



Little John, What Did You (Did You Not) Learn at School?

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Abstract

It is a fact that during the last decades the medical sciences made giant steps forward. Nevertheless, more people became ill, and not only the elderly people. This text is limited in size to give honest answers to the most pertinent questions about sugars and synthetic sweeteners (aspartame and sucralose) asked by attendants at presentations about Stevia. Also, due to the extreme toxicity of methanol (=wood alcohol), the effects of this substance must be discussed.

Introduction

Obesity has become almost endemic in the Western Society giving rise to many obesity-related diseases such as type 2 diabetes, heart and blood vessel diseases, atherosclerosis, inflammations, increases or appearance of some cancers. It has also been observed that the frequency of many auto-immune diseases has increased and that they occur at a much younger age (e.g., psoriasis, type 1 diabetes now occurs in 2 month old babies against the previous occurrence in adults of \pm 20 year old). To be able to explain these increases, it is less probable that a changed genotype of the population is the cause, because a change of a population genotype could only occur over a very long time period (thousands of years). Environmental factors are probably not the overriding reason, because these diseases also occur in regions with a healthy environment. Therefore, inadequate or even unhealthy food is probably the most important factor. Those who are interested in the effects of environmental contamination on the development of cancers should read the review written by a very large group of independent scientists [1]. In this review, it is emphasized that synergistic effects occur between components that, when tested alone, had no visible effect on the development of cancers. Synergistic effects are obtained when the effects of 2 or more components administered together are much greater than the sum of the effects of each of the components administered alone. Synergism is also an indication that 2 different processes are being influenced in the body. We should also consider these synergistic effects of various food components, e.g., 4-methylimidazole and aspartame. Cola light contains 4-methylimidazole, a weak carcinogenic compound. A synergism might occur between this compound and formalin, eventually formed from the methanol that is released from aspartame. By following a wise decision of the Californian legislature, the cola producers will change their recipe in the USA and omit this 4-methylimidazole. However, in the other countries of the world, this compound will still be present. Are the EU authorities that should take care of food safety, lulled into sleep by the food lobbyists? The evolution of man teaches us that man was a hunter-gatherer. His food was very varied and probably on some occasions, he must have been hungry too. Hunger was the driving force to go hunting and to collect food. Gradually, man settled and then it became necessary to grow food plants and to domesticate animals. He started breeding certain varieties of plants to obtain greater yields. This might have resulted in a too unbalanced diet, as well as in cultivars with, e.g., a huge content of gluten in wheat selections. In those countries, in which, currently, there is a more than adequate food supply, man does not eat because he feels hungry, but by habit or addiction (sugars). The excess of energy intake results in obesity. In fact, obese persons often are under-nourished, because they are missing some essential elements. Many do not eat enough vegetables and it has been observed that, e.g., about 20% of the Belgians never eat vegetables or fruit. Therefore, it is not surprising that many have a magnesium deficiency (up to 70%). Similar deficiencies can be found for zinc, vitamins, calcium, selenium, anti-oxidants. In fact, the functioning of the human body is a good example of efficiency. As the brain has an absolute requirement for a supply of sugar, a reserve is built up in the form of glycogen (=animal starch). This starch can be quickly degraded into sugar, ensuring a continuous availability as the brain cannot function without it. In the case of a chronic physical effort by the body, the alpha-cells of the pancreas produce glucagon, by which liver glycogen is transformed into glucose and by which fat from fat cells is degraded into fatty acids, which are absorbed by the blood and burnt. In this way, less blood glucose will be used so its level in the blood increases. Our main energy storage is in the form of fat because, expressed per unit weight, fat contains the greatest amount of

