requirement is of fourteen times the amount of glucose to do the same work as with *aerobe* exercise. In anaerobe exercise the muscles will be broken down the first 24 hours, and then built up again the next 24. There is no use in hard strength training more than every other day.

The muscles contain long fibres that contract during work, and they use high-energy ATP-molecules. These molecules are formed with glucose or fatty acids. Some muscle fibres use a process called *aerobic metabolism* to form ATP (adenosintriphosphate) from small amounts of glucose and large amounts of oxygen. These fibres are not so strong, but enduring, good for calm running, cycling or cross-country skiing. Other muscle fibres are stronger, but less enduring. They need energy quickly and must therefore produce high-energy ATP faster than the heart can pump blood to deliver oxygen. They manage this by a process called *anaerobic metabolism*, which takes large amounts of glucose and hardly any oxygen.

The fall in blood sugar levels during and after anaerobe activity is much greater than during aerobe activity, and to acquire enough glucose for the muscle cells – when the muscles increase in strength and volume – the glucose transporters in these muscle cells will increase immensely, and also in the liver and other places. As a result, the insulin's ability to transport glucose and suppress glucose production in the liver becomes much better, and therefore we require lower levels of insulin. The benefit is doubled: lower fat percentage and less risk of diabetes II.

Anaerobe metabolism produces lactic acid, which is released in the active muscle and hurts. If you stop the activity, it stops hurting immediately, so in anaerobe training there is much talk of *will and motivation,* and it is good to know about this pain. Research has showed that people who do a lot of anaerobe exercise – especially strength training – have a better self-image and are more sure of themselves than other athletes. And that might not be so odd: a person who has broken barriers by going through anaerobe mists of self inflicted pain and toil, has a better self knowledge than before and knows what she stands for. Anaerobe training environments are rather reckless, with a happy and care-free aggression, where jokes and self-irony reign. There are of course no limits on age and sex in such environments. Try to join up with a gang like this, or create your own. You will never regret it, and never quit.

Aerobe Quantity Exercise

Experience shows that we need at least 7 hours of brisk, hard activity a week, distributed over *all* the days of the week. More than three sessions of strength training – up to one hour every second day – is not recommended. Then we have at least four hours left for quantity exercise of aerobe intensity, or more, if you want. For the novice it is important to start off carefully, to avoid too much strain on tendons and joints. Good foot-wear and a friendly surface is important, but also variation in activities and physical surroundings. Choose rough and soft terrain instead of flat and hard. Don't just think of feet and road, but arms and oars, pedals and wheels. *Walk* to work if you can – grab a spade and dig the garden, saw and chop firewood. If you have children or grandchildren, *carry them* when they get tired.

You don't have to be as reckless and forceful with quantity exercise as with anaerobe training, but you need to change your habits and life-style. A dog or a friend to go for walks with can help when hours and hours of inactivity shall be replaced with daily activities. Or take out the old bike. Our society gives us less and less encouragement to do such activities, so it is important that you find out for yourself what is to be a part of your daily routine. We meet those who have managed, in all kinds of weather, on their way to and from work or in the woods. They look strong and content, and many of them are not young. You too can become one of them!

What Is So Good About Strength Training?

Most of our energy is spent producing heat – thermogenesis – to keep the body temperature up. Thermogenisis is the sum of:

- resting metabolism
- thermic effect of physical activity
- thermic effect of nourishment
- adaptive and regulatory thermogenisis.

The resting metabolism amounts to 65-75 % of the energy consumption, and decreases with age if the muscle mass decreases. Women have a lower resting metabolism than men, mainly because they are smaller and have smaller muscles, but in the week before menstruation, the resting metabolism increases by approximately 5%, probably because of increased production of progesterone, which produces extra heat. But otherwise it is the amount of well-trained muscle that determines the resting metabolism, and not if you are man or woman, young or old.

