

Obesity, the deadly Quartet and the contribution of the neglected Daily Organ Rest – a new dimension of un-health and its prevention

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Abstract: The “deadly quartet”: excessive body weight, hypertension, impaired glucose homeostasis, & atherogenic dyslipidemia constitute a greater threat to health than the added effects of smoking and alcohol abuse. It is strongly associated with unrestricted consumption of processed, refined foods. Recent observations from experience in South East Asia shows that the interval between lifestyle changes and associated change in disease pattern is shorter than earlier believed. Recent experience from obesity studies in Africa demonstrate not only dramatic health but also large social consequences from being overweight. Obesity is not only a result of overeating - dozens of other factors are known to contribute. Our Palaeolithic forefathers and those living a similar lifestyle today are reported to rarely have diseases and to live a long life. One such group is the Hunzas, living in Northern Pakistan, reported to live on a daily 1800-calorie 99 % plant-based diet, consisting in 73 % of mostly unrefined/unprocessed carbohydrates, 17 % fat and 10 % protein. They, and most likely also our forefathers, do/did most likely only eat twice a day, at noon and early evening. Calorie-restriction and also fasting was early recommended and has been so during thousands of years – early Greek medicine and giants such as Hippocrates, Galenus and later also Paracelsus prescribed restrictions in eating and fasting. So did Middle Age physicians and other nutrition experts such as Louis Cornado. Today it is actual again and practised around the World. Overeating and heavy postprandial metabolism is a great burden to the body causing elevated levels in blood of endotoxin, increased inflammatory and oxidative stress, release of tumor necrosis factor- α , and other pro-inflammatory cytokines, increases numbers of & activating of leukocytes, a reaction that is potentiated by the presence of sugars. All organs suffer from overconsumption of calories but the metabolic organs, liver, pancreas, kidneys and skeletal muscles the most. Non-alcoholic fatty liver disease (NAFLD) is today the most common chronic liver disease both in adults and children (41) and strongly associated with obesity, chronic liver diseases, diabetes and other chronic diseases. Various metabolic, uremic, microbiota-derived environmental poisons accumulate in large amounts in the adipose tissues. The content in adipose of persistent organic pollutants (POPs) - altogether 17 dioxins/furans and 18 polychlorinated biphenyl congeners, has been reported to be 2-3 times higher in obese compared to lean persons. High levels of poisons in the adipose decreases the turnover of fats in order to protect The content in adipose of persistent organic pollutants (POPs) - altogether 17 dioxins/furans and 18 polychlorinated biphenyl congeners, has been reported to be 2-3 times higher in obese compared to lean persons. High content of poisons in retards the turnover of the adipose tissues in order to protect other organs to exposure of the toxins. Daily fasting consisting in 16 to 18 hours of avoidance of calorie intake offers an interesting alternative. An attractive policy is to abstain from eating between 18.00 in the evening and 10 or 12 am, a plan, which I personally have practised during many years.

Keywords: deadly quartet, obesity, hypertension, hyperglycaemia, smoking, alcohol abuse, lifestyle, processed foods, refined foods, calorie-rich foods, high sugar diet, high fat diet, sugar additives, fructose, high fructose corn syrup, metabolic syndrome, Western foods, Alzheimer, cardiovascular diseases, diabetes, cancer, Parkinson’s disease, multiple sclerosis, epilepsy, seizure disorders, amyotrophic lateral sclerosis (ALS), Huntington’s disease, restless legs, obstructive sleep apnoea, endotoxemia, inflammation, immune function, pregnancy complications, fertility problems, stress, lack of exercise, early warnings, pesticides, flame retardants, plasticizers, recuperation, cleansing, detoxification, organ rest, sleep deprivation, sleep disruption, nightly eating, skipping breakfast, late eating, early eating, cytokines, tumor necrosis factor- α , persistent organic pollutants, dioxins, furans polychlorinated biphenyl congeners, lipolysis

Western life style and food habits – the real threat to health.

The epidemic of Western diseases is strongly associated with, in addition to stress and lack of exercise, overconsumption of processed Western type food, resulting in metabolic syndrome and manifested in, what has been called the “deadly quartet”: excessive body weight, impaired glucose homeostasis, hypertension and atherogenic dyslipidemia [changes in serum cholesterol, increased triglycerides, decreased high density lipoprotein (HDL) cholesterol, and an increase of “small dense” low-density lipoprotein (LDL) particles], manifestations often followed by diseases such as diabetes mellitus type 2, cardiovascular disease (CVD), cancers such as breast, colorectal, pancreas), neurodegenerative diseases (e.g., Alzheimer's disease), pregnancy complications (gestational diabetes, preeclampsia), fertility problems (polycystic ovarian syndrome) and much more. The development of metabolic syndrome with its ingredients: Abdominal obesity, High blood pressure, Elevated blood sugar, Elevated blood triglycerides, Low HDL cholesterol, High Uric acid in blood is often, if not always, a result of malfunctioning gut flora (dysbiosis), induced endotoxemia, low grade systemic inflammation, malfunctioning immune system (1,2) – all constituting, what I call a “mother of disease” (3).

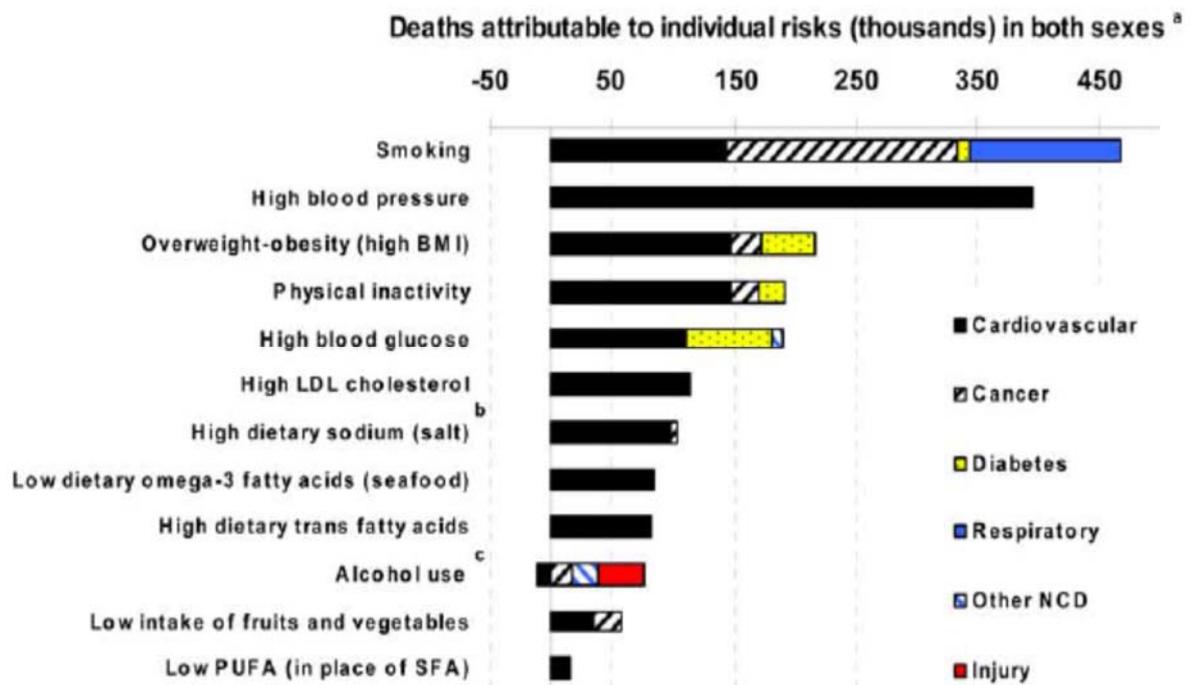


Fig 1. The 12 commonest causes of preventable lifestyle-associated deaths in the USA. After Danaei G (4).