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Kcal. In a well functioning body, during a meal, the hormone leptin is formed, which migrates to the brain to induce the satiety feeling, and so we stop eating. When the glycogen reserve is exhausted and when we eat again, the body first starts synthesizing glycogen to ensure that there is always a source of sugar available for the brain. When we are hungry, the hormone ghrelin is synthesized which stimulates us to eat. By eating varied food, as was usual up to half of the last century, man absorbed enough essential food elements, and so food supplements were unnecessary. By the daily eating of plants and seeds, enough direct sugar was available, as well as polysaccharides (starch), minerals, vitamins, anti-oxidants, proteins, fats and fibers, while meat delivered extra proteins and fats. Drinking water or beer was very common, as soft drinks and fruit juices were not yet as widespread. The food was less processed and less sugar, fat, salt and taste enhancers were added. Moreover, people were responsible for the local production of their own food, which also meant that they had a perfect control over their food. Fortunately, city gardens, fruit and vegetable barns are now becoming more prevalent, so that the consumer is more involved in the production process of the food and he knows better what he eats. To motivate people to eat healthier food, a fat tax was introduced in Denmark, but then abolished, as it was not effective. The Danish were not eating less fat, but obesity continued to increase. Over the last 30 years, the Danish have not changed their eating behaviour in respect of fats. It is now generally accepted, that the real culprit for the development of obesity, is the addition of large amounts of sugar to food, although denied by the sugar industry because a double-blind, placebo-controlled study to prove this is lacking. However, this is not a good reason to reject the research and observations done by previous generations of scientists. We should not forget that the current research relies on the results obtained by the previous generations. To support this, the following comparison can be given. Although the drowning by water has never been proved by a double-blind, placebo-controlled study, the thousands of drowned boat refugees are not less dead. We should remember that it is a very tiny line between being a food scientist or a food criminal. As also stated by [2], not "all sugars" but mainly fructose and glucose-fructose syrups are the great culprits of obesity and related diseases. Glucose can be used by almost all the cells, whereas fructose is almost solely used by liver cells. The pinnacle of unhealthy food is probably reached when, besides too much sugar (fructose), also too much fat, salt, as well as taste enhancers and preservatives are being added to food.

The large food companies want us to believe a nice fairy tale, namely that we easily can get rid of the energy of all the added sugars by being active and/or sporting. On the contrary, the examples given below show that it is very difficult to lose all the fat that we accumulated just by indulging in sporting activity. A car consuming 100 ml of petrol per km consumes about 900 Kcal/km (100 x 9 Kcal). To conduct a healthy life, we need about 2000 Kcal per day. In Belgium, 131 g of added sugar is consumed, by one individual, per day, which is equal to 524 Kcal extra. As many like drinking a few glasses of beer or wine, it does not constitute a major effort to reach a daily surplus of 900 Kcal calories above the required 2000 Kcal (total thus 2000 + 900 = 2900 Kcal). Of the daily 2000 Kcal needed, about 80% (= 1600 Kcal) is used to maintain the body temperature and the rest (400 Kcal) is used for movement and other body functions. To burn the extra and superfluous 900 Kcal, you need to push your car over a slightly uphill distance of 1 Km. Another way to regard the calculation, is by the following: running 1 Km at a speed of 10 Km/h consumes about 50

Kcal. To burn the supposed extra 900 Kcal, one has to run 18 Km. Extremely obese persons daily over-consume up to 6000 Kcal, so that they have to run 120 Km per day to burn all the extra Kcal, which seems impossible. Thus, the easiest way of maintaining your weight in balance, is to reduce the uptake of calories, and this of course must also be combined with enough exercise. Here too, the food lobby tries to blame the consumer. The food lobby considers they have the right to add so much sugar and fat. The consumer is then responsible for losing the surplus of absorbed calories, which he should lose by exercise. Another fairy tale that is maintained by some people, is that the use of (synthetic) sweeteners leads to insulin release, as the brain should associate the sweet taste with food intake (a kind of Pavlovian effect). This is certainly not the case because the trigger for insulin release is the blood glucose concentration. It is possible to absorb a large amount of fructose leading to the perception of sweetness, but there is no increase of insulin release because the beta-cells of the pancreas do not have the fructose transporter Glut-5. Therefore, fructose cannot enter the cells and cannot provoke an insulin release [2].

Besides the sugar problem, we should also consider the increase of methanol (= wood alcohol) in the food. This text is an honest effort to correlate the occurrence of different diseases with substances that should not occur in food.