The thermogenisis increases significantly with heavy muscular work, depending on how active you are. With hard and heavy strength training, the energy consumption can be 10-15% higher than when you are resting, and it stays higher up to 48 hours after such training, or for as long as it takes to build up the deposits of glucose after such hard exercise. The energy consumption in strength training is therefore many times higher than what we knew only a few years ago, before the extra energy consumption *after* training had been measured. In the hours subsequent to hard strength training, the thermic effect of food and oxidation of fat also increases.

Research shows that we eat far less than the extra energy we use the first two months after we embark on a solid strength training programme, and the difference is taken from our fat deposits! Food intake and energy consumption will be balanced after a couple of months, but not if we increase quantity and intensity in the training. With a reckless motivation and will, we can keep the energy consumption higher than what we eat, to replenish it for even a few more weeks or months, so that the fat deposits are depleted even more before fat percentage, muscle mass and muscle quality is stabilised at the desired level. The resting metabolism becomes so much higher and better as the strength training improves the balance between fat and muscle!

Many overweight people have insulin resistance with associated high production of insulin to reduce the excess glucose, or the beginning of diabetes. This excessive gathering of insulin in the blood implies enhanced stimulation of lipogenisis in both the liver and the fatty tissue, not only in connection with meals, but also with an increased level of fasting plasma insulin. Solid strength training will probably work as a wonder cure to the insulin driven problems associated with overweight, largely because the muscles are capillarated and come in better shape, because they get stronger and because the fat percentage decreases. Strength training also stimulates the protein synthesis.

Research shows that in diets *without* strength training, 50-70 % of the weight-loss is fat, and the rest is loss of muscle. If you diet without working the muscle, the resting metabolism also decreases by up to 30 %, and the ability to burn fat decreases accordingly. This reduction in resting metabolism is far too large to be explained by loss of muscle mass alone. The body probably tries to counteract the negative energy balance – the under-nourishment – through adaptive thermogenisis, and the reduction of muscle mass is only a part of this adaptation. Repeated fad diets without muscular training makes this adaptation happen faster and faster, and it will take more time before the resting metabolism reaches a normal level again, and in the worst cases, the reduction of resting metabolism becomes chronic.

Strength training will effectively counteract a reduction in resting metabolism, also if the fat percentage should not decrease much. But, by combining strength training with a change of diet towards lower glycolic content, more protein and less fast acting carbohydrates, we get a super-effect: Larger and stronger muscles, less fat and far lower risk of diabetes and cardiovascular diseases.

Research shows that strength training makes middle-aged women (Miriam E. Nelson) and men (William j. Kraemer et. al. 1999) far more energetic and "younger" than any other form of exercise. In men, the hormonal vitalisation – increased testosterone, along with others – has been shown in detail, and there is reason to believe that the same applies for women, as Miriam Nelson allowed 40 post menopausal women strength train for a year, twice a week, 40 minutes each time, with the following results:

- Increased bone density.
- Their strength increased to what is normal for women in their late 30's or early 40's.
- Fat was substituted by muscle – 9 % increase in muscle mass and most of them went down several sizes in clothing.
- Happier, more energetic, active and self-assured women.

People who don't strength train lose a third of their muscle mass when they grow older, and the decline starts around 35 years of age, mainly due to physical passivity. That's what leads to fragility, not age itself.

If you are afraid of getting large, bulky muscles when you train strength – like a bodybuilder – you can rest assured, that won't happen. Women and men who start effective strength training *do* get larger muscles – the first six months – but after that it is the *quality* of the muscles that improves, not the quantity. But what is the reason that bodybuilders get these large, bulky muscles? The answer is simple: Anabolic steroids and similar drugs!