Early warnings should not be ignored.

The dysbiosis-induced low-grade inflammation and malfunctioning immune system induces early a series of various, seemingly benign, manifestations in the body, for which the sufferers often seek medical advice at their local GP, and often receive local treatment. However, these , but irritating, symptoms should be taken serious as they are all signs of ongoing low grade inflammation, which with time might bring series consequences – severe diseases and eventually death. Such signals should be regarded as “early warnings” and stimulate to radical changes in lifestyle and especially in food habits. Among these “early warnings” are manifestations such as: acne, dandruff, unexplained fatigue, sleep problems, frequent headache, hair loss, gray hair, skin rashes, dry eyes, frail nails, dry

mouth or increased salivation, reduced sex functions, irregular menstruations, obstipation or diarrhoea, osteoporosis, overweight, frequent infections, mental depression, easy breathless, sweaty feet, sweaty hand palms, vaginal flour – all accompanied by discrete increased low grade inflammation. If ignored – worse is to come. Calorie-restriction (CR) and Time-restricted eating (TR) has not become a success.

Worse is to come.

A series of professionally done studies suggest that most of the endemic chronic diseases, all from ADHD, Alzheimer, and diabetes to prostatic and other cancers will have in average be tripled in incidence by the year 2050: diabetes at least be doubled (5) and the incidences of ADHD, Alzheimer disease (6) and cancer (7) at least tripled. No health insurance system, governmental or private, will have a chance to sustain under such conditions. Even in times with low inflation seems the costs for healthcare double each ten-year period (8). It can be calculated that in the US, the country with the highest healthcare costs in the world, will by the year 2020 the costs of healthcare correspond to half (> \$ 15000) of the average family income (about \$ 46 000) after tax (app 30 000) – sales tax excluded.

A rather recent and most interesting looked at the prognosis for the US and UK, together (9), two countries, which already have the highest rates of obesity and chronic diseases in the world, representing approximately 5 % of the world's population. The study suggests that these countries combined will, by the year of 2030, see another 76m obese adults, and suffer from an additional 6–8.5m cases of diabetes, 6-7m cases of cardiovascular disease, 492,000–669,000 cases of cancer, which would result in a loss of between 26 and 55million quality-adjusted life years and a dramatic increase in costs of care, by the authors calculated to be \$50–68 billion per year) (9).

Easy access of food and to high consumption of processed foods - the problem.

For some decades the epidemic of obesity and chronic diseases has mainly been a problem for the Western world. Modern agricultural techniques, techniques for mass production and easy access of cheap foods has led to a much too larger consumption of agricultural foods, especially frequently industrially manipulated and rich in processed agricultural products such as meat, dairy and wheat (10-12). Similar developments are now observed also in other parts of the world, largely in parallel to the adoption of a “modern”/Western lifestyle. Seemingly the epidemic of obesity and associated diseases has its epicentre in Southern United States [13], states like Alabama, Louisiana and Mississippi having the highest incidence of obesity and chronic diseases in the US and the world. These diseases are spreading around the world much like a tsunami; to the West to New Zealand and Australia, to the North to Canada, to both Eastern and Western Europe & now also to the Arab world and to the South, particularly Brazil.

Now reaching Asia and Africa with a speed like a typhoon.

Japan was the first country outside the Western hemisphere to adapt Western lifestyle and it suffers now the burden of Western diseases - rarely seen before. The island Okinawa, once said to have the best health and the greatest numbers of centenarians in the world, has since the US did build military basis on the island and the island became westernized lost its leading position with the lowest incidence of obesity, chronic diseases and number of centenarians in the world – today it ranks among the lowest when the 50 Japanese states (prefectures) are studied.

The death rate in prostatic cancer increased 25-fold and almost linearly between the years 1947 - 1948 after the war, when Japan, at least to some extent, adopted its food habits to Western agriculture-based foods, which happened in parallel to the increase in consumption of intake of eggs 7-fold, meat 9-fold and cow's milk products 20-fold (14,15). Now the same development is seen in China, India and other Asian but also in African countries. China for example, once known for its extremely good lifestyle and food habits, especially in rural areas, and low incidence of obesity as well as chronic diseases but also high numbers of centenarians (16) is today badly affected by obesity and illness, also here much in parallel to introduction Western type agriculture and especially with dramatically increased production and consumption of dairy products. I have had difficulties to access official information, but my professional colleagues tells, that the incidence of chronic diseases such as coronary heart diseases, diabetes, and cancers such as breast cancer and prostatic cancers seems to double each ten years, especially observed in the large cities.

Incidence of obesity and chronic disease increases with unprecedented speed.

It is recently reported that the incidence of metabolic syndrome and cardiovascular risk rose dramatically in the Chinese population during only eight recent years between the 2002 and 2010 (17). A four-fold increase in incidence of metabolic syndrome was observed, affecting only 5.4 % of the population in 2002 rising to as much as 21.3 % in 2010. The situation seems even more serious considering that the rate of hyperglycaemia rose five times from 9.1% in 2002 till 53.1% in 2010. And, the age-standardized prevalence of obesity did double during the same period - from 13.5% to 25.4%, in parallel with increased incidence in hypertension (from 23.6% to 40.8%), hypertriglyceridemia (from 12.1% to 17.4%) and the alarming rise low density cholesterol LDL (from 32.1% to 71.1%). It was also reported that the gap in incidence of metabolic syndrome and its serious consequences, previously much in favour of rural compared to urban populations decreased significantly during these eight years (17). A just published study reports, much similar development in cancer disease in South East Asia –exemplified by prostatic cancer, which is fast increasing; already high in Japan, Taiwan, Hong Kong and Korea, but also Shanghai and most likely also Beijing - but also urban China is fast following in the footprints of the most affected (18). It is especially worrisome that the increase of Western habits is increasing considerably faster among the young Chinese. The metabolic syndrome and obesity is increasing faster in younger age groups and the prevalence of juvenile type 2 diabetes reported to have doubled within a recent 5 year period and today to have surpassed the prevalence of juvenile type 1 diabetes in China.