Dangerous Compounds in Our Food

Fructose, aspartame, methanol and sucralose

Fructose

Small amounts, (up to \approx 10 to 15 g/day) have a beneficial influence on fat metabolism and this only in a hypo-caloric condition, e.g., during fasting. By eating a few fruits per day, the required fructose is absorbed, as well as some minerals and anti-oxidants.

- Large amounts of fructose or glucose-fructose syrups (above 15 g/d) are a very poisonous. Many people consume up to 75 g added fructose and/or glucose-fructose syrups, even "organic" syrups such as maple leaf syrup, etc. It is not true that because fructose or glucose-fructose syrups are produced in an organic way that they become less poisonous, when consumed in large amounts. "Organic" is certainly not synonymous with "healthy".

Observed health risks of large amounts of fructose and glucose-fructose syrups:

(1) If healthy rats are fed large amounts of fructose for 2 weeks (older literature) or glucose-fructose syrups, they develop type 2 diabetes (see research by [2]). Previously, this was the method used to obtain diabetic rats to study type 2 diabetes.

(2) Development of insulin resistance, by a nearly complete absorption of fructose and glucose-fructose syrups in the liver and the subsequent synthesis of saturated fatty acids from them.

(3) Accumulation of fat leads to the so-called 'fat liver', by which other diseases might develop (similar to the fatty liver of heavy alcohol drinkers).

(4) Stimulation of pancreatic cancers (only \approx 5 - 6% chance of survival; [3]).

(5) Inhibition of the hormone leptin, so that no satiety feeling develops, which results in excessive overeating. This again leads to obesity and obesity-related diseases.

Table 1: Amounts of methanol (mg/L) in the different juices (Hou et al., [12]).

apple: 14	banana: 107
guava: 14	pineapple: 113
carrot: 53	Valencia orange: 145
lemon: 55	star-fruit: 148
watermelon: 65	alfalfa-germs: 171
grape: 79	pea shoots: 194
spinach: 97	tomato: 240
papaya: 104	black-berry: 362 (Possner et al, [8])

(6) Research by [4] indicates that the over-consumption of fructose and glucose-fructose syrups leads to a higher degree of anxiety and depression.

(7) Recent research with mice shows that glucose-fructose syrups in amounts corresponding to those of human consumption provoked up to 90% more mortality in females and moreover, 26% less fertility [5]. Ordinary table sugar (=sucrose) did not provoke these effects. Maybe, this can be explained by a difference in the speed of absorption of free fructose and fructose after hydrolysis of sucrose.

(8) There seems to be a relationship between type 2 diabetes and pancreatic cancer.

(9) Recent research in 3 mice models shows that large amounts of fructose stimulate breast cancers (both early appearance and the development of the cancers are stimulated) [6].

(10) Recently, [7] showed that a large fructose intake by mother animals leads to a fetal programming of obesity in the female offspring, high blood pressure, metabolic dysfunctions, insulin resistance, low adiponectin content and increased risks for heart and vascular diseases.

- The sugar lobby confuses the consumer by inventing new names for sugar and by suggesting that it is not about sugars (e.g., cane sugar, dextrose, maltodextrine, lactose, galactose, modified starch etc.).

- Coconut fat seems to be a little healthier because of its short fatty acid chains (C12). The lobby now abuses this "health claim" to give the impression that coconut flower syrup is much healthier, which is certainly not true as it contains a huge amount of fructose syrup. Of course, here the term "organic", is in the hands of the big industry, which enables them to mislead the consumer so that the pursuit of profit comes first.

- Although many scientists have proved the dangers of large amounts of fructose and glucose-fructose syrups, the sugar lobby tries to debunk these results. Here the authorities have the duty to apply the principle of precaution, i.e., total prohibition to sell these products or to add them to food, unless there is proof that they are sufficiently safe.

Suggestion for sugar tax to have a positive and efficient influence on health:

- 100 €/kg fructose
- 50 €/kg sucrose

Methanol or wood alcohol in the food

Animals: metabolize methanol to formaldehyde (formalin) which is detoxified into formic acid which can even function as a food

component in animals.

