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Koala wisdom

Oliver Schulz

The koala is probably the animal most closely associated with Australia and definitely one of the most popular animals all over the world. Its big head, the fluffy ears, body proportions that resemble a teddy bear all contribute to the koala being regarded as a most sympathetic representative of “down under”.

Koalas have a remarkable diet that consists to a very large extent of eucalyptus leaves. The leaves not only provide almost all nutrients the animal needs, but also a sufficient amount of water. The name “koala” in fact derives from an Aborigine expression for “does not drink”.

Whereas a “Eucalyptus leaves only” diet works perfectly for the koala, it would not exactly be recommendable for humans. However, some polyphenols in the leaves might hold the key to solve the biggest nutritional problems of our times: the epidemic spread of diabetes, obesity, metabolic syndrome and related diseases...

The real costs of high sugar consumption

Sugar, chemically sucrose or saccharose, is omnipresent: It is cheap, it tastes nice, it covers unpleasant aromas, it provides “mouth-

feel” to industrially produced foods, it adds bulk to foods, it is water-soluble and heat-resistant. From an industrial point of view, sugar is simply the ideal ingredient. And it has another property that is not often talked about, but just as real: Sugar is highly addictive. It makes the consumer long for more – which is exactly what food producers would wish for (DiNicolantonio, 2017).

A worldwide recognised expert on sugar addiction and its consequences, is Dr. Robert Lustig, professor of paediatrics at the University of California, San Francisco. In an article for the American magazine “The Atlantic”, Dr. Lustig explains: “The brain’s pleasure center, called the nucleus accumbens, is essential for our survival as a species... Turn off pleasure, and you turn off the will to live... But long-term stimulation of the pleasure center drives the process of addiction... When you consume any substance of abuse, including sugar, the nucleus accumbens receives a dopamine signal, from which you

experience pleasure. And so you consume more. The problem is that with prolonged exposure, the signal attenuates, gets weaker. So you have to consume more to get the same effect – tolerance.

And if you pull back on the substance, you go into withdrawal. Tolerance and withdrawal constitute addiction. And make no mistake, sugar is addictive.” (Lustig, 2012)

Many experts agree that the excessive sugar consumption is the real cause of the skyrocketing numbers of not only obesity and diabetes, but other chronic and lethal diseases, such as cancer, morbus Alzheimer and depression to name but a few.

The World Health Organisation (WHO) has addressed this issue and recommends the reduction of sugar consumption to a maximum of only 10%, ideally 5%, of the daily calorie intake. For an average adult diet of 2,000 calories this corresponds to 25 to 50 g of added sugar. The reality is in stark contrast: In Germany for instance, the average consumption is 92 g per day. Every day. And every person: Men, women, children, new-borns... (Statista, 2017). Other EU countries deliver similar values.

Sensible as the WHO's recommendation may be, it leaves one key point aside, however: there is a plethora of studies providing evidence that a calorie is not a calorie. Calories from sugar, especially from fructose are far worse than calories from other sources.

Fructose is actually broken down very much like alcohol, damaging your liver, changing your microbiome and causing mitochondrial and metabolic dysfunction. Fructose is more

readily metabolized into fat than any other sugar which probably is the main reason why the rates of non-alcoholic fatty liver disease – also among children – has been increasing at such an alarming rate over the past decade.

Glucose metabolism and fructose metabolism

As mentioned earlier, a calorie is not a calorie. And even in sugars, not all calories are created equal: In an interesting experiment with rats, the animals were divided into a glucose-only and a fructose-only group. Both groups received an isocaloric diet. The animals fed a diet containing fructose showed accelerated lipid synthesis and developed a fatty liver while the control group fed a glucose-containing diet, did not show changes in the lipid accumulation in the hepatic tissue.

Dr. Robert Lustig showed similar results in a ground-breaking clinical study in 2016: obese schoolchildren who had a restricted fructose intake whilst keeping the same total caloric intake, had an alleviation of symptoms of hypertension, hyperlipidemia, and hyperglycemia (Lustig, 2015).

