

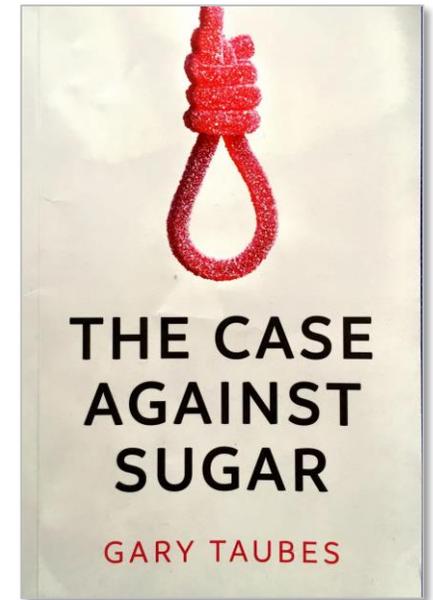
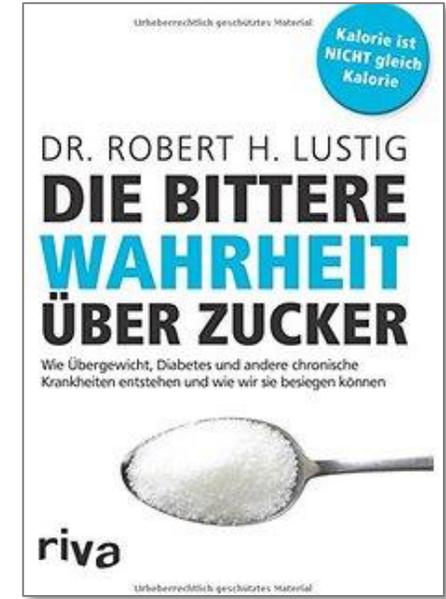
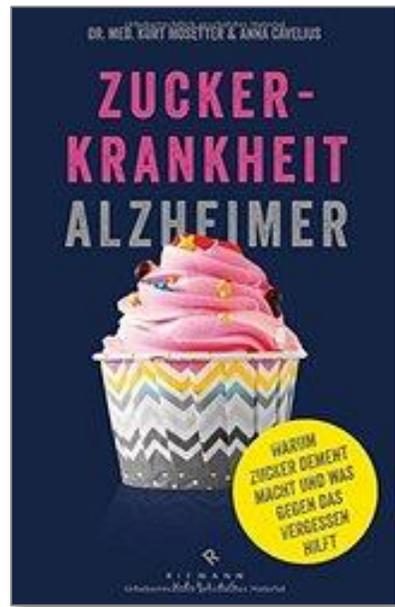
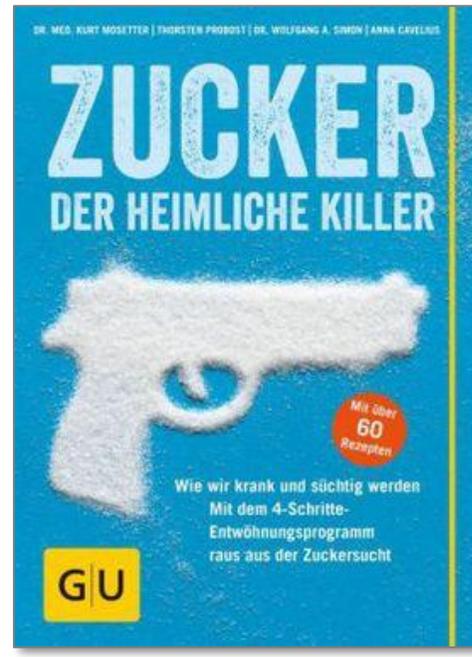


Auswirkungen des Zuckers auf unseren Körper

Public Health Schweiz 26.4.2018

*PD Dr. Bettina Wölnerhanssen
Dr. phil. II Anne Christin Meyer-Gerspach*

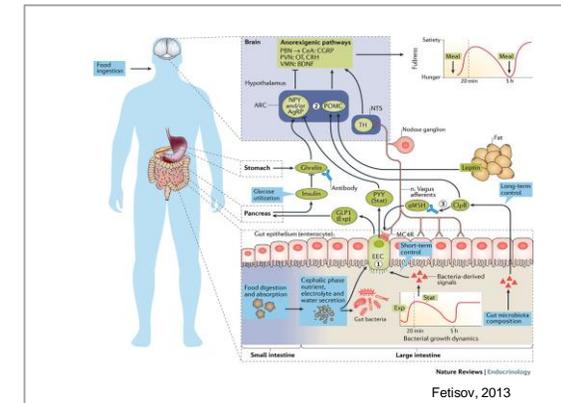
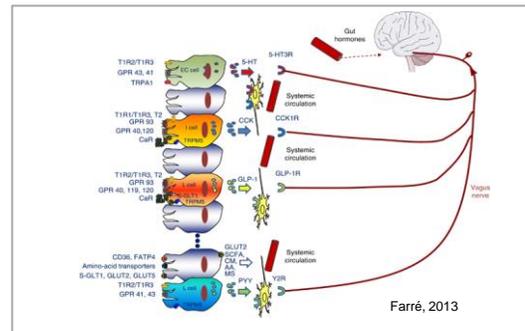
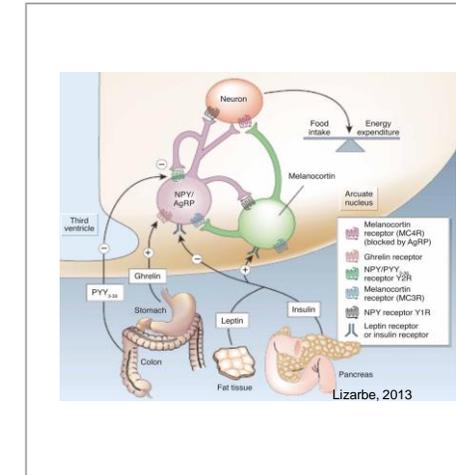
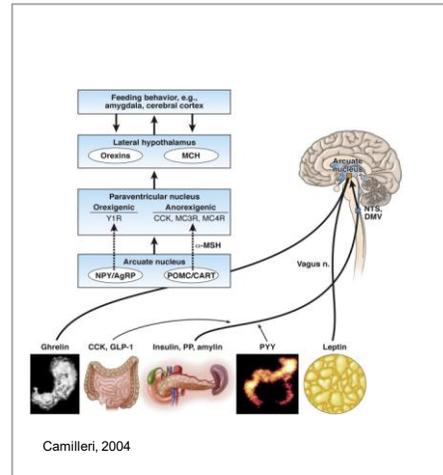
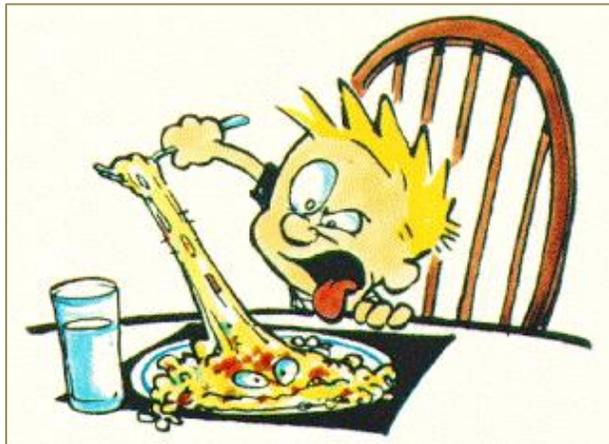
St. Clara Forschung AG/St. Claraspital Basel



Appetitregulation

KOMPLEX!

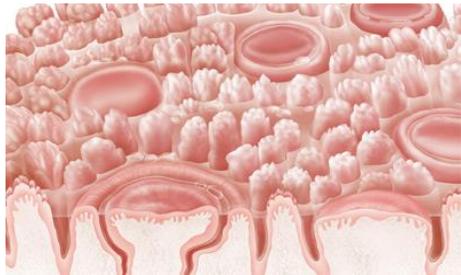
Ich esse *wann* ich will, *soviel* ich will und *was* ich will



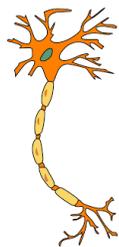
Zunge vs. Darm



Zunge

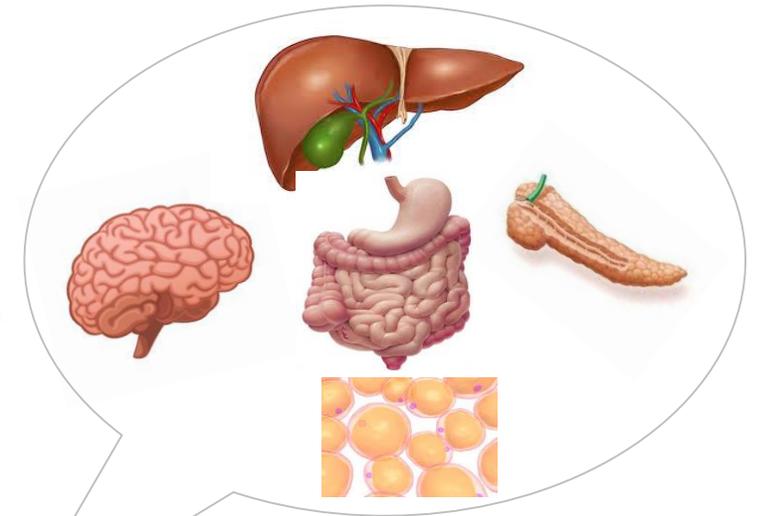
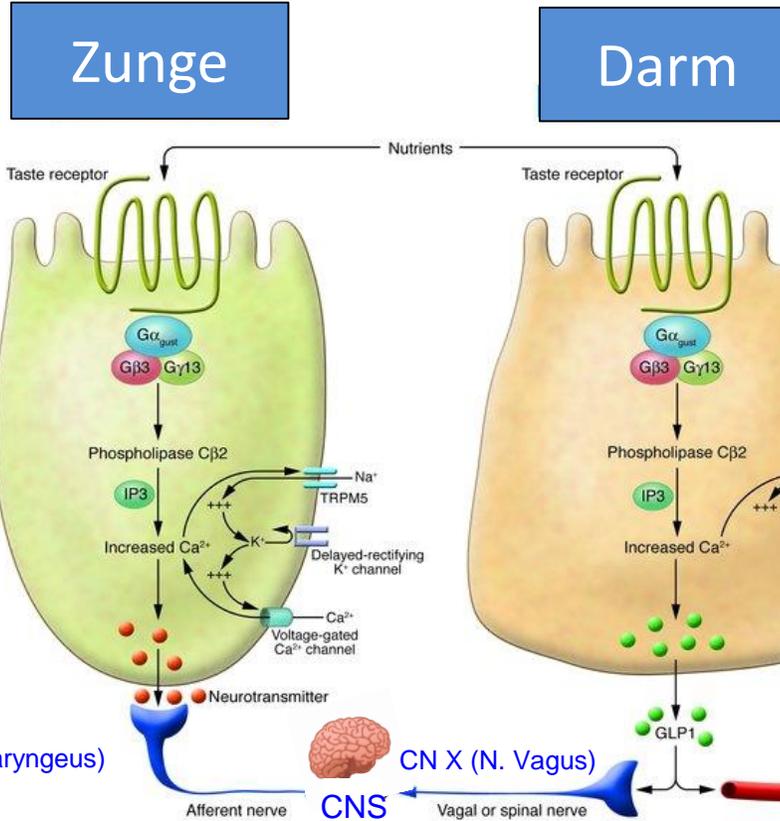