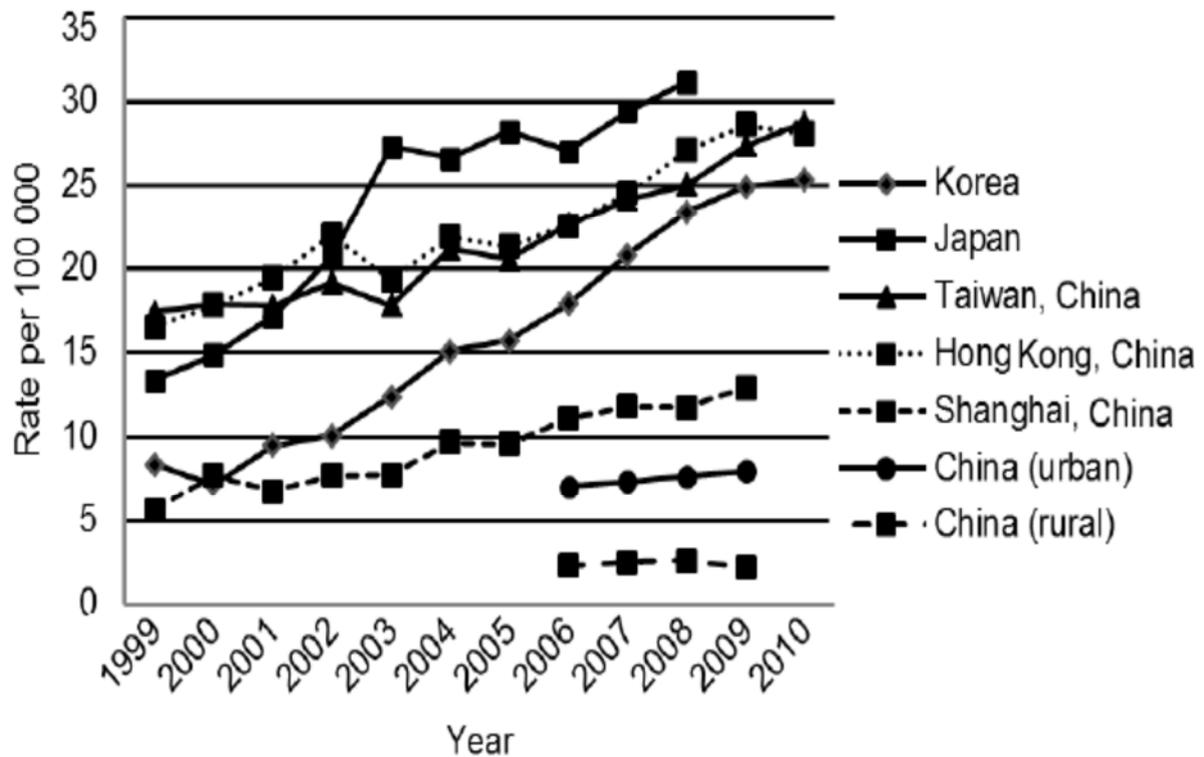


Fig 2. Incidences and developments of prostatic cancer in EastAsia (18).

The interval between change of lifestyle and signs of un-health shorter than ever seen.

It is of the greatest interest to observe that the interval between change of lifestyle and altered pattern of disease, is much shorter than previously believed. What took about one hundred year to occur in the Western world, was obviously achieved in in South East Asia in less than 10 years. As obvious from the fig 3. The large increase in dairy production and consumption which exploded after the shift of millennium – was seemingly almost immediately followed by a typhoon of obesity and chronic disease. Feeding large populations with cheap foods is obviously one of the greatest political problems, and given priority in almost all countries. Western politicians know well the consequences and have done so for decades but seemingly abstained from serious attempts to stop the epidemic of obesity and chronic diseases which follows – they are obviously willing to accept the negative consequences and show little attempt to stop them. Both in Europe and in the US do governments continue to subsidize agriculture with large sums of money to produce even more of disease-promoting foods and are obviously prepared to pay for subsequent attempts to cure those, who have been affected by disease due to overconsumption of cheap calorie-condensed agricultural foods. Preventive medicine is this far not existing in any country on Earth.

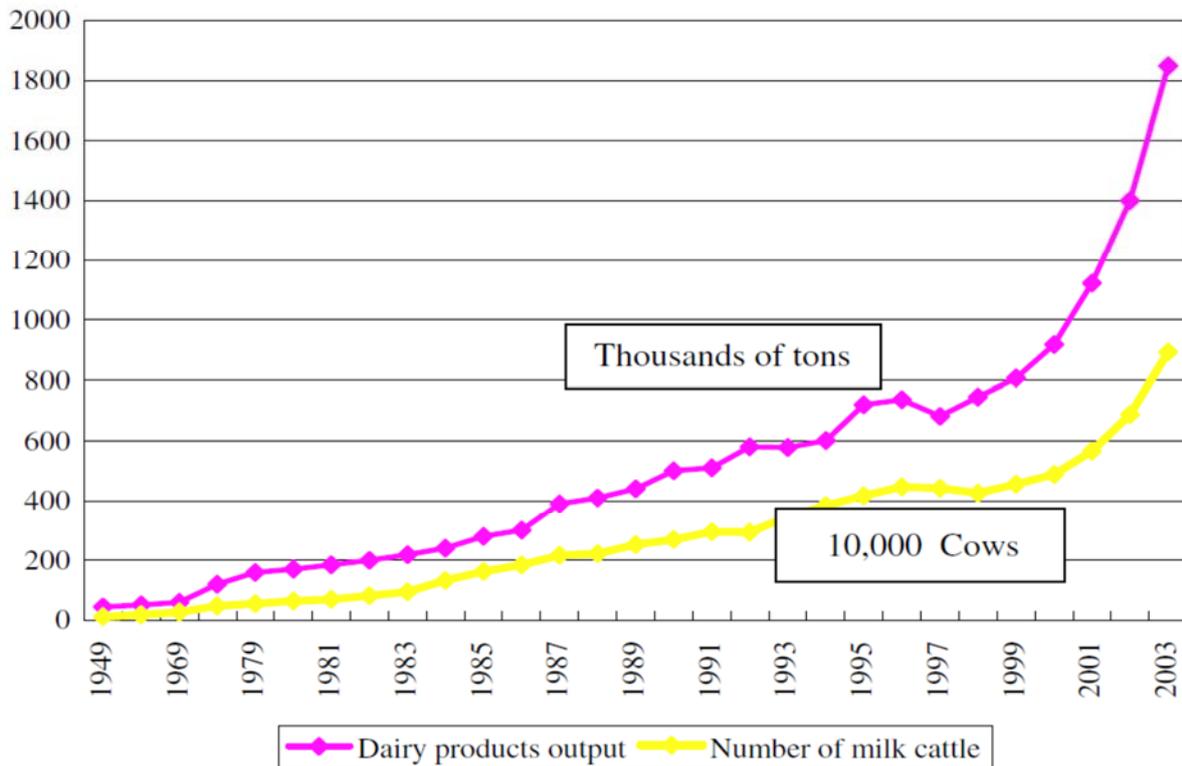


Fig 3. Consumption of dairy products in thousands of tons and number of cattle (in 10 000 of cows) up to the year 2003. It is expected to be much higher today as the increase has and is continuing.

Consumption of refined sugar, strongly associated with obesity and Western diseases, has skyrocketed in the last 150 years from a decent ½ kg in 1850 to presently about 50 kg/person/year in Western and South American countries . The consumption of sugar is still comparatively low in Asian countries – usually below 10 kg/person/year, but are fast growing. Despite the fact that Asian countries in addition to having a considerable internal and fast-growing production are India and China the largest importers of sugar in the world – China is expected to be the largest importer in the year 2020. One can only speculate about the damaging effects on public health such a development will lead to.

Also Africa is following on the same pathway – a recent study reports a fast increasing public health problem with obesity in Tanzanian women with damaging physical and social consequences – the prevalence of overweight reported as considerable for the continent: 16% overweight, and 6% obese (19) – see fig 4.