Man: metabolizes methanol to formaldehyde (formalin), but is nearly unable to detoxify formaldehyde into formic acid. This formalin is the big problem. Man is about 100 x more sensitive than most of the animals, even rhesus monkeys. The lethal dose for humans can, because of ethical reasons, not be determined experimentally. Generally, it is believed that the intake of about 8 -15 g is lethal. The claim by [8] is thus an insidious error, namely that the minimum concentration that starts undermining the health is 0.1 g/kg body weight. A person of 80 kg might thus absorb $0.1 \times 80 = 8$ g, but for humans this is a lethal dose. This toxicity limit might be found for animals, but certainly not for humans. Figure 1 shows the photo of a technician victim of methanol poisoning as methanol was added to her soft drink. She barely survived and now is blind for the rest of her life. The Californian Office of Environmental Health Hazard Assessment (OEHHA, 2012) limited the total daily intake to 23 mg methanol, which is about 350 times less than claimed by Possner, and possibly this amount is a still relatively large amount.

Formalin: Is very reactive, and its reactivity can be compared to that of radicals (life time: ≈ 1 nanosecond for, e.g., the hydroxyl radical) (1 nanosecond is a billionth of a second). Formalin is so reactive that even in people who committed suicide by drinking a large amount of methanol, often no traces of formalin are found as it completely reacted with the cell structures.

- Has been used before as an efficient disinfectant,
- Is often being used in chemistry just because of its reactivity,
- Is often used when making slides used for microscopy to fix different biological structures,
- When formed, formalin certainly causes damage, even in small amounts!

Chronic exposure will definitely cause damage and because methanol is easily transported through the whole body, this damage can also occur in the brain, as well as in other body parts, because methanol is easily transformed into formalin. Herein formalin differs from other poisons which in small concentrations can be detoxified by the liver without provoking a visible physiological damage. Methanol can also easily pass the placenta into the fetus and it can provoke damage there (see later).

- Formalin can "plasticize" structures, and for this reason formalin is used to conserve animals, as well as to fix tissues to make slides.

- Formalin can "plasticize" the brain, the eye nerve and others.... This might lead to blindness or death as happens when drinking home-distilled alcohol containing too much methanol.

- Formalin can also methylate DNA as well as its transcription factors. This might cause mutations, which possibly can lead to cancers, and also to the development of type 2 diabetes. This has been proven for aspartame, a wide-spread source of methanol and thus also of formalin.

- Proteins too can be methylated. Then, the immune system considers these changed proteins as foreign and will attack them, with as a consequence an increase of auto-immune diseases. This might possibly explain the development of type 1 diabetes and psoriasis. Indeed, an increase of type 1 diabetes is observed in the population and moreover, type 1 occurs at a younger age (even babies of only

Table 2: Possible methanol concentrations (in mg/L) found in the blood of babies after drinking 1 glass (72.4 mg methanol/200 ml) of black berry juice.

Months	Boys			Girls		
	Weight(in g)	Blood vol. L (8%)	mg/L blood	Weight(in g)	Blood vol. L (8%)	mg/L blood
0	3410	0.27 L		3290	0.26 L	
1	4500	0.36		4200	0.34	
2	5600	0.45		5150	0.41	
3	6400	0.51		5850	0.47	
4	7000	0.56	141.9	6400	0.51	142
5	7500	0.6	120.6	6900	0.55	131.6
6	7900	0.63	114.9	7300	0.58	124.8
7	8300	0.66	109.7	7650	0.61	118.7
8	8600	0.7	103.4	7950	0.64	113.1
9	8850	0.71	102	8250	0.66	109.7
10	9200	0.74	97.8	8500	0.68	106.5
11	9400	0.75	96.5	8700	0.7	103.4
12	9700	0.78	92.8	8950	0.72	100.5

2 months old). This might be explained by earlier contact with methanol via the placenta or food (think of stored fruit juices and jars of baby food in which methanol can be formed) (Table 2).