Geschmacksknospen



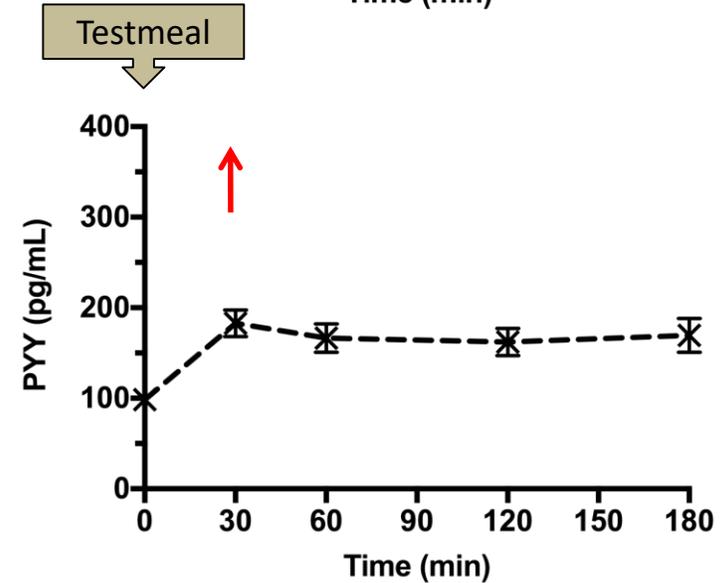
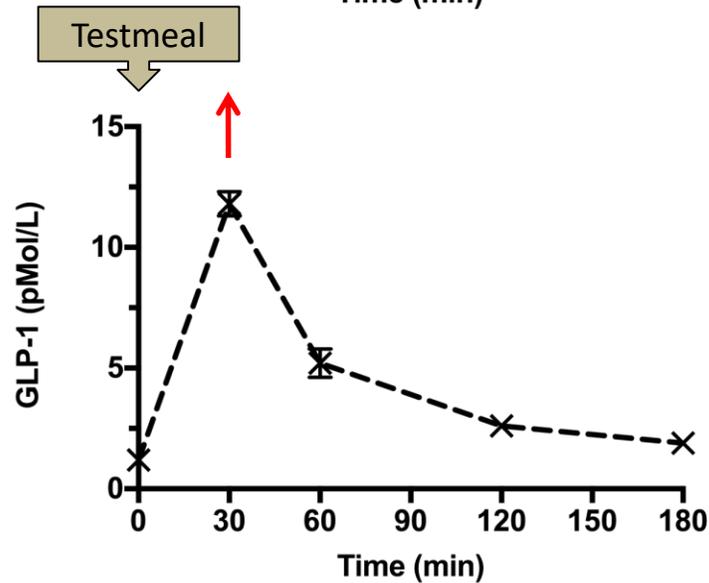
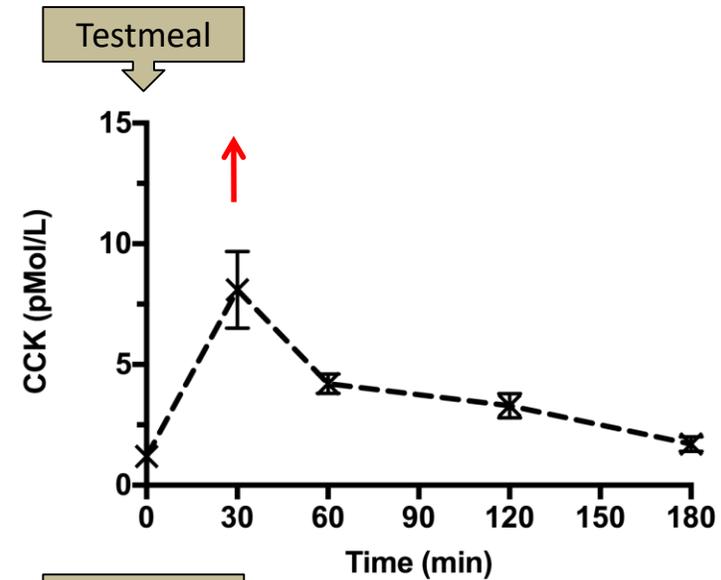
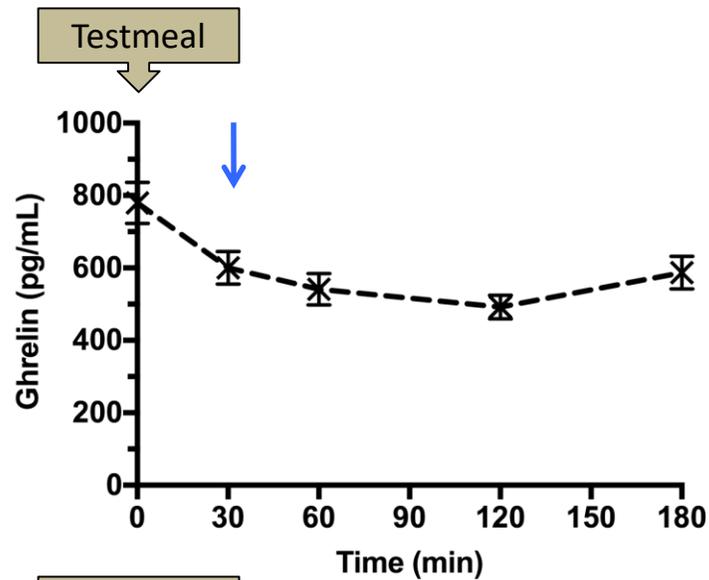
CN VII (N. Facialis)
 CN IX (N. Glossopharyngeus)
 CN X (N. Vagus)

Bewusstes Schmecken



Unbewusstes Schmecken

Hunger- und Sättigungshormone

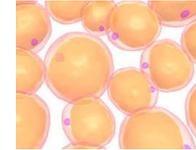


Sättigungshormone: Bsp. GLP-1



Gehirn

Sättigung ↑
Hunger ↓
Belohnung



Fettgewebe (braun)

Wärmeproduktion ↑



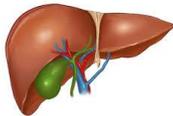
Magen

Magenentleerung ↓



Muskel

Insulinempfindlichkeit ↑



Leber

Zuckerproduktion ↓



Niere

Salzausscheidung ↑

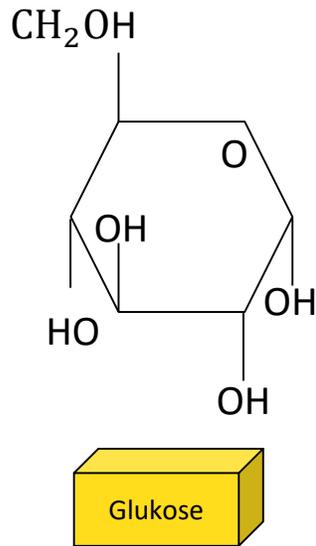


Pankreas

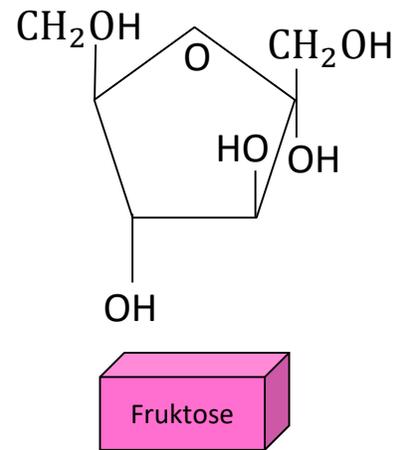
Insulinsekretion ↑
Glucagonsekretion ↓

Aufrechterhaltung Homöostase:
Energiebilanz, Flüssigkeitsbilanz,
Blutzuckerspiegel, Salzhaushalt