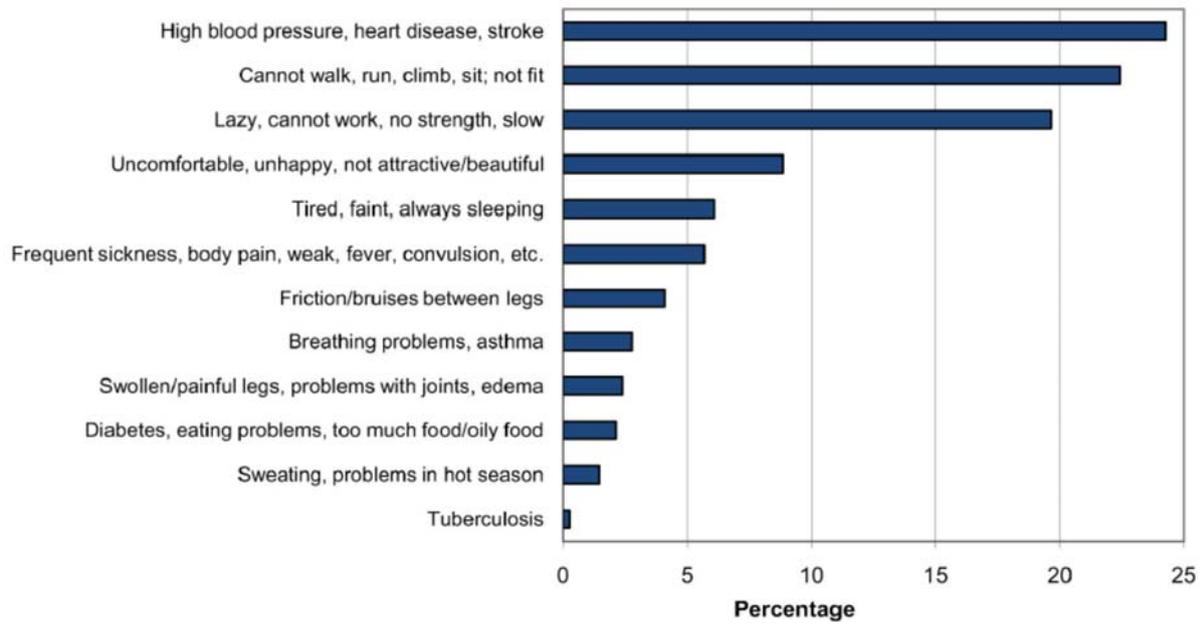


Fig 4. Social and physical consequences of obesity in Tanzania, Africa (19).

Obesity – a complex issue.

Clearly, obesity is resulting from eating too much of the wrong foods – mainly refined industrially processed agriculturally produced foods and lack of physical exercise, but there are other contribution factors which do not receive the attention that they should.

Among these factors are:

- Genetic predisposition – existing, but of relatively minor importance
- Epigenetics: results of programming of immune system of both mother and offspring
- Pre-birth effects: intrauterine starvation or overfeeding, mothers on high carbohydrate and fat diet
- Mothers leaking poisons and, endotoxin, and whole or parts of inflammation inducing bacteria.
- Vitamin D deficiency
- Dysbiosis – too much or lack of certain microorganisms, a high ratio of Firmicutes to Bacteroidetes. Of greater importance than previously considered
- Endocrine disruptors: hormones, to a large part from dairy, but also influenced by exposure to pesticides, flame retardants and plasticizers
- Intake of Pharmaceuticals: cause dysbiosis & metabolic disturbances, increases appetite, and promotes weight gain
- Maternal age: Old age -> too low or too high birth weight -> obese offspring
- Fecundity (fertility fruitfulness): obese mothers produce more children & almost always obese children
- Lack of temperature variations – cold or heat: reduces the need of calorie
- Smoking cessation: nicotine decreases appetite & increases utilization of calories
- Sleep debt: increases hunger food intake & energy storage
- Poorly functioning diurnal rhythms due to shift work or night life– further discussed below.
- Neglected need of organ rest (detox, cleansing) - further discussed below.

See further (20, 21)

The importance of complying the “built-in” diurnal clock.

Human beings are diurnal creatures. We conduct most of our activities during the day, including our feeding, our physical exercise and our work - the night is most often reserved for relaxation and rest, not only of our muscles but also our internal organs should be allowed to rest. It is a period of the day, which is aimed for recuperation, cleansing/detoxification and resetting of our various metabolic, immunological and other internal clocks, sometimes referred to as the period of resynchronization. These important processes were normal to our Palaeolithic forefathers, but also to previous generations of farmers and hunters, who normally rose with the sun and went to bed soon after the dawn, and still are in cultures living a similar life as our forefathers. This lifestyle is today challenged by modern society with its most different organization and lifestyle. It must be recognized that these changes constitute great threats to health of the individuals directly or indirectly involve. Night activities are increasingly common: shift work, overtime work, night eating, sleep disruption and deprivation are will all constitute a threat to our normal diurnal rhythms most likely disrupt our metabolic clock and energy homeostasis. Increasing evidence suggests that for example shift workers have a higher risk of metabolic diseases, including obesity, diabetes, metabolic syndromes and cardiovascular diseases and also that sleep deprivation, irregular sleep, sleep disruption and nightly meals have similar consequences (21-23).

Rest, recuperation, cleansing, detoxification - especially important in patients suffering early Alzheimer, diabetes, and fatty livers.

Daily nocturnal fasting is important in order to try reduce/eliminate poisonous substances from blood and tissues. Alzheimers’ disease (AD) is characterized by toxic accumulation in the brain of amyloid beta (A β), induced by either overproduction or some clearance failure, and suggested to be the underlying mechanism of the neuronal cell death. Sleep disturbances are common early in various forms of dementia and other forms of neurodegenerative diseases, particularly in Alzheimer’s in early as well as in later stages (24). Sleep may play an important role in A β clearance, and getting good quality sleep vs. poor quality sleep might reduce the AD risk associated with neuro-inflammation and the ϵ 4 allele. It is recently reported that men, who suffer of sleep disturbances – reported to be at age 70 increased for general dementia +114% and for AD as much as +192% (Both $P < .001$)(25). Similar developments are recently reported in Parkinson’s disease (26), multiple sclerosis (27,28), epilepsy and other seizure disorders (28), amyotrophic lateral sclerosis (ALS)(29), Huntington’s disease (30) restless legs (28), obstructive sleep apnoea (28) etc. Disturbances in the light/dark cycle, sleep/wake schedule, or feeding/activity behaviour, disturbed circadian function of the diurnal clocks in various peripheral tissues and synchronized by the brain are strongly associated with impaired glucose tolerance especially in type 2 diabetes (31), changes beautifully illustrated in experimental studies (32) – see fig 5).