- Very recently, a relationship was observed between the increased incidence of autism and the increased consumption of methanol from foods and smoking products. No increased autism was observed in children of mothers who during pregnancy, did not consume more than 66.7 mg methanol, weekly by food products (<10 mg/day). Autism occurred more frequently after a weekly intake of 142.3 mg or more methanol, which in fact is still a small amount (\pm 20 mg/day)! [9]. Pregnant woman should avoid drinking of (conserved) fruit or vegetable juices, as well as soft drinks sweetened with aspartame, because these might be a rich source of methanol.

- Recently, it has been shown that the symptoms of fibromyalgia (joint pains, tiredness, irritated bowel and sleep disorders) completely disappeared if aspartame (= source of methanol) and monosodium glutamate (taste enhancer) were completely omitted from the diet. The causal relationship became clear as the symptoms reappeared when one of these compounds was reintroduced into the diet [10]. In this case, aspartame and glutamate function as an excitotoxin.

- Possibly, the fixation of structures and/or the methylation of them can be the cause of the more frequent occurrence of Alzheimer disease (entangling of Tau proteins) and also its occurrence at a younger age.

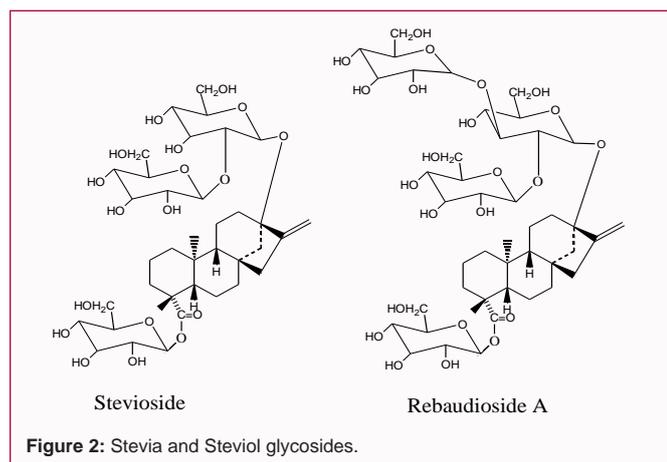
Most important sources of methanol and hence of formalin:
 First of all, we have to take into account the evolution of man. Mainly by eating plants (fruit and vegetables) man was always in contact with small amounts of methanol coming from the plant food. Also within the body, small amounts of methanol can be formed. Its metabolism is adapted in such way that the concentration of methanol and formalin is kept very small (0.2 - 5 mg/L blood). It is also true that mainly in elderly people and persons with neurological diseases, greater concentrations of methanol and formalin are found. Might this reflect a relationship with natural ageing? As man is about 100 x more sensitive than most of the other animals, we should avoid external sources of methanol as much as possible. The list below gives only the most important sources of methanol and formalin [11]:



Figure 1: March 2014, Destelbergen: Cindy, 29 years old, victim of methanol added to her cola (Destelbergen, Belgium).

- Smoking tobacco products
- Aspartame (11% of its weight). One L of cola light may contain up to 650 mg/L, giving 71.5 mg methanol after degradation.
- Fruit and vegetable juices after storage (Table 1). Pectin esterase and pectate hydrolase are the main enzymes releasing methanol from pectin present in cell walls. During the grinding of vegetables or fruit, the compartmentalization of the cells is lost and the enzymes come into contact with the pectin of the walls and release methanol. Enzymes are proteins enabling or speeding up reactions that normally would not occur or be very slow. By boiling proteins, their structure is changed and enzyme activity is destroyed. Compare this with cooking an egg which solidifies the proteins. When storing fruit- or vegetable juices for 3 hours at 30°C, the following methanol concentrations can be found.