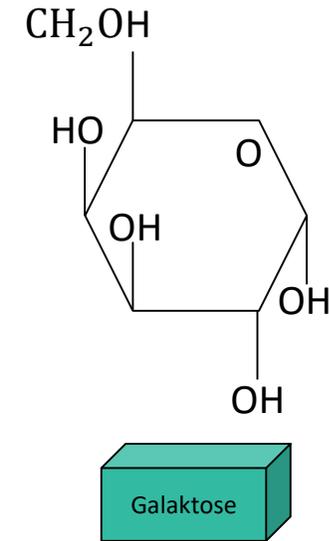
Einfach-Zucker



Glukose
= Dextrose
= Traubenzucker



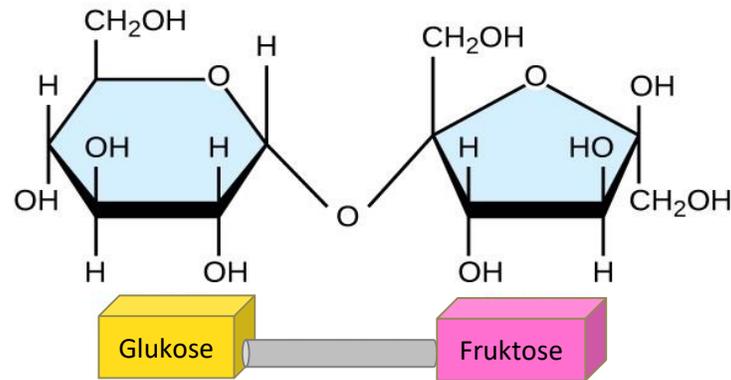
Fructose
= Fruchtzucker



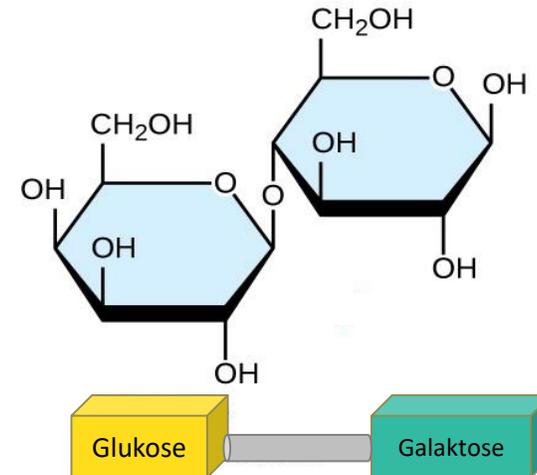
Galaktose
= Schleimzucker

Zweifach-Zucker

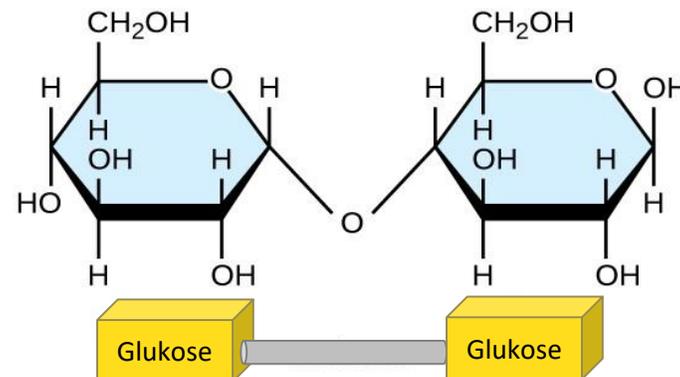
Saccharose = Haushaltszucker



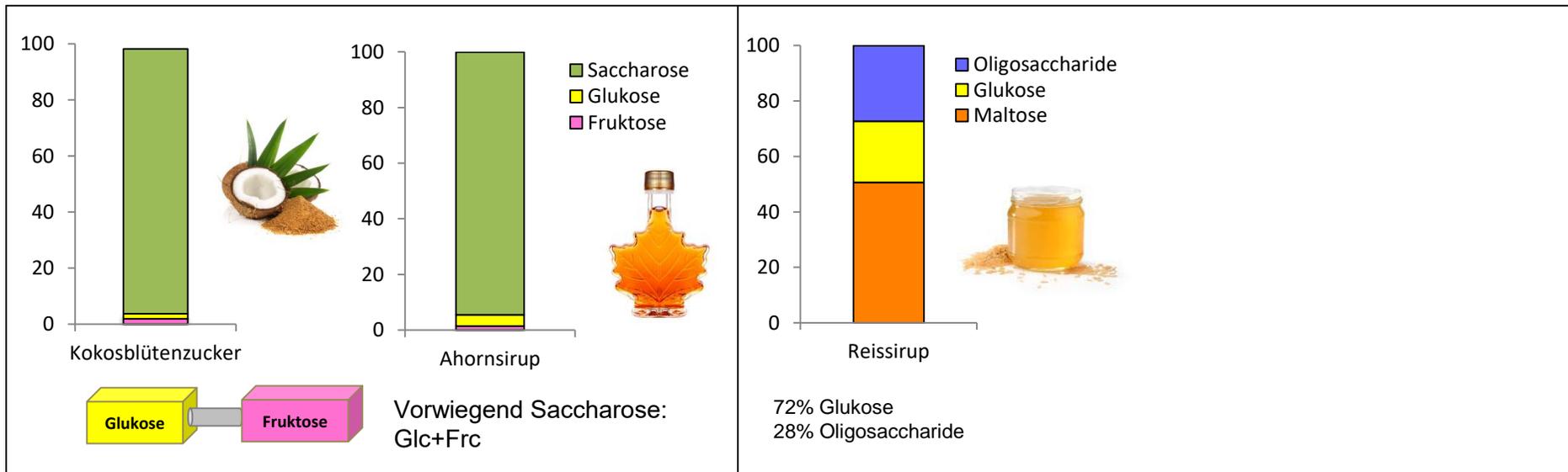
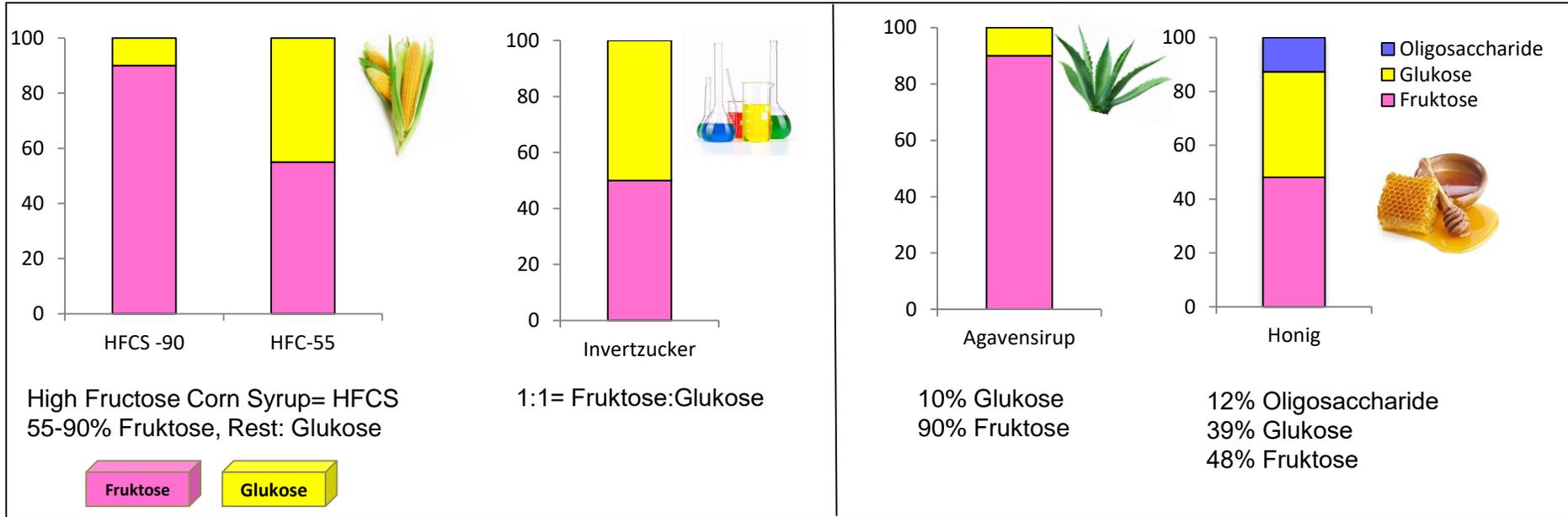
Laktose = Milchzucker



Maltose = Malzzucker



Gemische wie...



Abbau im Darm

„Zweifach-Zucker“

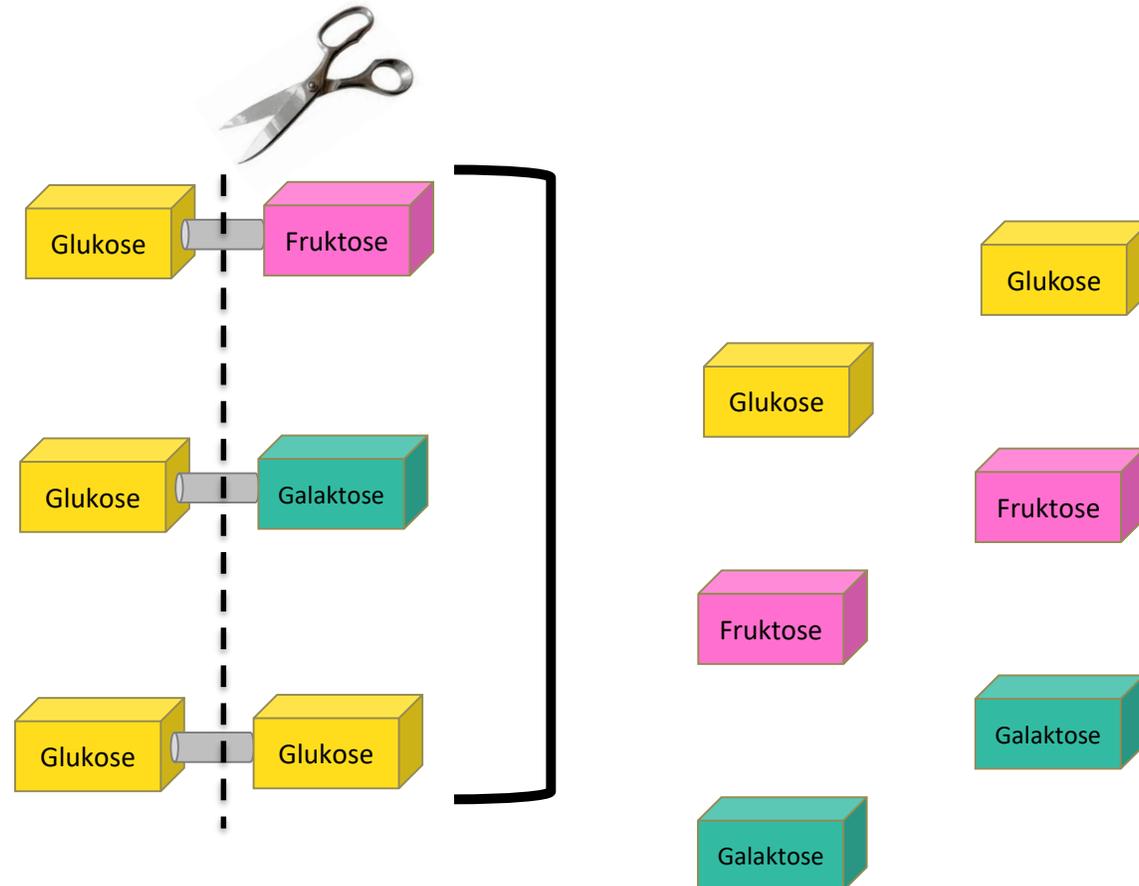
- - ->

„Einfachzucker“

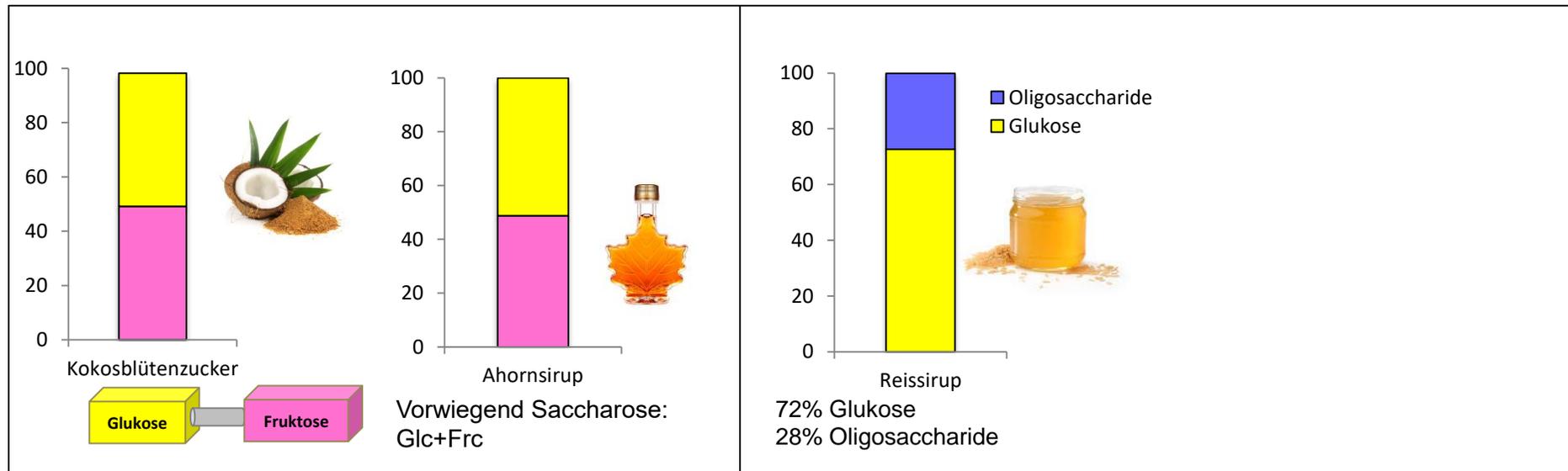
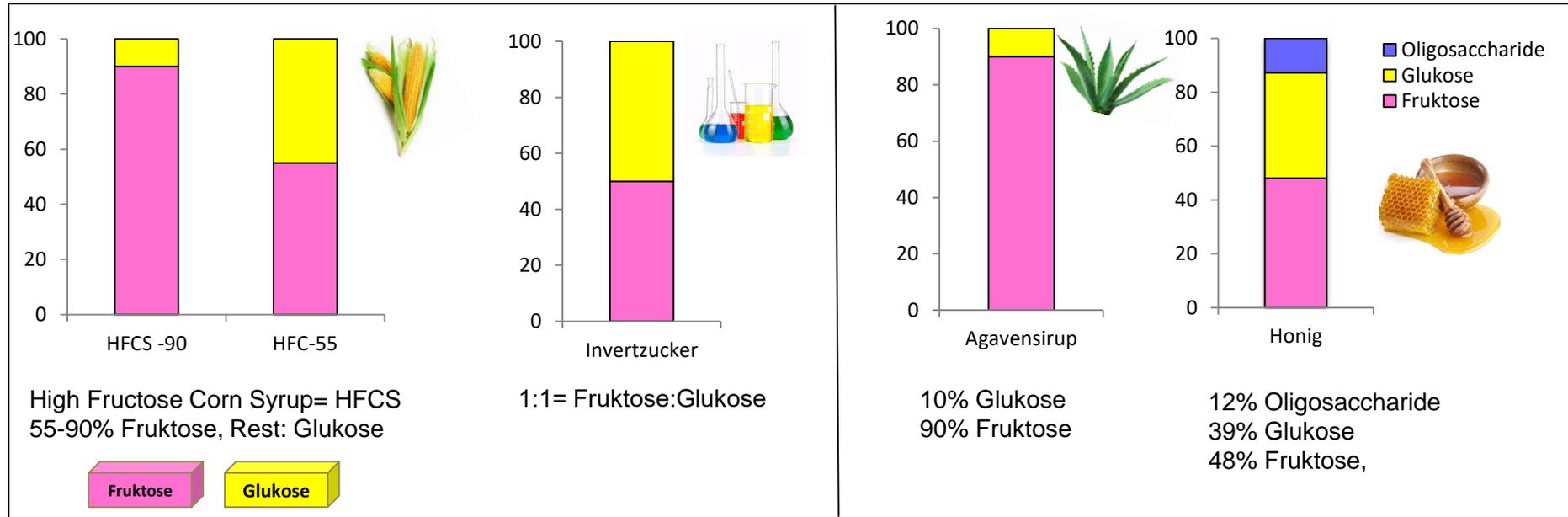
Saccharose
= Haushaltszucker