Olav Nøkling M. Sc.: Insulin and the Metabolic Syndrome

Insulin is a hormone that is produced in the pancreas, and that regulates our blood sugar. Blood sugar, or glucose, is formed by the food we eat – especially food that is rich in carbohydrate, like sweets, bread and potatoes. Glucose is the most important fuel when the body produces energy. During and after a meal, the glucose level increases and is regulated by increased release of insulin from the pancreas. The insulin ensures that the blood sugar deposits to the cells in the liver and muscles, but when the glucose deposits in the muscles and liver are filled up, the insulin makes sure that the excess blood sugar is deposited as fatty tissue. The insulin increases this fat-deposit by stimulating and enhancing an enzyme in the fat cells – lipoprotein lipase – which brings the fat-molecules from the blood and into the fat-cells. The insulin also causes the release of more fat-cells, even when the insulin co-operates with *cortisol*. The hormone cortisol increases when we suffer from psychological problems and stress.

More insulin in the blood means obesity and *also* when food intake and physical activity is kept at a constant level. *More* insulin also means better appetite. Insulin is a vital hormone since it transfers glucose from blood to cells, so with insulin deficiency, the glucose level in the blood will become dangerously high. That's *diabetes mellitus* or type I in a nutshell. Diabetes type II, on the other hand, is not caused by a deficiency in insulin, but that the cells for one or more reasons are resistant to insulin and transferring blood to the cells becomes difficult.

Overweight people have far too much insulin in their blood – hyperinsulinism –, including when they are fasting, just like people with diabetes II, at least 80 % of these diabetics are overweight. Hyperinsulinism, is most frequent among people who store fat around the stomach. Overweight people also *produce* much more insulin than others, often from childhood and this is believed to have genetic origin that it is passed on from previous generations. In reality, this means hypersensitivity to carbohydrates. The increased insulin production causes the body to react by producing even more insulin, to manage the constantly difficult task of getting the blood sugar out of the blood circulation! Incorrect diets and not enough hard muscle work increase the insulin production even more, and at the same time, the effect of the insulin worsens. This dramatic and dangerous condition is called *insulin resistance.*

It was previously believed that excess weight was the cause of hyperinsulinism. We now believe that insulin resistance is inbred, but that the condition gets worse with wrong diet and not enough physical activity. The diet is dominated by fast acting carbohydrates – both in food and drink – in a manner that is almost impossible to break away from, and attempts at light exercise, i.e. walking, will cost almost as much valuable fatty tissue as harmful fatty tissue.

Most overweight people have insulin resistance to a certain degree, and already have diabetes II, or are on the verge of getting it. The insulin resistance causes higher production of insulin, and that brings us to the core of obesity, because *more* insulin means that the glucose is transformed into fat and deposited at places where there already is too much fat. *More* insulin also means that the fat deposits are used less when the body needs energy. This double effect of *more* insulin means greater desire for sugar in the food, faster metabolism and use of the sugar we eat, and a need to eat more often and larger amounts. *More* insulin therefore means larger fat-deposits.

Insulin resistance causes the glucose level to increase dramatically in connection with a meal, a powerful signal for more insulin, in so much that the blood sugar decreases rapidly, often to a dangerously low level. This calls on other hormones to increase the blood sugar, but then the body's sugar deposits are depleted. The overweight person has low sugar-deposits and gets little energy from the fat she has deposited, so she will often be weary, exhausted – and hungry. Her hunger often has a desperate character, because the energy is running out and is directed towards the most easily digestible carbohydrate there is; e.g. sweets, white bread, cakes and chocolate. This is less about hunger than a desperate need to counteract the awful weariness caused by a dangerously low or steeply falling glucose level. In these desperate meals a lot of food is eaten quickly and new fat-masses are deposited.

If the overweight person pulls herself together and does not eat in such desperate situations, and continues with physical activity, the protein in the muscles will be broken down and used as energy. If this happens frequently, the muscles will grow increasingly smaller, and because the metabolism is related to muscle mass, the metabolism will be lower and fewer calories will be used than before. With fewer muscles and less fatty tissue, stamina and strength will deteriorate, and the overweight woman will move slower, when she has to move, and less if she doesn't have to.

Overweight women with good will power can quickly lose weight in this way, because when the muscles are broken down and used as energy instead of fat, the weight-loss is ten times faster. One kilo of protein doesn't have half the amount of energy as one kilo of fat, and muscles are one part protein and four parts water. Each kilo of muscle tissue has only a tenth of the energy that is in a kilo of fatty tissue.