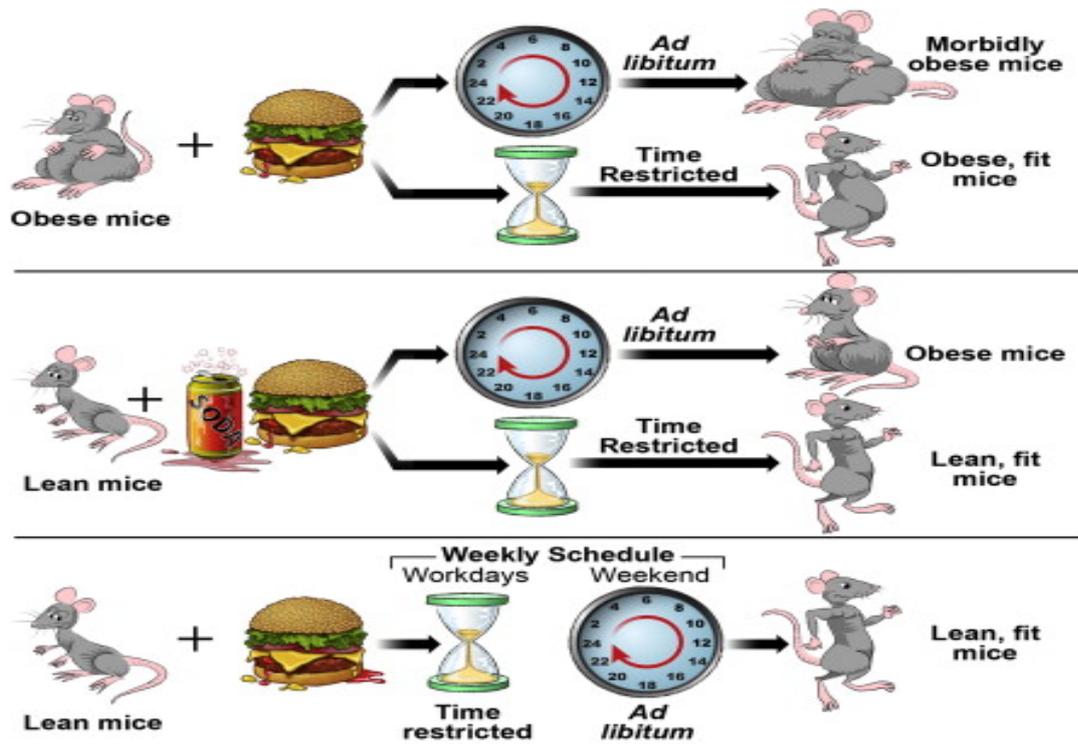


Fig 5. Chaix et al demonstrates how daily time-restricted feeding (TRF) promotes metabolic health in mice by attenuating metabolic diseases from high-fat, high-fructose, and high-fat + high-fructose diets, in lean, obese and diabetic mice. It is especially interesting that the protective effects were maintained even when TRF was temporarily interrupted by ad libitum access to food during weekends (32).

The same group of researchers did also report the physiological consequences of Time-restricted feeding as observed in experiments in mice. Two groups of animals received exactly the same food and the same amounts of calories. One group was allowed to consume freely day and night, the other had it restricted to only half of the 24 hour day. Dramatic differences were observed in body weight, glucose intolerance (insulin resistance), leptin resistance, liver pathology (fatty infiltration) inflammation and motor coordination (33).

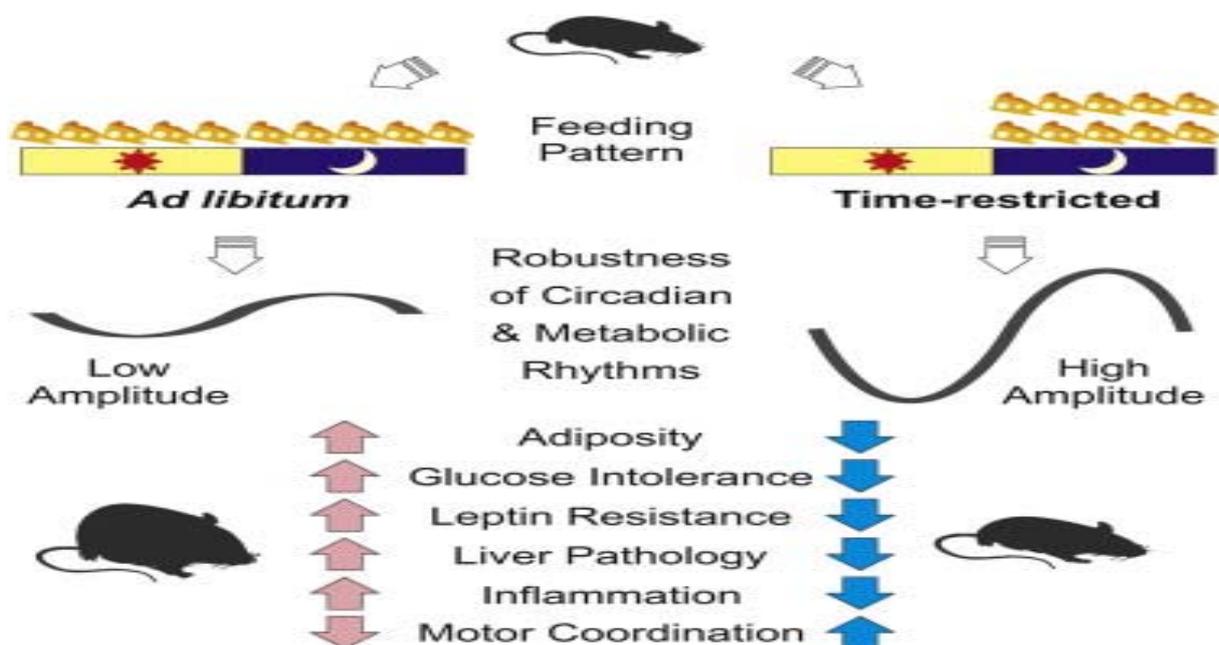


Fig 6. Time-restricted feeding improves robustness of Circadian & Metabolic clocks. Time-restricted feeding prevents obesity, diabetes, and liver diseases in mice on a high-fat diet. The type of nutrients provided and the time of feeding influence liver metabolome and nutrient homeostasis. Trf raises both bile acid production and energy expenditure and reduces inflammation (33).

Paleolithic lifestyle stimulates a robust circadian rhythm & a healthy and long-lasting life

Observations that our forefathers might have eaten only twice a day are supported by studies in people with similar lifestyle. One such group is the hunzas in Northern Pakistan, today known for their good health and high numbers of centenarians. The adult hunzas are reported to live on a daily 1800-calory 99 % plant-based diet, consisting in in 73 % of mostly unrefined/unprocessed carbohydrates, 17 % fat and and 10 % protein (34). They are going out to work in the fields on empty stomach, eating their main meal of the day at noon and slighter meal just before going to bed around dawn – see further http://thepdi.com/hunza_health_secrets.htm & <http://projectavalon.net/forum4/showthread.php?48210-HUNZAS-a-people-who-live-to-age-145->

The concept of of calorie-restriction is not new, it was promoted already by ancient Greek medicine by giants such as Hippocrates, Galenus and later also Paracelsus. Louis Cornado (1464-1566) in his book *La Vita Sobra*, written when he was more than 80 years old, recommended in addition to a tranquil life and plenty of sleep and ½ l/d new/virgin/fresh red wine per day a diet consisting in at most ½ a kg of mainly fruits and vegetables, olive oil, a little bread and egg and occasionally a little fish and lean meat. He lived until an age of 102 years and his teaching influenced many generations during following centuries.

Calorie-restriction (CR) and Time-restricted eating (TR) has not become a success.

Instituting daily fast in humans, have not been met with the success that could be expected. The studies are often poorly designed - consider, for example, two breakfast eaters (BF-eaters) having their last meals at midnight; one then consumes BF at 5:00 a.m. (provides only 5-h overnight fast) and the other consumes BF at 10:00 a.m. (provides at least 10-h overnight fast). Both are obviously considered as “BF-eaters” a fact that is ignored in the majority of studies. In contrast, BF-eaters, who

have an earlier dinner (last meal) at 7:00 p.m. and eat her/his breakfast at 10:00 a.m. as a matter of fact will have an overnight fast of no less than 15 h (35).