Note: the values are not much smaller when storing at 4°C [12]. The mostly given safety limit for alcoholic beverages is 100 mg/L. Herewith, it has to be taken into account that common alcohol is the best antidote against methanol. Thus consumption of fruit juices with these greater amounts of methanol is to be discouraged. The question is also, how much methanol can be found in stored pots of baby food. Preliminary results showed large concentrations in baby foods (results not shown). [8] Found that the methanol concentrations can significantly differ between different cultivars and the production method. However, they took median concentrations, e.g., 18.6



mg/L as median concentration of values between 12 and 72 mg/L for different orange juices. The concentrations of free methanol in black-berry juices varied between 16 and 270 mg/L, with a median concentration of 160 mg/L. In addition, black-berries contained also about 230 mg/L bound methanol, of which about 40% is set free (= 92 mg). The total maximal methanol concentration in black-berry juice then becomes: $270 + 92 = 362$ mg/L (see Table 1). Calculation of median concentrations does not seem to be the best approach and hides the very large concentrations which the consumer might encounter.

What are the possible blood methanol concentrations when a baby is drinking fruit juices (e.g., 200 mL of black berry, containing 362 mg/L or 72.4 mg methanol/serving of 200 mL)?

Methanol might also accumulate in pots of baby food. If we accept “normal” methanol concentrations in blood of 0.2-5 mg/L, it is not difficult to understand why methanol-related diseases might occur in young babies (see Table 2 above). At the age of 4 months, MeOH reaches concentrations up to about 142 mg/L and even at the age of 12 months, between 93 (boys) and 100 (girls) mg/L is present. Other possible sources of MeOH are not yet considered.

- The pasteurization of fruit juices inactivates the enzymes, but after the outgrowth of surviving spore-forming bacteria, pectinolysis might occur and thus certainly methanol is being formed during long storage periods.

- Tomato juice and sauces are certainly rich sources of methanol as well as black-berry juices. When spaghetti sauce is simmered at a low heat with the lid open for a long time the methanol is evaporated and this makes it safe again (cfr. custom in Italy).

- Smoked food. In Scotland, multiple sclerosis occurs more frequently than in the Faroe-isles, a population group originating from the Scots, thus, both populations have a similar genotype. Only after World-war II, the smoking of different foods started in the Faroe-isles, a custom imported by Scottish soldiers, and since then there has been an increase of the incidence of MS.

- In June 2015, in India over 80 people died after drinking home-distilled alcohol containing too much methanol.

How to live in a healthy way? Avoid processed food and carefully read the labels. Buy a good magnifying glass if necessary to read the small letters on the labels.

- Avoid fructose and glucose/fructose syrups even with the label,

“organic”.

- Avoid excessive consumption of alcohol. Small amounts of alcohol (up to max. 30 - 40 g/day) might have a small beneficial health effect [13] (Persons with Type 1 diabetes have to be very careful with this, to avoid hypoglycemia!).

- There has to be a prohibition of the use of the 'guideline daily amount' (GDA) of sugar because soft-drink producers abuse this while encouraging over-consumption. E.g, a can of cola of 33 cL contains 35 g sugar and the soft drink producer calls this 39% of the GDA, thus, misguidingly suggesting that man needs up to 90 g of added sugar, which is far too much. The recent suggestion of the WHO is only 25 g of added sugar per day.

- Avoid stored fruit juices and always eat fresh food from the local market.

- Vegetable and fruit juices immediately frozen after production are OK. Prior to freezing, vegetables should be blanched to denature the pectin methyl esterase.

- What if you prepare your own jam or vegetable conserves in grandmother's way?

By cooking (sterilising), the enzymes are inactivated and methanol cannot be formed anymore. The same holds true for the self-prepared jam; by sufficiently cooking, the enzymes are inactivated.

- It should be mandatory to mention, on the label, the methanol content that can be expected after storage.

- It should be mandatory to mention the amounts of fructose and/or glucose-fructose syrups on the labels to allow the consumer to avoid being poisoned by these products.

- It is obvious that the EU institutions and the EC have no respect for their citizens, as since 2017, they authorise the free and unlimited use of fructose and high-fructose corn syrup in food products. Many independent scientists, e.g., [2] have proved that the consumption of large amounts of fructose or glucose-fructose syrups is detrimental to human health (development of obesity and its related diseases, e.g., type 2 diabetes). In this case too, the lobbyists were allowed free play.