Fructose is the sweeter half of the sugar molecule: whilst keeping every gram of sugar we consume contains half a gram of fructose. The liver can metabolise fructose safely only to a limited extent which is believed to be around six to nine teaspoons (25–38 grams) of added sugar per day, or 12.5 to 17 grams of fructose. Cutting the fructose intake therefore seems to be addressing the very core of all metabolic problems that torment us.

Eucalyptus leaves

Whereas other sources that have been identified as possible culprits of the obesity pandemic, fat, sugar, starch, have been addressed by the pharmaceutical and nutritional industry, fructose has thrived unharmed in the shadow. Fat-blockers, carb blockers, enzymes that inhibit the breakdown and utilisation of starch have all had a turn at solving the crisis – with no remarkable effects. Fructose seems to have been simply overlooked – until recently, when a Japanese company collected all available data on the effects that excessive dietary fructose seems to exert.

Nagaoka Co., Ltd. developed an extract from polyphenols obtained from eucalyptus leaves, with a unique mechanism of absorbing fructose.

EUCAGRANIN® the trademarked eucalyptus leaf extract, suppresses fructose uptake by inhibiting functions of the cellular membrane absorbing fructose. The mechanism takes place in the small intestine, when carbohydrates are disintegrated into monosaccharides such as glucose or fructose under the action of digestive enzymes. The active ingredient of EUCAGRANIN® has been identified as a polyphenol and classified as a hydrolysable tannin.

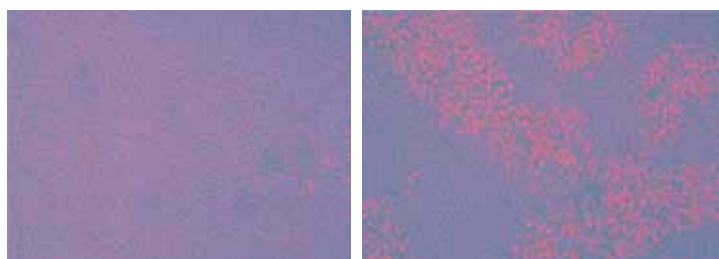


Fig. 1: Liver tissues of rats fed a glucose diet (left) and a fructose diet (right). Red dots indicate lipid droplets

The effect of the extract has been tested in animal models. Rats were fed a diet rich in fructose, with or without the addition of the eucalyptus extract. The pictures of the lipid accumulation in hepatic tissue shows a similar difference as in the previous Figure 1 that compared a glucose-only diet with a fructose diet:



Fig. 2: Rats fed with fructose (left) and fructose with EUCAGRANDIN(R) (right)

In another study (Sugimoto, 2010) with male Wistar rats, a group of scientists examined how eucalyptus leaf polyphenols specifically target the absorption of fructose. The animals received high doses of sucrose after they drank water (control) or water with eucalyptus leaf extract (ELE group). The ELE animals had a significantly lower amount of serum fructose than the control group, whereas the serum glucose was similar in the two groups. This effect could be observed in human volunteers, too.

The next step the researchers carried out was a small, yet “state-of-the-art” randomized double-blind/crossover placebo-controlled clinical study with six healthy male adult participants. Target of the study was to find out if Eucalyptus polyphenols would be able to show a significant effect on slowing down the accumulation of visceral fat on a high-fructose diet (40 g of sucrose per day, equivalent to 20 g of fructose).

Despite the small number of volunteers, the results were significant: after one month of treatment, the placebo group had accumulated on average 13.3% more visceral fat, whereas the eucalyptus group showed a marked decrease of 0.7% visceral fat. It is visceral fat that many nutritionists and physicians see as the main cause of diet-related disorders and metabolic diseases.