Insulin works by tying itself to receptors on the cell membrane, and that is the start of a series of activities within the cell. The most important insulin-sensitive tissues in this context are the liver and the muscles. When the insulin is tied to the muscle cells, they increase their glucose absorption. After a carbohydrate-rich meal, 70 % of the sugar is deposited in the muscles, and insulin must be present for that to happen. If the effect of insulin is reduced, the glucose absorption is delayed, and the blood sugar values remain high for a considerable time after the meal. When everything is as it should be, the liver is very sensitive to insulin, and the insulin prevents the production of glucose through glocogenolyse and glycogenese. But when the insulin does not work properly, there is no such prevention of glucose production, and the liver is forced to receive large deposits of glucose.

The main physiological regulator of insulin production is the glucose level in the blood. When the beta cells in the pancreas; which produce the insulin, function normally, there is a coherent connection between the insulin level and the sugar level in the blood. The insulin level in the blood mirrors the insulin resistance and as long as the beta cells are able to compensate, the insulin resistance will be accompanied by increased insulin level. When the beta cells can't cope any more, often after many years of excessive strain on them, we get diabetes type II, and the connection between insulin resistance and insulin level becomes distorted, complicated and dangerous.

Most people with insulin resistance have normal insulin receptors, and neither pushing molecules nor genes have given any traces of any good hypotheses about the reasons for this. But excess weight and obesity is usually followed by insulin resistance, with far too high levels of free fatty acids in the blood circulation and far too much fat in muscle cells and liver cells. The genetic tendency for obesity and insulin resistance in the population has of course not changed or increased in the last few years and generations, but obesity and insulin resistance are increasing rapidly in Norway as in most other countries. We can't ignore people's lifestyles; not training the muscles enough and consuming too many calories in

proportion to the amount of physical activity performed daily and annually. Very few campaigns from the authorities to encourage people to diet have been based on correct insight. The association between muscle work, insulin, food and obesity has not been recognized, but that is not usually why the campaigns fail. Even with the latest and best knowledge such attempts will fail for those who are already affected by insulin resistance and obesity, also called the metabolic syndrome. Insulin resistance and hyperinsulinism go hand in hand with dangerous side effects:

- Diabetes II
- Cardiovascular diseases and high blood pressure
- High cholesterol and triglycerides
- Fatigue, anxiety and depression
- Urine acid arthritis and fibromyalgia

It is much better to treat the insulin resistance with the correct diet and exercise, rather than trying to cure these problems with medication!

The hormone *glucagon* is also produced in the pancreas and has the opposite effect of insulin. When we haven't eaten for a few hours, the blood sugar levels drop, but the brain requires a constant blood sugar level, or we become irritable, drowsy and sleepy. A low blood sugar level is a signal to the pancreas to produce more glucagon. Protein-rich food stimulates the production of glucagon, slows down the production of insulin, increases the fat-burning process and decreases the development of fat cells. Our own choice of food-stuffs can affect the balance between glucagon and insulin, and counteract obesity if we make the right choices. One of the glucagon's many tasks is to split fatty tissue that can become blood sugar in the liver, in order to achieve the right level of blood sugar. Glucagon is the body's fat burning hormone.

Leptin is another interesting hormone that is produced in the fatty tissue. The more fatty tissue we carry, the more leptin we produce. Leptin sends messages to the hypothalamus in the brain to control the appetite. Oddly enough, overweight people have more leptin in their blood than others, but it's not efficient when the amount of insulin in the blood is too large. Consequently, overweight people have large appetites, especially for sweet stuff and other fast acting carbohydrates.

The last hormone we shall mention is *cholecystokinin,* which is produced when we eat protein-rich or fatty food. This hormone sends signals to the brain telling it that we are satisfied! It is *not* activated when we eat carbohydrates – sugar, white bread, potatoes – but it can explain why we feel content for a long time after a good dinner of salmon, mackerel or herring, protein-bombs of healthy fat!