- The labelling of the various food products should be much simpler out of respect for the consumer. The traffic light system should be used, so that the consumer can see at a glance if there are too much sugar, fat, salt or taste- enhancers added to food products (codes: green, orange and red).

One bright spot: ethanol (= common alcohol, max. 30 - 40 g per day) is the best antidote against methanol because ethanol binds about 16 x better to the enzyme that oxidizes alcohol. Of course, pregnant women must ignore this, because ethanol is also bad for the fetus. Moreover, no one single mother will accept that her baby of 2 months old will develop type 1-diabetes or autism, diseases that might have been prevented by good food laws. Therefore, food and fruit juices containing too much methanol must be removed from the market. The precautionary principle has to be chosen above profit. Politicians must make a stand and show what health of the citizen means to them.

Why is the study of methanol so difficult? First of all, it has to be said that the food industry will not easily support this kind of research. As animals react about 100 x less sensitively than man, the research should be done on man. However, because of the extreme

toxicity of methanol, this would be irresponsible and unethical. Doing experiments directly with formalin is not feasible either because this product is so reactive that it would immediately react at the point of administration. Thus, common sense has to take over and the best advice is to avoid all possible sources of methanol in the food. As is the case with most of the “chronic effects”, it is difficult to convince the consumer of the danger of this compound. At small concentrations, the poison has an effect over a longer time period and harmful effects are not always immediately seen. Therefore, “acute” effects of larger doses are easier to explain, as it is possible that people will die immediately, an outcome which might happen only after a long period, in the case of chronic effects of small concentrations.

Sucralose

Sucralose is a halogenated sucrose containing 3 chlorine atoms. Since 1973, this group of compounds is on the black list of chemicals in Europe, as these compounds are toxic, have a very long half-life and there is the danger of bio-accumulation. Nevertheless, since 2004 the halogenated sucralose has been authorized as a food additive. It is water soluble and cannot be filtered out in water-treatment plants. Therefore, it is not surprising that sucralose has already been found accumulating in fjords in Sweden (2007). All water organisms will be in continuous contact with this chlorinated compound and the long-term effect on natural habitats is unknown. Because of its resistance and long half-life, sooner or later sucralose will also end up in incinerators. Then it will give rise to the carcinogenic dioxins, as heating chlorinated compounds gives rise to dioxins. Prevention of dioxin formation by incineration at much higher temperatures (1100°C) compared to the usual 800°C is not a good solution, as then nitrogen from the air is oxidized giving rise to another group of toxins (nitrogen oxides - NOx). A similar outcome was demonstrated with VW engines: by burning of motor fuel at high temperature under high pressure more NOx were formed. On 3 February 2016, the EU parliament clearly showed that for them human health is not important at all. They accepted that diesel engines may emit more than double the amount of NOx than already fixed in 2007 (80 mg/km). It can be estimated that in the EU thousands of people will develop cancers and suffer and die too early. Also for this reason, it might be necessary to establish a “new ec”. EU policy is clearly a big failure. Generally, it is accepted that only a small part of sucralose ($\pm 15\%$) is absorbed into the body. Of this, a small amount is metabolised, mainly into its glucuronide. When storing sucralose under acid conditions (e.g., in soft drinks), it can be degraded into 4-chloro-4-deoxy-galactose (4-CG) and 1,6-dichloro-1,6-dideoxyfructose (1,6-DCF). This last compound is weakly mutagenic both in the Ames assay as well as in the L5178YTK +/- assay. Moreover, sucralose was weakly mutagenic in the mouse lymphoma mutation assay. Earlier, it has already been shown that sucralose damages the DNA of cells of the digestive system as demonstrated by the mouse comet assay. Recently, [14] showed that sucralose was carcinogenic in male animals, mainly in concentrations of 2 and 16 g/L. However, we have to take into consideration that these are rather large concentrations. On the other hand, we have to take into account the study of a very large group of independent scientists [1]. This group has shown that compounds that are not carcinogenic on their own can have synergistic reactions (read “cooperative”) when administered together and can induce cancers. If we then consider the cola-light products, we see many components that possibly can induce cancers by a synergistic action of weakly carcinogenic compounds (e.g., 4-methyl-imidazole, aspartame and sucralose). In the USA, the Center for Science in the Public Interest

(CSPI) downgraded sucralose from “use with caution” into “avoid”. Moreover, in the USA the Allowable Daily Intake (ADI) is only 5 mg/kg BW which is far below that of the EU (15 mg/kg BW).