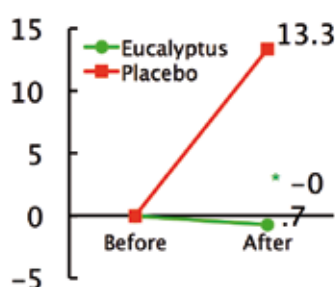


Fig. 3: Results of a clinical study. Design and results are described in the text

Safe and sound

The use of Eucalyptus leaves has a long history in the East and in the West. Tea preparations, candies and different uses of its oil has been known and used for more than 200 years. Despite its long history of use, Nagaoka Ltd. has carried out their own safety studies to show that no adverse effects are to be expected from the use of the extract.

In a study in which 20 adults received 2,592 mg/day of eucalyptus extract (3,240 mg EUCAGRANDIN®) for 4 weeks to demonstrate the safety of extract from eucalyptus leaves, no adverse event was observed. The No Observed Effect Level (NOEL) in a 90-day repeated-dose toxicity study in male and female rats was 100 mg/kg. Eucalyptus leaves were assessed negative in a micronucleus study and other mutagenicity studies.

In the regulatory classification, eucalyptus leaves are approved for the edible use according to the classification of foods and medicines specified in the Pharmaceutical Affairs Law of Japan and are classified as an “Old Dietary Ingredient (ODI)” according to the Dietary Supplement Health and Education Act of the U.S.

As the use of the plant in all kinds of food preparations has such a long history of use in Europe, too, it will not require a Novel Food registration. The preparation of the extract also follows traditional methods.

Summary

The increased use of sugar in the production of foods all over the world has long been identified as the driving force behind the obesity pandemic and the massive increase of what is now referred to as “lifestyle diseases”. Obesity, metabolic syndrome, diabetes type II, but also conditions that are not at first glance recognisable as sugar-related, such as cancer, depression and Alzheimer’s are thought to be at least partly caused by one agent: sugar.

It is starting to become clear that sugar consumption is not simply a matter of “too many calories and too little exercise” which used to be almost a dogma of nutrition over many years. Recently, many experts point to the fructose part of the sugar molecule as the real culprit, as fructose has a different metabolic fate than glucose: fructose is mainly metabolised in the liver and contributes to the accumulation of fat there as well as in other body regions where fat plays its unwanted role.

Reducing sugar and especially fructose in the diet will be the aim of health-conscious individuals as well as for societies as a whole: sugar taxation is discussed in several countries and states.

Yet, everybody knows how extremely difficult it is to reduce sugar intake: since a plethora of foods cannot do without this cheap, tasty and very versatile ingredient, we will see high sugar consumption for many years to come.



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One way to ameliorate the negative effects of sugar would be to inhibit its absorption. For the first time this is not merely wishful thinking, but reality: With EUCAGRAN® the Japanese company Nagaoka Ltd. has introduced a new extract derived from eucalyptus leaves that shows promising characteristics to curb the absorption of fructose with surprisingly beneficial effects on visceral fat accumulation.

So despite the fact that the Australian koala is not exactly known to be a symbol of scholarship, we can definitely learn from its eating behaviour and start to include eucalyptus leaves in our diets...

References

- DiNicolantonio JJ, O'Keefe JH, Wilson WL: Sugar addiction: is it real? A narrative review. *Br J Sports Med*. Published online first: 23. August 2017. doi:10.1136/bjsports-2017-097971
- Lustig, RH: The Most Unhappy of Pleasures: This Is Your Brain on Sugar. *The Atlantic*, Feb 21st, 2012
- Lustig RH et al: Isocaloric fructose restriction and metabolic improvement in children with obesity and metabolic syndrome. *Obesity*, 24, 453-460, 2015
- Sugimoto K et al: Eucalyptus Leaf Extract Suppresses the Postprandial elevation of Portal, Cardiac and Peripheral Fructose Concentrations after Sucrose Ingestion in Rats. *J Clin Biochem Nutr* 46, 205-11, 2010
- www.de.statista.com: Pro-Kopf-Konsum von Zucker in Deutschland in den Jahren 1950/51 bis 2014/15 (in Kilogramm Weißzuckerwert), accessed November, 5th, 2017

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