Heavy muscular work is important to obtain the benefit of requiring less insulin. But, an overweight person with insulin resistance is unable to perform heavy muscular work. This is where electro-exercise can be the solution; an effective way of getting the muscles to work while the overweight person relaxes. It's a great motivation to get started on one's own and the continuation of electro-exercise can also be valuable to this person in the future.

When electro-exercise is performed correctly, it is tremendously effective. The Danish physician and researcher, Thomas Mohr, has written a 6-page article on this at *dadlnet.dk* on April 10th 2000. He reports that electric stimulation of paralysed musculature provides a feeling of well-being, increases the maximum oxygen intake from 20-100%, increases muscle mass, enhances insulin stimulated glucose intake and better mineral status in the lower

extremities. He believes that electro-exercise will be used for even more purposes in the future. *The International Functional Electrical Stimulation Society*, which has annual conferences, has a mission to promote the research of electrical stimulation. Mohr also reports that an increasing number of healthy people use electro-therapy as a substitute for normal muscular training.

Fat is a more precise and harsh word than obese, it is associated with the person/people overeating fatty foods. The overweight person has not eaten too much tuna, salmon, mackerel or steak, but too many sweet things and other fast acting carbohydrates. In the ancient hunter and livestock cultures there was little carbohydrate in the diet and people dreamed about sweet berries and honey. With agriculture, cereals were served at the table, but not finely ground and refined and certainly not in the form of sugar. Even 200 years ago, the sugar intake was almost zero. 100 years ago it was less than 10 kilo per person per year, whereas in Norway today, we gulp down 40 kilo per person per year, or more than 180 million kilos all together. The USA is ahead of us, with a sugar consumption of 65 kilo per person per year. The steep and ugly curves for increase in sugar consumption, fast acting carbohydrates and excess weight, follow each other like shadows and the connection is obvious.

Johan Throne Holst (1868-1946) founded and led the chocolate factory Freia Chocolade Fabrik in Oslo. In 1931 he set up a large fund for research in nutrition, and along with a large contribution from the sister-factory; the chocolate factory Marabou in Sweden, the chocolate producer paid for the establishment of "Johan Throne Holsts Institutt for Ernæringsforsking" *(Johan Throne Holst's Institute for Nutritional Research).* Until recently, most people did not know that this is *not* a part of Oslo University. This is where the most prominent nutritional physiologists in Norway are educated and the Scandinavian nutritional circles still produce articles for the Internet about the benefits of chocolate. Normal chocolate is dangerous for people who are suffering from the metabolic syndrome and is fattening and unhealthy for the rest of us.

Most nutritional physiologists are women, but the *gurus* are men, and they sneer if anyone dares to question their nutritional advice to the population. New research, with key words such as *glycemic index* is not tolerated, not even as advice for diabetics. Norwegian sports and work physiologists have not contributed to new and different insights into what kind of exercise and work and is most effective in fighting obesity, with one honourable exception, Kjell Nedregård's masters dissertation "Styrketrening som virkemiddel i behandling av fedme" *(Strength Training As Treatment For Obesity).* This was produced at the institute for *general* physiology at the University of Oslo.

The dictator-techniques that are used to keep the public from knowing about the free research in this area are drastic. But in the future, we assume that the public will gain enough information to see through the "fat lie" about obesity, in the same way that leading newspapers in Germany and USA have reported previously. Obesity causes diabetes, one of the most expensive diseases to treat per person, and one that the medical industry has the greatest profit from. We cannot expect help from diabetologists to reveal the 'fat lies' apart from honourable exceptions like Richard K. Bernstein (1997): "The Solution to Diabetes".

But so what? Anyone with a professional background and the opportunity to do relevant research and who brings this knowledge to the public can do so. What the public can learn is what of *diet and food consumption* is correct in preventing obesity, and what kind of *training* efficiently reduces the need of insulin.

(For Bailine by Olav Nøkling M. Sc.)