The healthy alternative

Stevia and Steviol glycosides

Note: Stevia: the plant or dried leaves are wrongly considered as a Novel Food” [15] and still not completely accepted in the EU. As published earlier, Stevia was on the positive list of herbs of Belgium and the sale of leaves and raw extracts was authorized in Belgium and Europe. By the action of an overzealous officer of the Belgian Ministry of Public Health, the EC wrongly considered Stevia as a Novel Food. In fact, Belgium must justify itself to Europe and the rest of the world as to why they previously put public health at risk by according the authorization of Stevia or it has to admit that it gave in to the food lobbyists under the influence of an European Novel Food law based on negative proofs (unique in the world and scientifically impossible). Belgium should at least make a sound statement why Stevia was suddenly prohibited. In Germany, the court ruled twice that Stevia is not a Novel Food. At least, the Stevia-dossier clarifies that the politicians of the EC have no respect for the EU consumer and that they are dominated and overruled by the thousands of lobbyists of the industry (similar to, e.g., the delay of the abolition in 2015 of the expensive roaming rates for GSM). Do we really need the multinationals to protect the population against hunger and thirst or are they necessary to provide the attendance fees for the numerous EU politicians? Do big companies pay the same taxes as small companies? The Stevia-dossier clearly shows that the foundation of a “New ec” might be necessary which would indeed have respect for the consumer. Moreover, the consumer should not be overwhelmed with countless and incomprehensible labelling rules, but should be guided by simple and understandable rules like, e.g., the traffic light system to indicate the quality of the food.

Steviol glycosides: Below, we give a short summary of the health effects of steviol glycosides, the natural sweeteners present in Stevia (see Figure 2). More information can be found in [15,16] (Figure 2).

Small doses are used to sweeten food products and are absolutely safe sweeteners without calories: Exact dosage is important for the taste and consumers have to adapt a little to the taste.

Large doses have beneficial pharmacological effects (750 to 1500 mg/day):

- Decrease blood pressure in cases of hypertension only
- Beneficial for type 2 diabetes
- Can regulate blood glucose concentration
- Can regulate insulin-secretion
- Decrease oxidised LDL's (“bad cholesterol”)
- Increase insulin sensitivity: very important for type 2, and possibly also for type 1 (few case studies)!
- Decrease glucagon-secretion (hence less burning of fat, avoiding increase of glucose)
- Decrease atherosclerosis
- Decrease some cancers, proven for skin cancers in animals.
- Decrease inflammations

- A recent study demonstrated that crude Stevia extracts nearly completely inhibited the in vitro growth of *Borrelia burgdorferi* [17]. After a tick bite, the bacteria injected can provoke the Lyme disease. With the presence of purified steviol glycosides, this effect was absent. However, this might be due to the fact that steviol glycosides are very large molecules that cannot be absorbed by the bacteria. The same holds true for glycosides of phenols and isoflavonoids. What happens with the *Borrelia* bacteria when patients consume these extracts is not known, nor is it known what the effect of steviol glucuronide might be on this bacteria (Note: after the intake of steviol glycosides, steviol glucuronide is found in the blood).

Possible explanation of the pharmacological effects: Mainly by radical scavenging and development of anti-oxidant systems.

- A “common trigger” is required to explain the different and simultaneous beneficial effects and this trigger might be radical scavenging. This has been shown with hydroxyl- and superoxide radicals (for steviol glycosides).

- Radical scavenging by crude Stevia water extracts is proven for hydroxyl- and superoxide radicals, DPPH, TBA-reactive material and NO [18].

- Recently, the involvement of the pancreas TRPM5 ion channel by steviol and steviol glycosides in insulin and glucose metabolism has been published [19,20].

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