Laktose
= Milchzucker

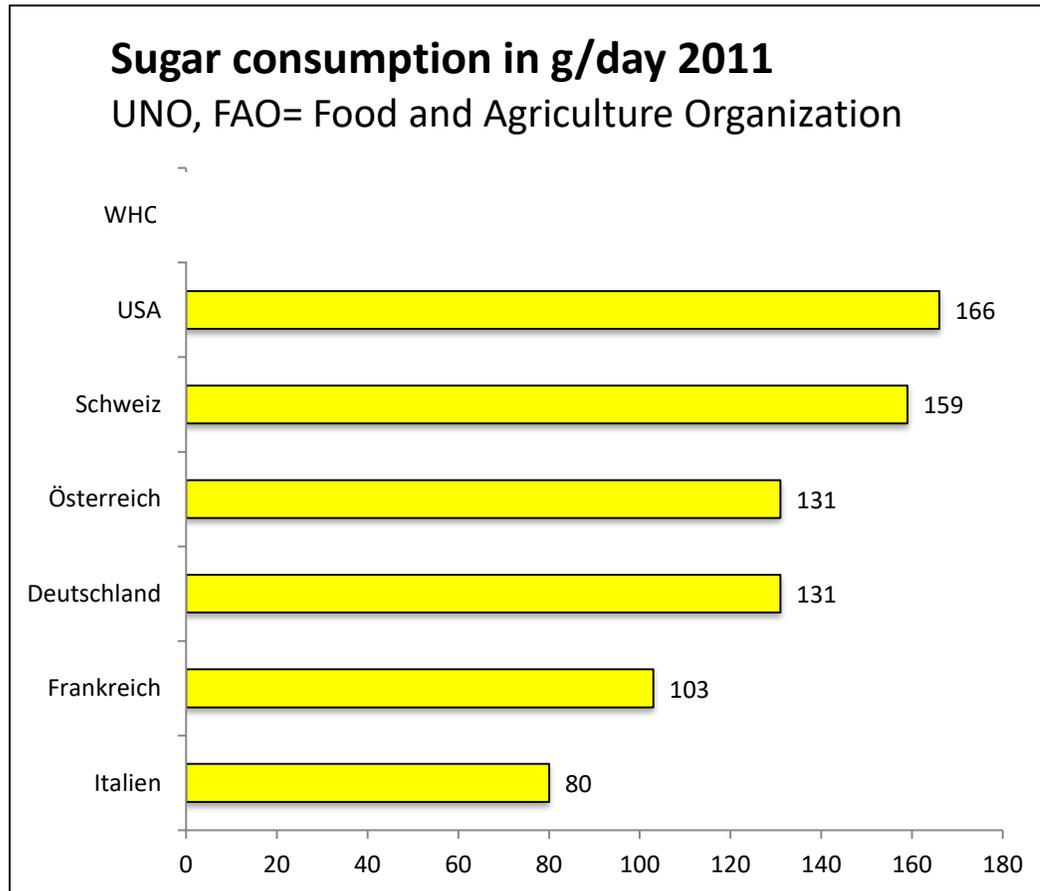
Maltose
= Malzzucker



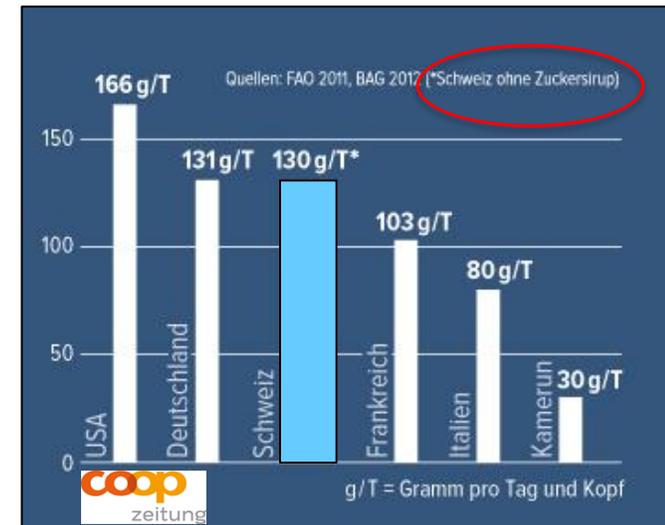
Gemische wie...



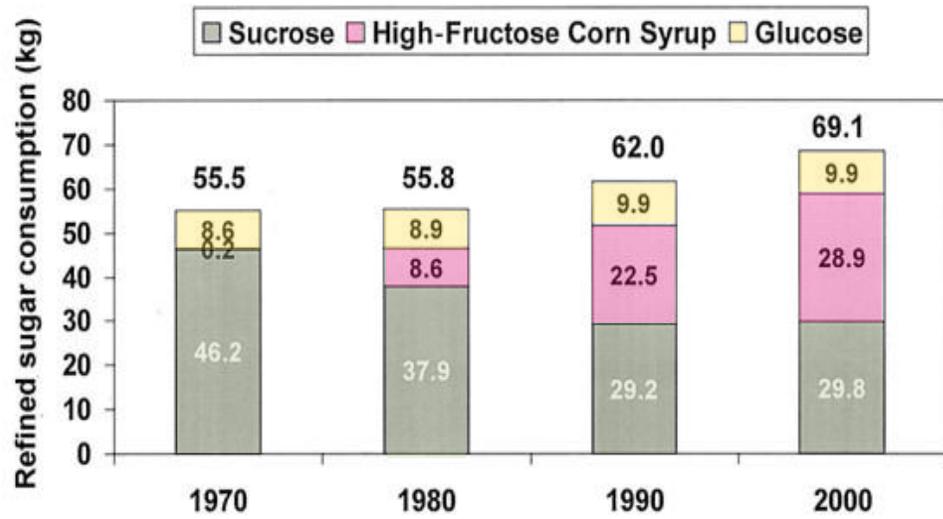
Wie viel...?



Ohne
Zuckersirup!

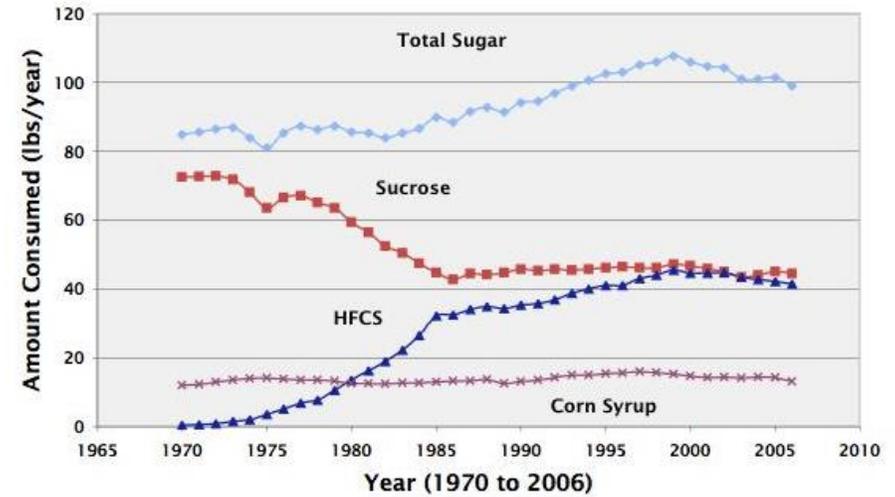


Wie viel...?



<http://www.ajcn.org/content/vol81/issue2/images/large/znu0020507890003.jpeg>

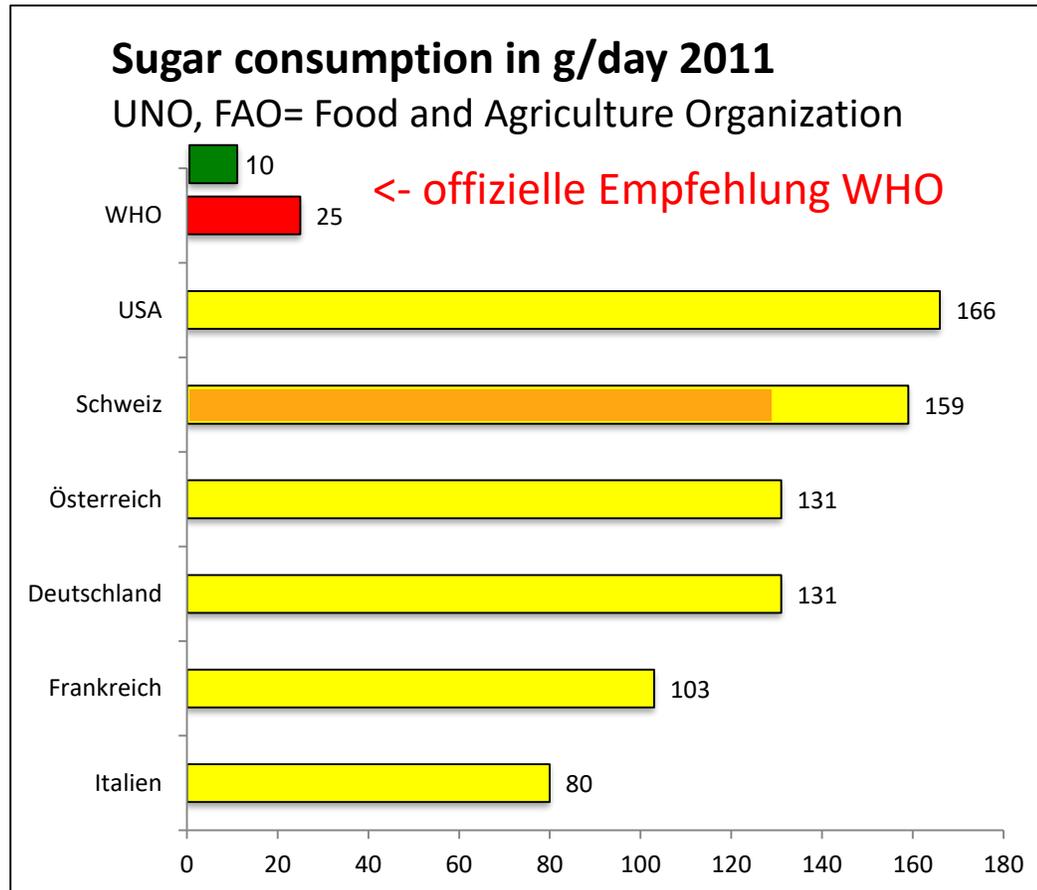
Adjusted U.S. Per Capita Refined Sugar Consumption



NuFS, San Jose State University



Wie viel...?