The compliance of the participants has often been low, and there has been a tendency towards compensatory eating during the following day often observed. It seems that the clinical effects are most effective when applied to middle-age people compared to younger or older. It is clearly documented that abstaining from late eating is more effective than abstaining from eating breakfast. It should be said, however, that almost all successful methods for reducing weight is without doubt reducing the size and changing the content towards mainly plant fibres a cornerstone. Fibres eaten in the morning will not be metabolized during the closest 2-3 hours, which is the time needed for this food to be transported to the large intestine and to be metabolised by microbiota. Zilberter & Zilberter summarizes in a recent review the clinical effects of “skipping breakfast” as demonstrated on fig 7 and mainly based by studies of Okomoto et al (36) – a Japanese publication which is difficult to find but most interesting to read. These authors follow during 53 months in the period 2008 -2012 no less than 12,304 patients. The main conclusion from the analysis of Zilberter & Zilberter is that breakfast eaters and late eaters are more affected by disease and requiring medical attendance than breakfast skippers and early evening eaters. Clearly, the few studies presented until today are to a great extent both confusing and also controversial.

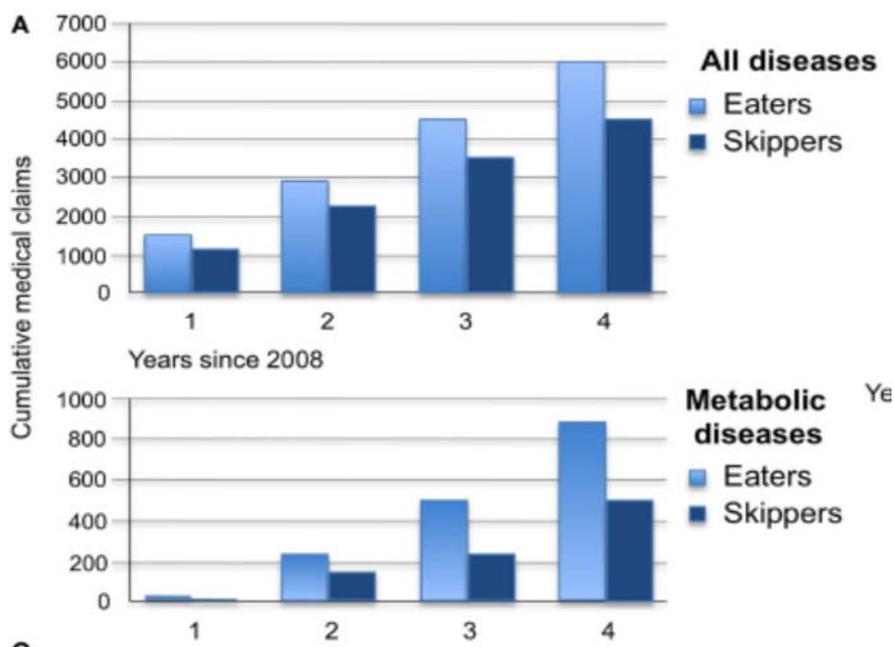


Fig 7. Difference in visits to hospital outpatients between Breakfast skippers and Breakfast eaters. (35).

Postprandial inflammation of Western foods – a great burden to the immune system.

Processed industrially produced Western foods are much richer in calories particularly agriculture derived sugar and sugar-like foods (bread, pasta, pizza, cooked tubers, polished rice etc) and refined dairy products, rich in long-chain fatty acids. Sugar and sugar-like foods are absorbed by the small intestine within short time after intake and creates during a short time a strong burden to inner organs, particularly the liver.

The body has no possibility to take up long-chain fatty acids through the portal vein in order to be quickly metabolized - that is the privilege of fatty acids with chain-length shorter than C12 (37). Long-chained fatty acids, to about 80 % consisting in cow's fat need to be transported by the thoracic duct via the general circulation to the liver. Most of it will remain in the general circulation during 1-2 hours and expose the content to the endothelium in various parts of the body including the carotids and the brain vessels, induce inflammation and intimal calcifications, known as strong risk factors in atherosclerosis and other chronic diseases such as Alzheimer's and type 2 diabetes. Other consequences associated with elevated postprandial glucose and insulin concentrations are:

- increases content of endotoxin in blood (said to be equivalent to smoking 3 cigarettes)(38,39)
- cascades of inflammatory and oxidative stress (39)
- release of tumor necrosis factor- α , a key proinflammatory cytokine (38)
- increases numbers of & activated leukocytes (40)
- Inflammatory reaction significantly potentiated by simultaneous intake of sugar (39)

The obvious negative effects of consuming energy-rich foods were rarely observed before the Industrial Revolution and introduction of Western food habits – at least not the same extent as today. The situation has dramatically become worse with introduction of sugar additives such as sucrose and high fructose corn syrup, today available in a large number of beverages and processed foods. Food ingredients supplied by larger meals, elevates both blood glucose and blood fat concentration, which is a risk to the individual – it must be kept within narrow limits for the individual to survive and stay healthy.

The liver and skeletal muscles in focus.

Non-alcoholic fatty liver disease (NAFLD) is today the most common chronic liver disease both in adults and children (41) and strongly associated with obesity, chronic liver diseases, diabetes and other chronic diseases. Fructose-induced lipogenesis is reported to be responsible for 26% of accumulated hepatic triglycerides and 15%-23% of secreted very low-density lipoprotein triglycerides in patients with NAFLD compared to less than 5% in healthy subjects. Metabolic syndrome is today increasingly common in children and childhood NAFLD has become in recent years become a highly prevalent childhood liver disease.

It has long been neglected, that skeletal muscle, is not only a part of our locomotor system, but also an important metabolic and also endocrine organ – as a matter of fact it constitutes approximately 45 % of the total body mass and, furthermore, no less than 2300 of skeletal muscle genes are involved processes under control of circadian rhythms - involved in numerous metabolic processes including myogenesis, transcription, and metabolism (43). The skeletal muscle is the major storage of amino acids and sugars as glycogen (easy access energy) but not of fat. In humans five times more glycogen is stored in skeletal muscles (≈500g) compared to the liver (≈100g) which represents Glycogen makes up about 1-2% of muscle weight and 6-10% of liver weight. The liver seems more willing to release its glycogen, the content of which decreases more rapidly during fasting, when the liver glycogen content is decreased by ≈65% after 24 h fasting, no major decrease in muscle glycogen content during fasting (44). It also takes some time, about 15-20 hours, before a considerable lipolysis

starts (45) – see fig 8.