2003 WHO/FAO Report über Ernährung und die Prävention von chronischen, nicht übertragbaren Erkrankungen:
„Zucker sollte nicht mehr als **10%** einer gesunden Diät ausmachen“.

Lobbying der Zuckerindustrie führe dazu, dass folgender Satz eingefügt wurde:

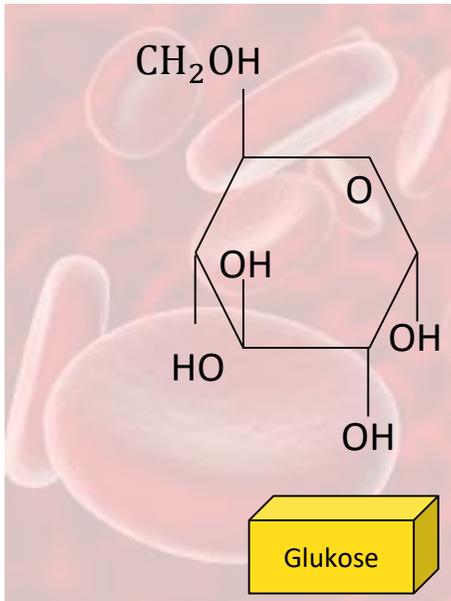
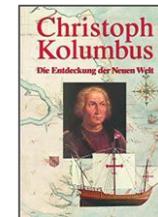
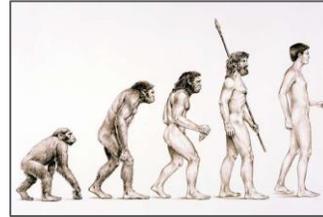
„Das Ziel einer Ernährung mit weniger als 10% der totalen Kalorienzufuhr in Form von Zucker wird **kontrovers** diskutiert“.

2014/2015, WHO:

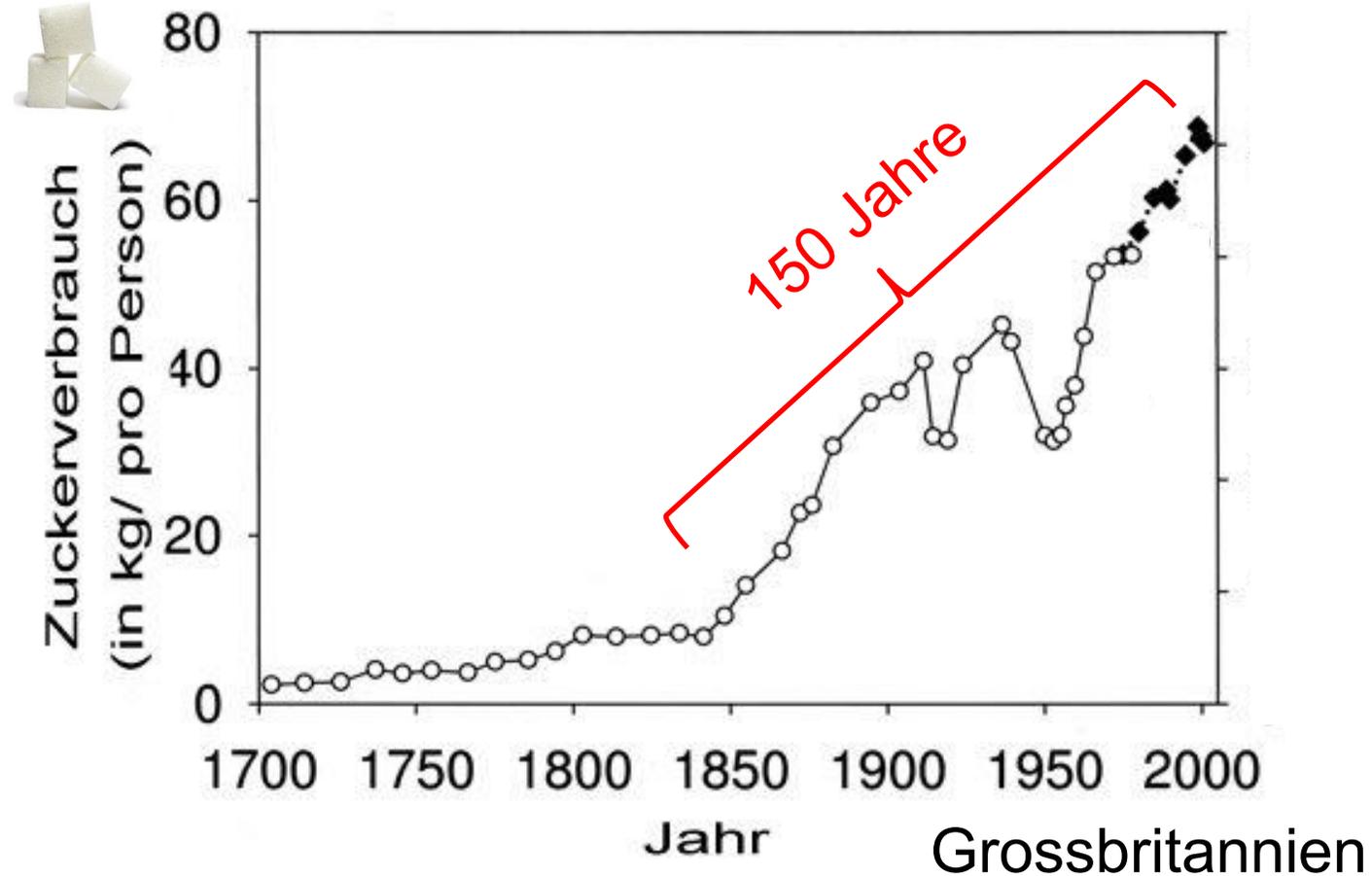
„Zucker sollte nicht mehr als **5%** einer gesunden Diät ausmachen.“

Brauchen wir Zucker?

400'000 Jahre



Körper braucht
Glukose
Aber: nicht in der
Nahrung





THE THE AND THE
GOOD BAD UGLY

Glukose

Fruktose

Saccharose

Akute Wirkungen

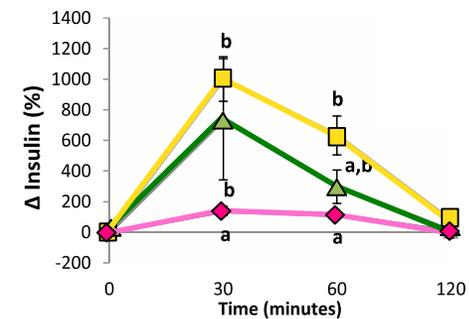
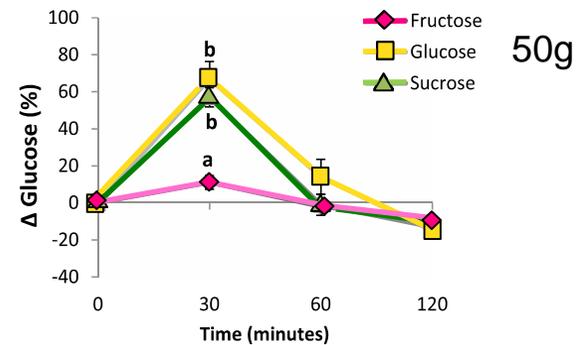
Chron. Wirkungen

RESEARCH

Open Access

Acute effects of feeding fructose, glucose and sucrose on blood lipid levels and systemic inflammation

Faizan Jameel¹, Melinda Phang^{1,3}, Lisa G Wood^{1,2} and Manohar L Garg^{1*}

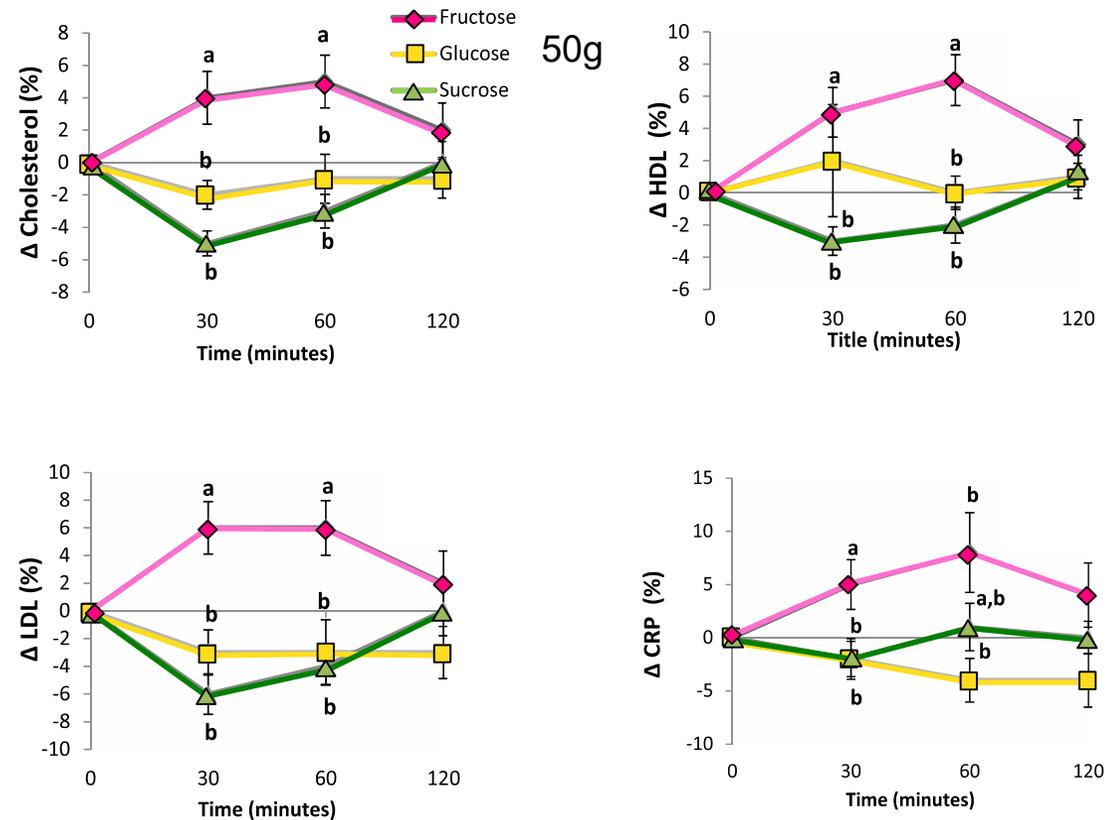


RESEARCH

Open Access

Acute effects of feeding fructose, glucose and sucrose on blood lipid levels and systemic inflammation

Faizan Jameel¹, Melinda Phang^{1,3}, Lisa G Wood^{1,2} and Manohar L Garg^{1*}





HARIBO



1 Portion = 25g = 11 Stk.



Liv
7 Jahre alt, 20 kg



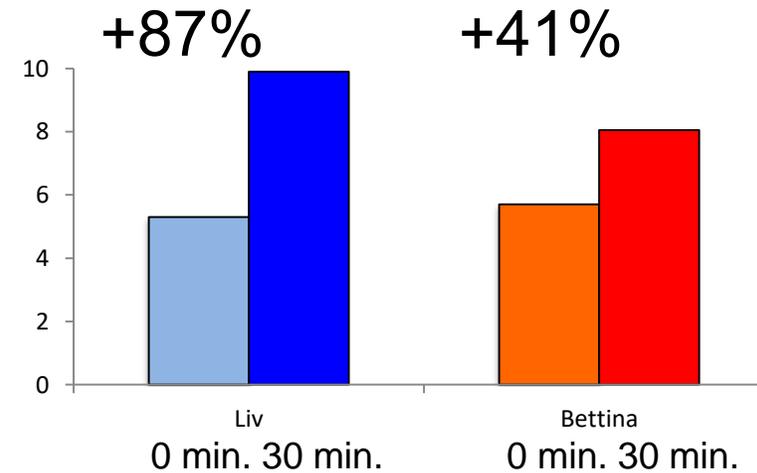
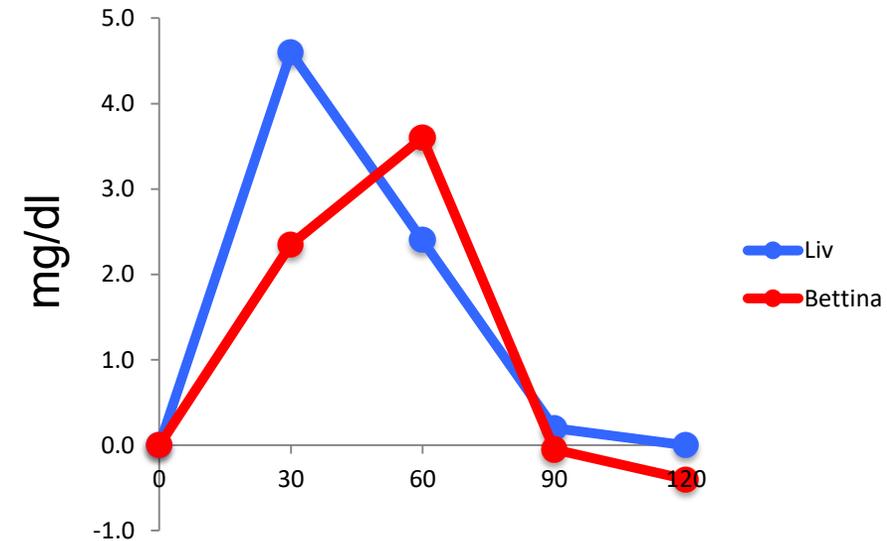
Bettina
41 Jahre alt, 51 kg

Blutzuckeranstieg

11 Haribo Gummibärchen
= 25g „eine Portion“



Anstieg vom Ausgangswert



RESEARCH ARTICLE

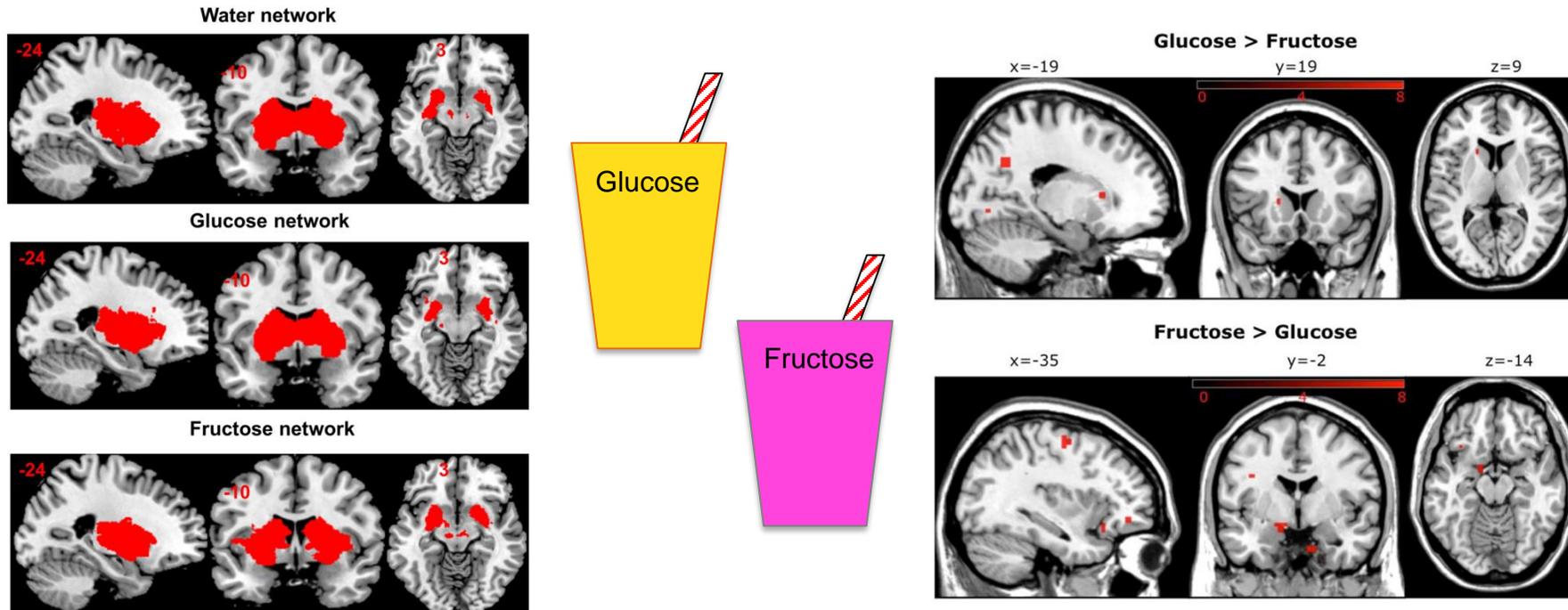
Dissociable Behavioral, Physiological and Neural Effects of Acute Glucose and Fructose Ingestion: A Pilot Study

Bettina Karin Wölnerhanssen¹*, Anne Christin Meyer-Gerspach¹, André Schmidt^{2,3}, Nina Zimak¹, Ralph Peterli⁴, Christoph Beglinger¹, Stefan Borgwardt^{2,3}

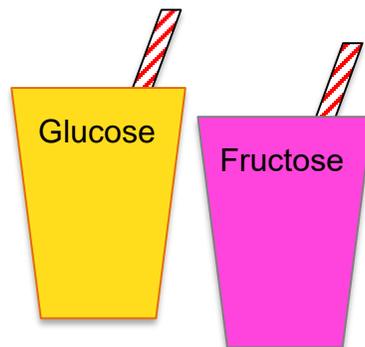
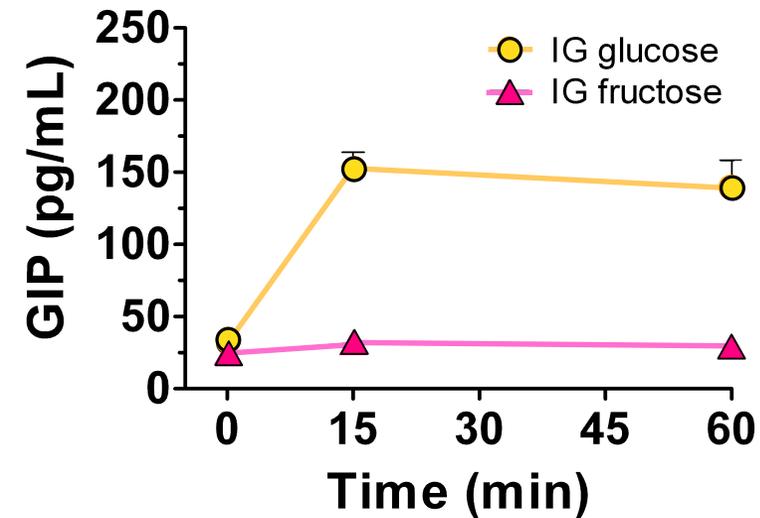
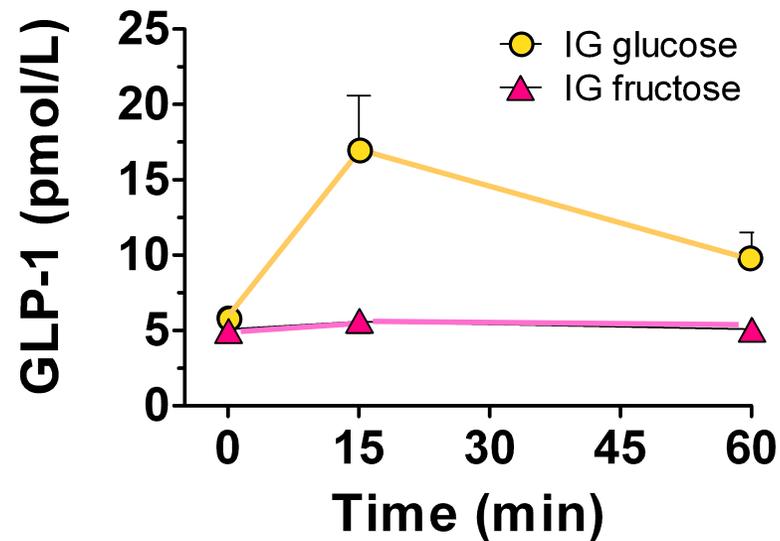
1 Department of Gastroenterology, University Hospital of Basel, Basel, Switzerland, **2** Medical Image Analysis Center, University Hospital of Basel, Basel, Switzerland, **3** Department of Psychiatry, University Hospital of Basel, Basel, Switzerland, **4** Department of Surgery, St. Clara Hospital, Basel, Switzerland



* These authors contributed equally to this work.
* bettina.woelnerhanssen@usb.ch

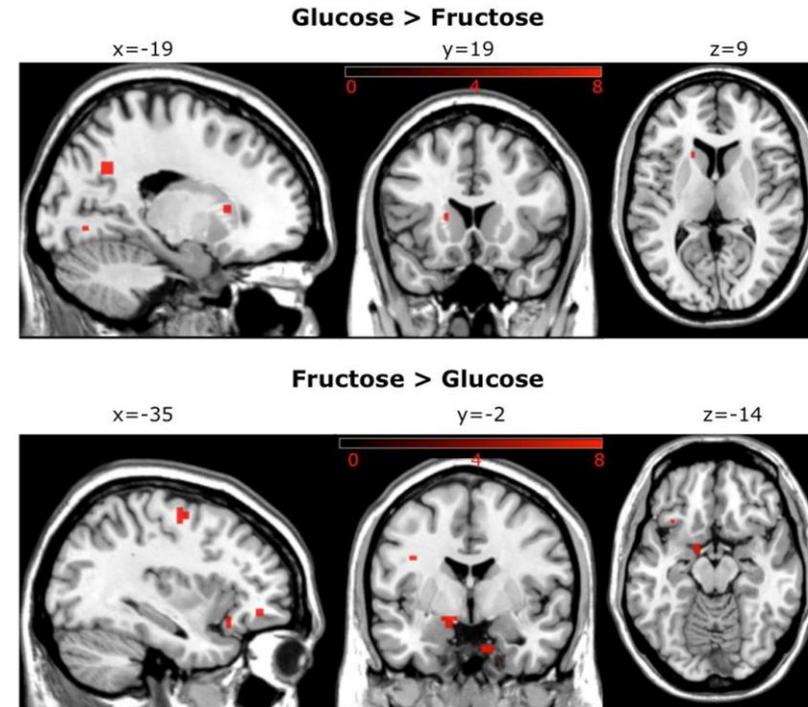
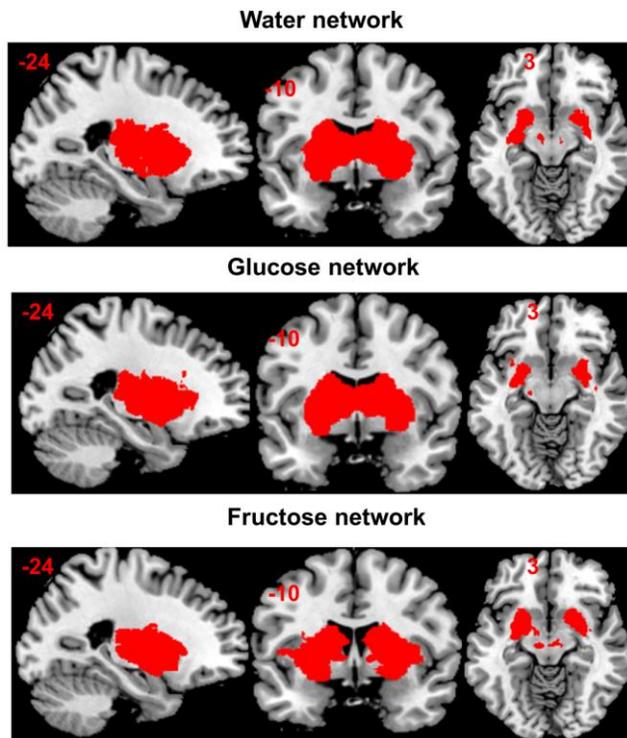