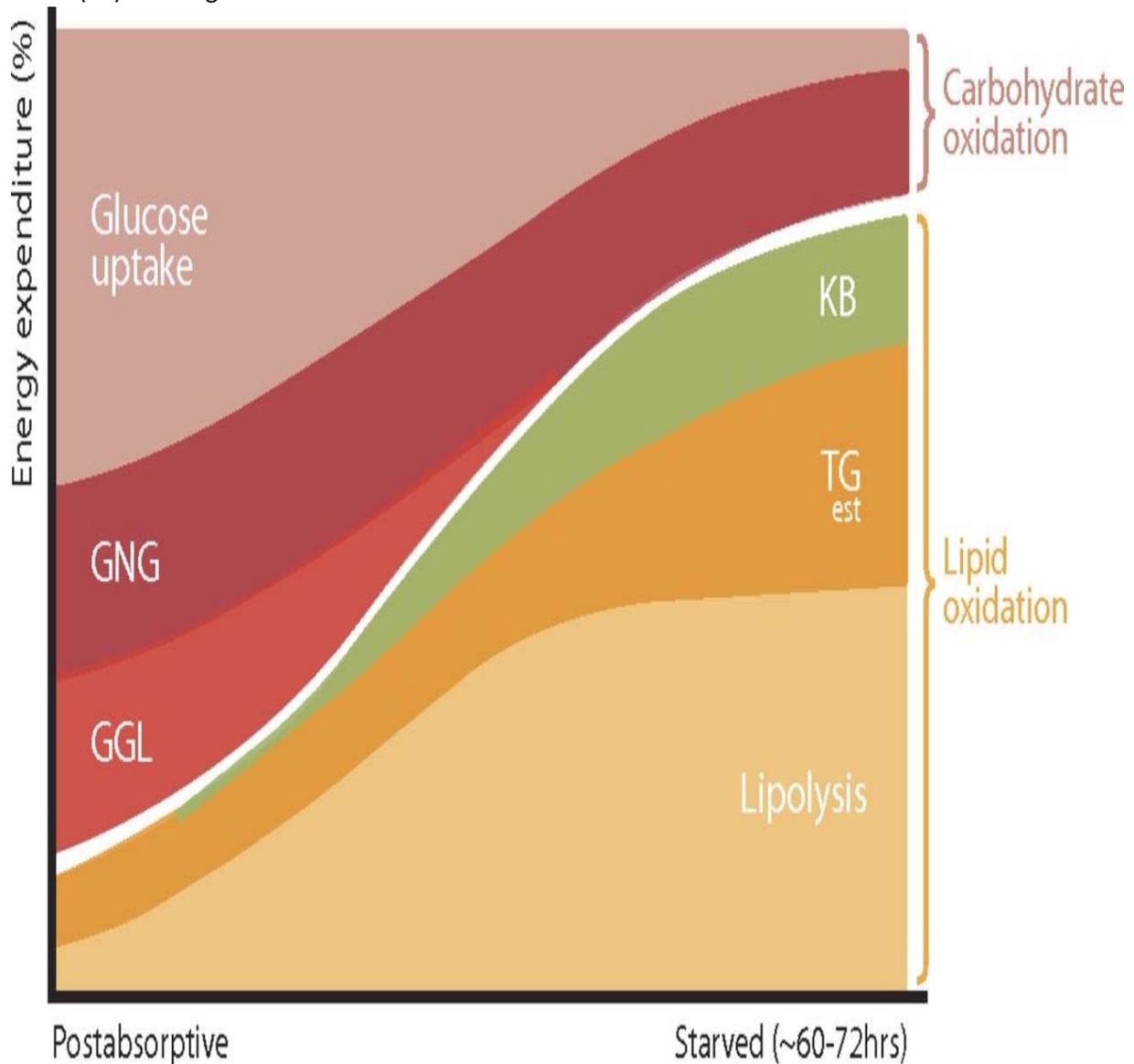


Fig 8. Schematic diagram depicting approximate changes in substrate metabolism during short-term fasting. GGL=glycogenolysis, GNG=gluconeogenesis, kb=ketone bodies, Tgest=triglyceride re-esterification

Fatty infiltration of skeletal muscles, liver & some other organs – a sign of sickness.

It is a sign of sickness if fat is stored in the liver and in skeletal muscles. Fatty infiltration is a sign of excessive consumption of foods or force-feeding of domestic animals with more or less unsuitable feeds and also influenced by physical inactivity. The meat produced by modern agriculture is of those reasons rich in fatty infiltration of skeletal muscles and of organs like the liver, and especially so in foods like goose liver pâté and pig meat. Changes in muscle composition and function are also strongly correlated with disease development. More recent studies have begun to demonstrate that disruptions in circadian rhythms will have detrimental to both skeletal muscle and general health. Chronical diseases, like arteriosclerosis, diabetes type 2 and others is intricately tied to skeletal muscle function.

Parker demonstrated more than 50 years ago in a now classical animal study that environmental poisons like DDT accumulate in the adipose tissues (47). Another by now classical study reported in 1972 the presence of phthalate ester plasticizer originating from the polyvinyl chloride blood bags in its content, human blood, to be infused into the patient (48). Today most of the food we eat such as milk and juice have been stored in containers with plastic material on its inside. The fish we eat contains more or less of environmental chemicals and the meat often remnants of antibiotics, other drugs and various chemicals. Most of these are lipophilic and follow fats into the adipose tissues. Also endotoxin and remnants of various bacteria are ending up in the adipose tissues. Patients exposed to regular maintenance haemodialysis are reported to suffer high degree of inflammation and what has been called “paradox obesity” most likely due to sequestration of uremic and other toxins in adipose tissue (49).

Adipose tissue a “garbage bin” – inducing inflammation, further obesity and chronic diseases.

The adipose tissue is a complex organ with numerous endocrine, metabolic and immunological functions – but it is also, as mentioned above a storage of various inflammation-inducing toxins (50). The content in adipose of persistent organic pollutants (POPs) - altogether 17 dioxins/furans and 18 polychlorinated biphenyl congeners, has been reported to be 2-3 times higher in obese compared to lean persons (51). The adipose tissues are, as a consequence of the accumulation POPs, infiltrated by macrophages, leukocytes, and activated natural killer T cells, and regulatory T cells, much in parallel to activation bioactive molecules, collectively termed adipokines – processes leading to longterm inflammation and risk of chronic diseases. An unfortunate consequence is that the turnover of the fat is significantly reduced – most likely in attempt to protect other, and eventually more sensitive, tissues from further exposure to the toxins. See fig 9 (50).