Sättigungshormone



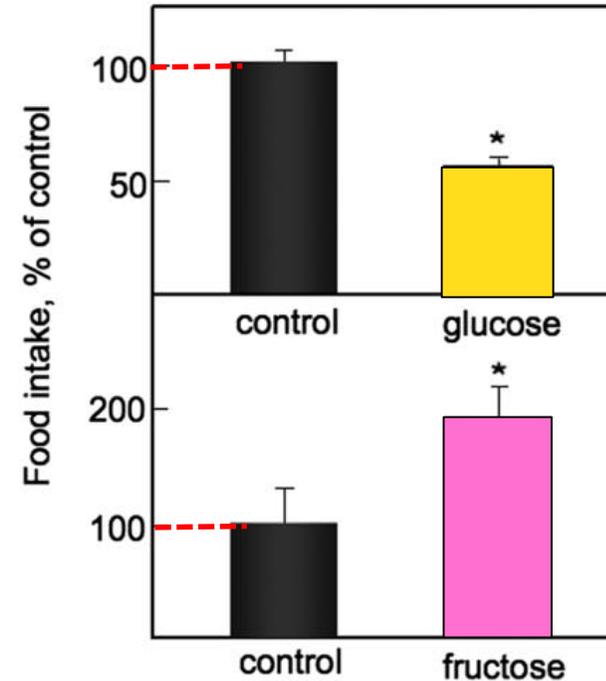
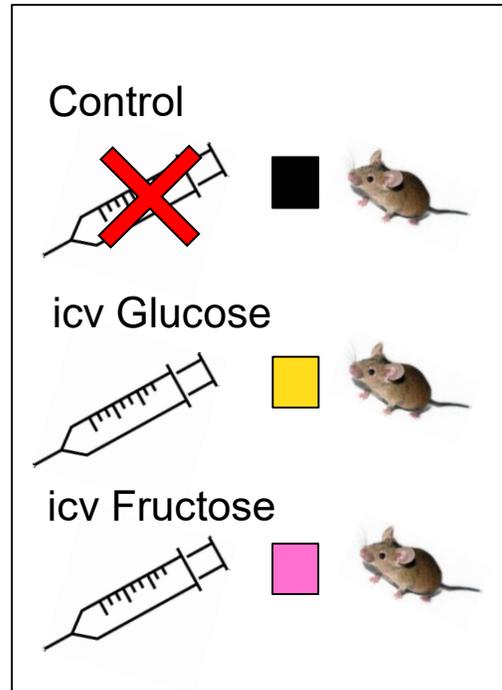
Fruktose hat **keinen Effekt** auf die Freisetzung von Sättigungshormonen

Belohnungsnetzwerk



Einnahme von **Glukose** im Gegensatz zu **Fruktose** führte zu einer Aktivierung von Regionen, die für die Motivation und die **Belohnungsverarbeitung** zuständig sind.

Effekte von zentral verabreichter Fruktose und Glukose



Food-deprived mice were given intracereboventricular injections of fructose or glucose. Mice were given access to food and food intake measured over the next 30 min



THE GOOD THE BAD AND THE UGLY

	Glukose	Fruktose	Saccharose
Appetit/Belohnung	Sättigung/Belohnung	kaum Sättigung	Sättigung/Belohnung
<u>Akute</u> Wirkungen	starker Anstieg von Blutglukose, Insulin	Lipogenese in der Leber -> Anstieg von Blutfetten, hsCRP, oxidativer Stress	Bei ext. Zufuhr: starker Anstieg von Blutglukose, Insulin



THE GOOD THE BAD AND THE UGLY

Chron. Wirkungen

Glukose

Leberverfettung,
Blutfettstörung,
Insulinresistenz,
Hoher Blutdruck,
Herzkreislauferkrankungen
Übergewicht, Gicht, *AGEs
... Alzheimer? Krebs?

Fruktose

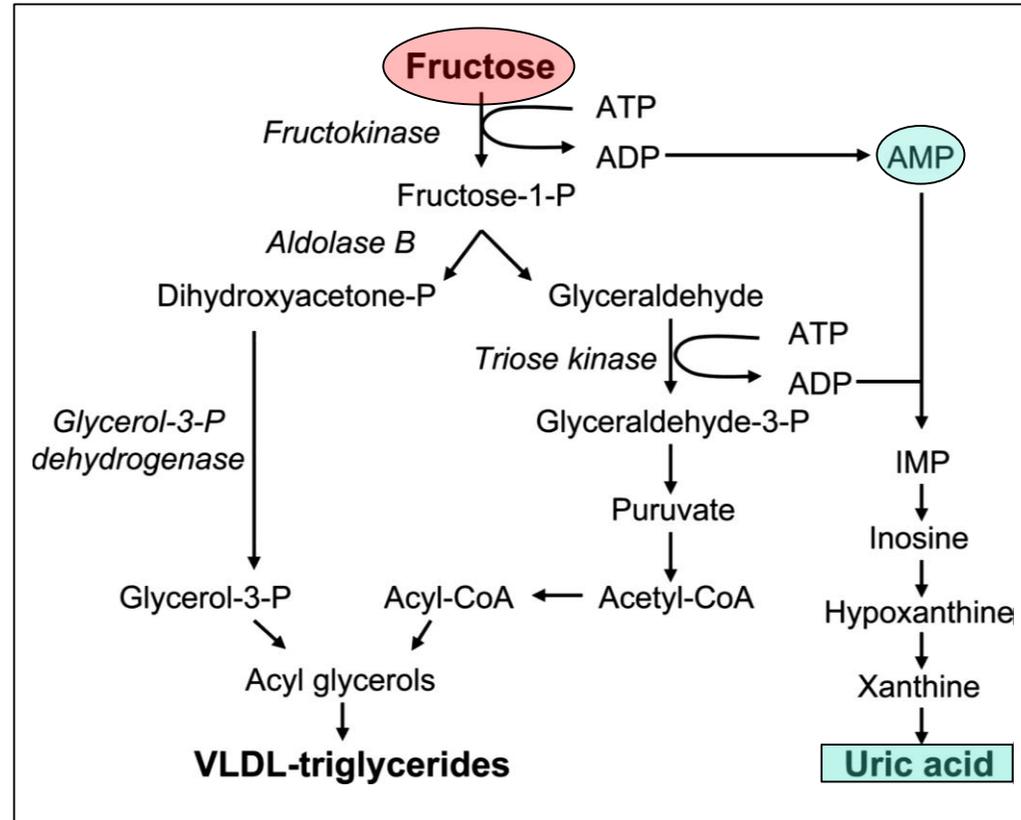
Leberverfettung,
Blutfettstörung,
Insulinresistenz,
Hoher Blutdruck,
Herzkreislauferkrankungen
Übergewicht, Gicht, *AGEs
... Alzheimer? Krebs?

Saccharose

Leberverfettung,
Blutfettstörung,
Insulinresistenz,
Hoher Blutdruck,
Herzkreislauferkrankungen
Übergewicht, Gicht, *AGEs
... Alzheimer? Krebs?

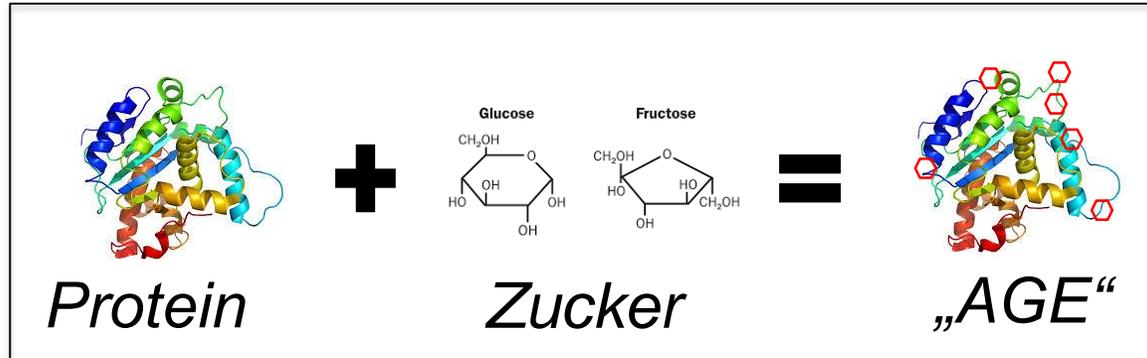
*AGE: Advanced glycation end products

Fructose und Gicht



- „Dietary trigger“: endogener Purinanfall durch **FRUKTOSE**
- **Mayo Clinic:** Nahrungsmittel vermeiden wie weisses Brot, Kuchen, Süssigkeiten, Süssgetränke, Produkte mit “High-fructose corn syrup“ ...

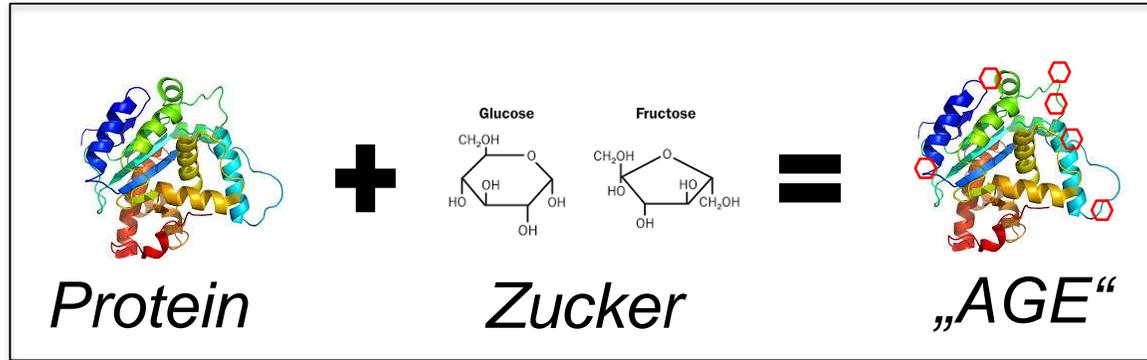
AGEs = Advanced glycation endproducts



Maillard Reaktion (nicht-enzymatisch, spontan)

- Bräunliche Endprodukte, „Vergilbung“ = AGEs
- Stören Funktion des Proteins
- Stabil, akkumulieren im Körper
- Fluoreszierende Eigenschaften

AGEs = Advanced glycation endproducts



Maillard Reaktion (nicht-enzymatisch, spontan)

- Konsequenz abhängig von der Lebensdauer des Proteins
- Bsp: HbA1C (Hämoglobin) „Langzeitzucker“
- Kollagen: Hautalterung, grauer Star, Arthrose, Gefäßelastizität, Alzheimer, Karzinome