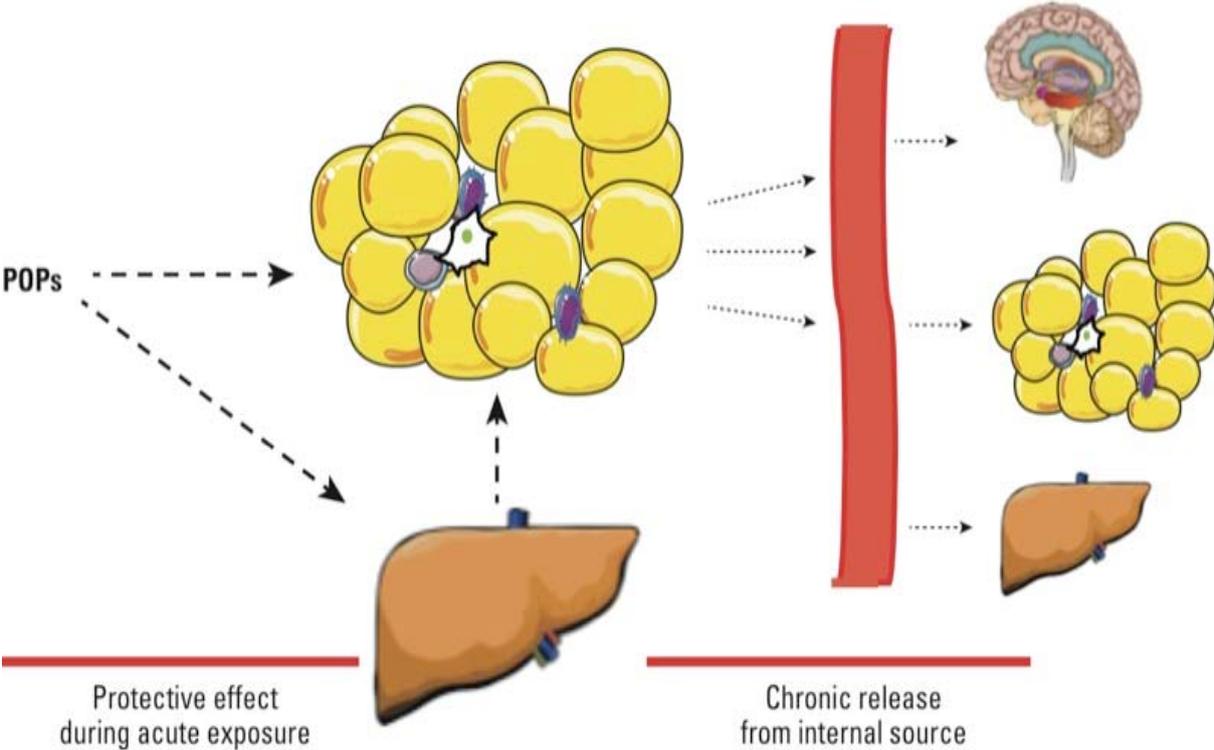


Fig 9. Protective effects against POPs during acute exposure and retarded elimination (50).

Visceral adiposity a greater problem than abdominal.

Clearly the visceral adiposity which occur today did not exists among our paleolithic forfathers – it is a phenomenon closely associated with overeating of processed calorie-condensed food, a possibility that did not exist in those days. It should normally consist only in a few. Today, however, studies have demonstrated intraabdominal up to the size of 6 litres in extreme obesity (52). The fat localized in visceral is supposed to provide fast available extra calories in situations of acute stress in addition to release of proinflammatory factors such as IL-6 and PAI-1, which exists in amounts about three times as much per gram tissue compared to abdominal fat (53). The high amount of fatty acids and proinflammatory factors released in obese individuals in stressful situation has often become a problem and has been associated with exaggeration of acute and inflammation and progress of disease (2,54-56).

The processed and calorie-rich food that an increasing proportion of global inhabitants, consume creates unsolvable problems. While paleolithic food is estimated to contain about 80 % in plant foods rich in fibre and favoured food for gut microbiota does modern foods contain less than 20 % of such quality – see fig 10. A common recommendation of consumption of plant fibre based on epidemiologic studies, made both by nutrition organisation and governmental authorities is 4 g dietary fibre per 1,000 kcal, or 25 g for adult women and 38 g for adult men. However the experience is that the common diet both in North America and Europe contains only around half that much, while The Hunzas, much like our paleolithic forefathers, did most likely daily consume between 80 and 100 grams. It is certainly even more damaging that about 60 % of consumed food in the West consists in sugar and “sugar-like” substances, which constitutes an enormous burden to metabolic organ such as the liver, pancreas and also to the kidneys. It is also damaging that Western food is so rich in long-chain fatty acids, about 30 % compared to less than 10 % in paleolithic food. As already emphasized, long-chain fatty acids enters the body through the thoracic duct and remain in circulation for 1-2 hours before finally being metabolized by the liver.

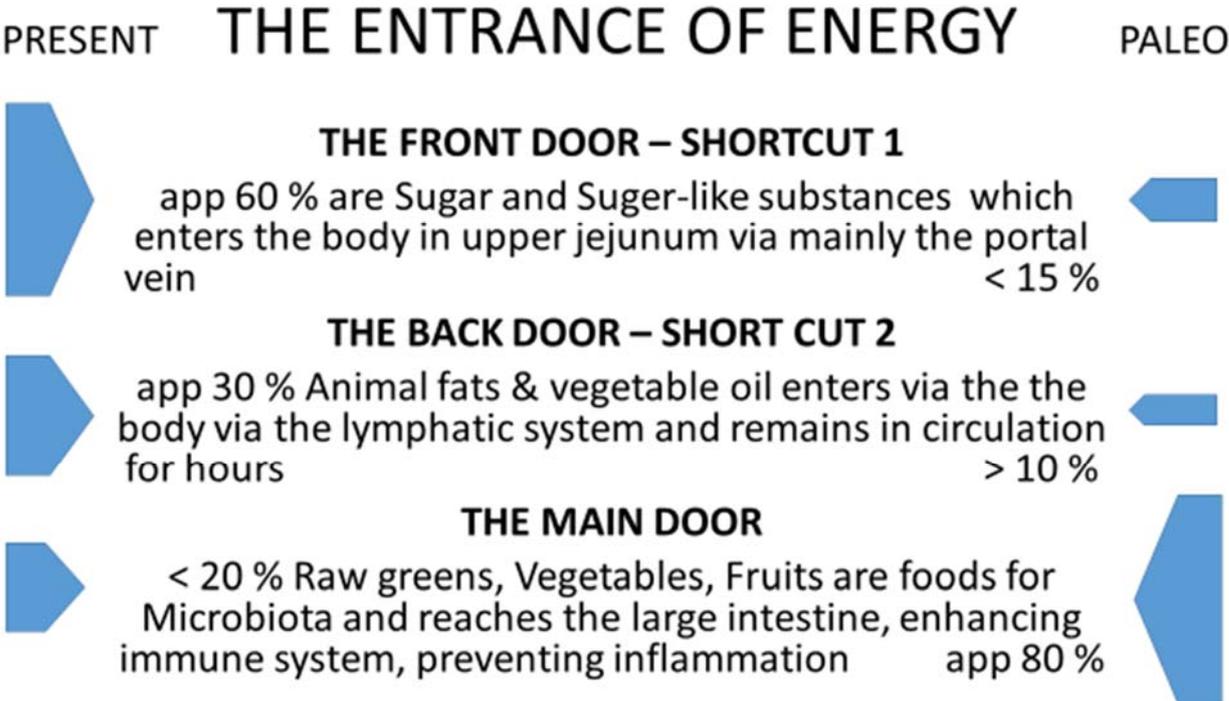


Fig. 10 The pathways of consumed foods into the body – a comparison between Western and Paleolithic foods.

To achieve effective lipolysis - considerable fasting is needed.

It is estimated that during rest and sleep only about 65 calories will be “burnt” and during the type of work, that most of people have today, not much more – 85 calories/day. In order to burn only 300 calories one will need to run about 5 km or cycle 20 km – running marathon is estimated to utilize not much than what is consumed in one day. Much support that regular fasting is going to be a necessary ingredient in our daily life. Many religious groups incorporate periods of fasting into their rituals including Muslims who fast from dawn until dusk during the month of Ramadan, and Christians, Jews, Buddhists and Hindus who traditionally fast on designated days of the week or calendar year. In many medical clinics, patients are now monitored by physicians while undergoing water only or very low calorie (less than 200 kcal/day) fasting periods lasting from 1 week or longer for weight management, and for disease prevention and treatment – and impressive improvements in health observed (57). A more effective but also more difficult to practise method is calorie restriction – e.g. reduction of the daily intake by 20–40% year around, which have demonstrated dramatic improvements in health (57). Daily fasting consisting in 16 to 18 hours by avoiding calorie intake between 18.00 in the evening and 10 or 12 am offer an attractive alternative, which I personally have practised during many years.

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