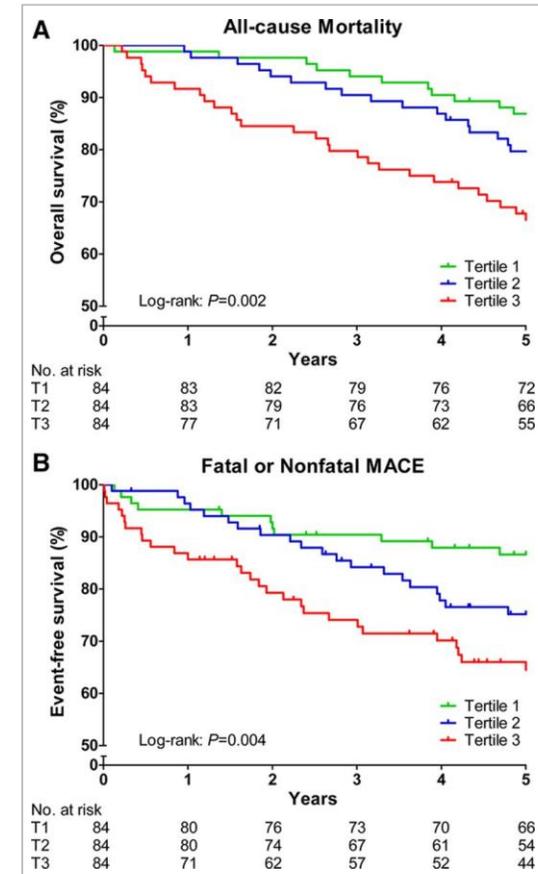
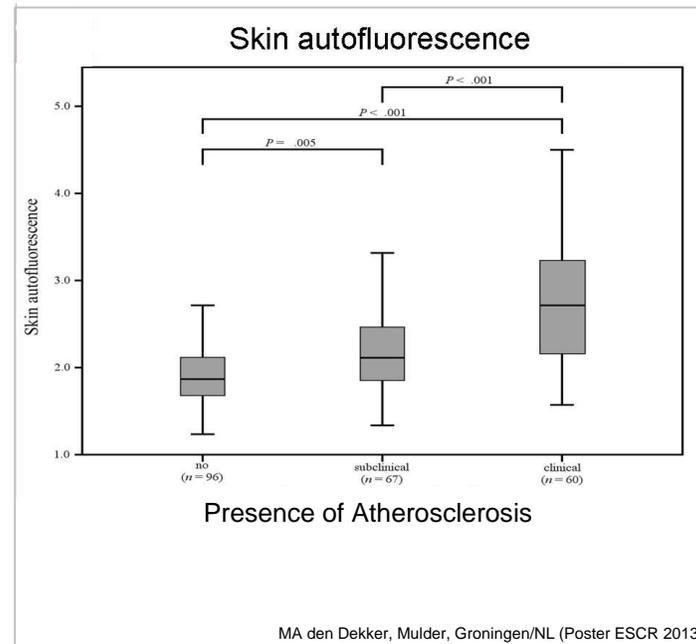
Skin Autofluorescence Is Associated With 5-Year Mortality and Cardiovascular Events in Patients With Peripheral Artery Disease

Lisanne C. de Vos, Douwe J. Mulder, Andries J. Smit, Robin P.F. Dullaart, Nanne Kleefstra, Willem M. Lijfering, Pieter W. Kamphuisen, Clark J. Zeebregts, Joop D. Lefrandt

(*Arterioscler Thromb Vasc Biol.* 2014;34:933-938.)



Wie hoch ist die persönliche Verzuckerung ?

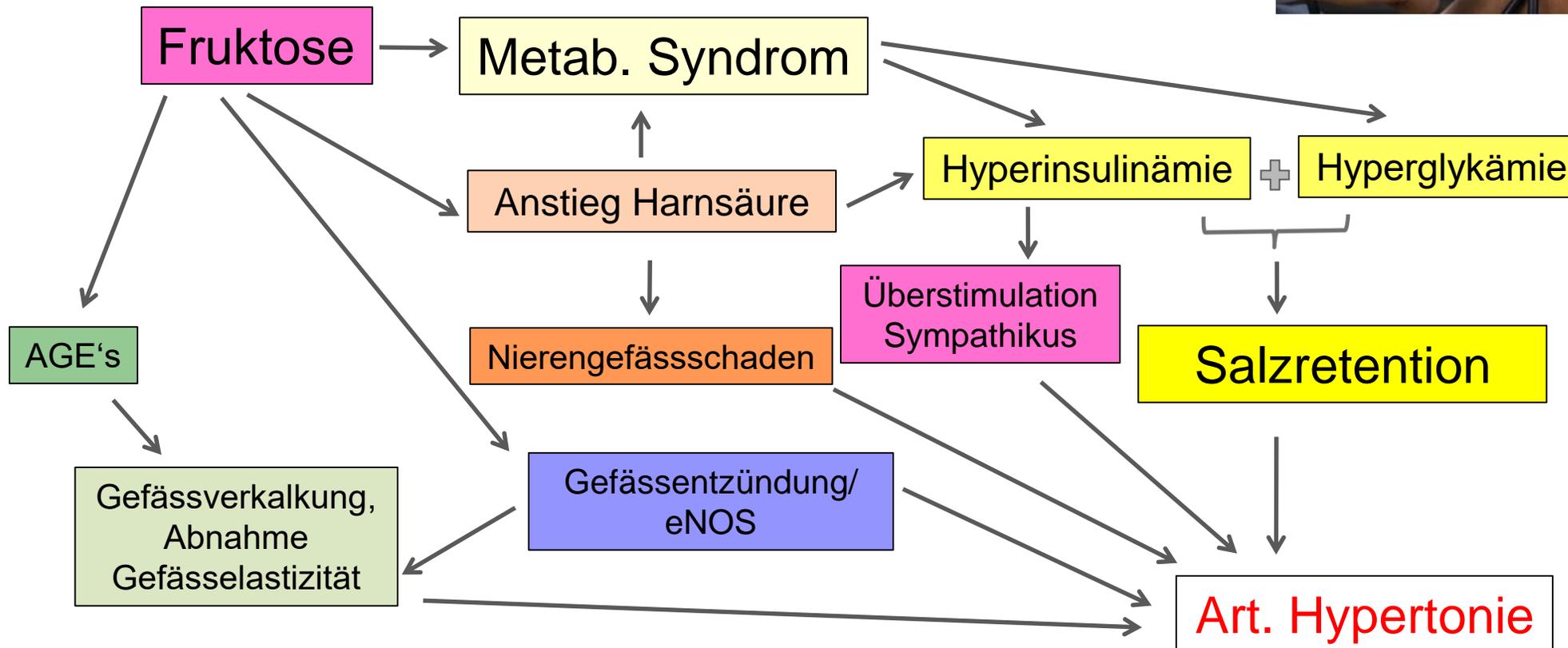


- Messung AGEs über Hautfluoreszenz
- Korreliert mit dem Grad der Gefäßverkalkung und Sterblichkeit

Fruktose und Bluthochdruck



Je höher der Fruktosekonsum, desto höher das Risiko für Bluthochdruck



Sugar-sweetened carbonated beverage consumption and coronary artery calcification in asymptomatic men and women.

[Chun S, Choi Y, Am Heart J. 2016 Jul;177:17-24.](#)



Abstract

BACKGROUND:

Sugar-sweetened carbonated beverage consumption has been linked to obesity, metabolic syndrome, type 2 diabetes, and clinically manifest coronary heart disease, but its association with subclinical coronary heart disease remains unclear. We investigated the relationship between sugar-sweetened carbonated beverage consumption and coronary artery calcium (CAC) in a large study of asymptomatic men and women.

METHODS:

This was a cross-sectional study of 22,210 adult men and women who underwent a comprehensive health screening examination between 2011 and 2013 (median age 40 years). Sugar-sweetened carbonated beverage consumption was assessed using a validated food frequency questionnaire, and CAC was measured by cardiac computed tomography. Multivariable-adjusted CAC score ratios and 95% CIs were estimated from robust Tobit regression models for the natural logarithm (CAC score +1).

RESULTS:

The prevalence of detectable CAC (CAC score >0) was 11.7% (n = 2,604). After adjustment for age; sex; center; year of screening examination; education level; physical activity; smoking; alcohol intake; family history of cardiovascular disease; history of hypertension; history of hypercholesterolemia; and intake of total energy, fruits, vegetables, and red and processed meats, only the highest category of sugar-sweetened carbonated beverage consumption was associated with an increased CAC score compared with the lowest consumption category. The multivariable-adjusted CAC ratio comparing participants who consumed ≥ 5 sugar-sweetened carbonated beverages per week with nondrinkers was 1.70 (95% CI, 1.03-2.81). This association did not differ by clinical subgroup, including participants at low cardiovascular risk.

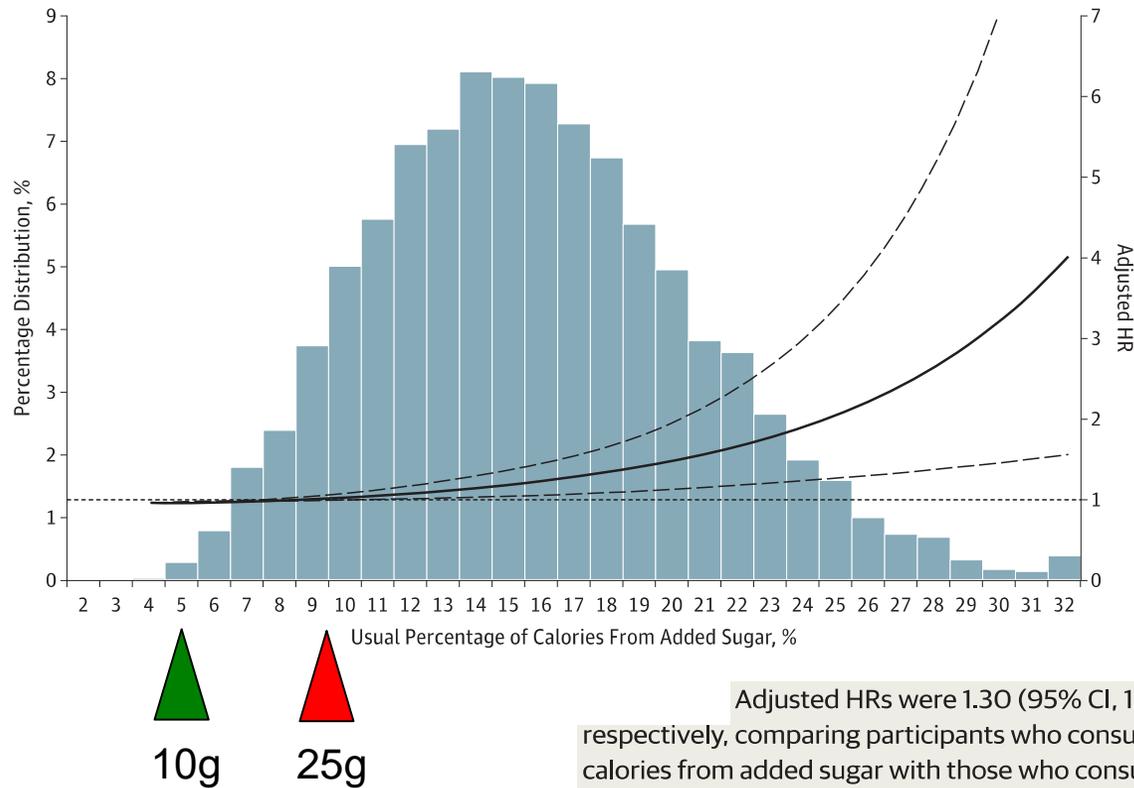
CONCLUSION:

Our findings suggest that high levels of sugar-sweetened carbonated beverage consumption are associated with a higher prevalence and degree of CAC in asymptomatic adults without a history of cardiovascular disease, cancer, or diabetes.

Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults

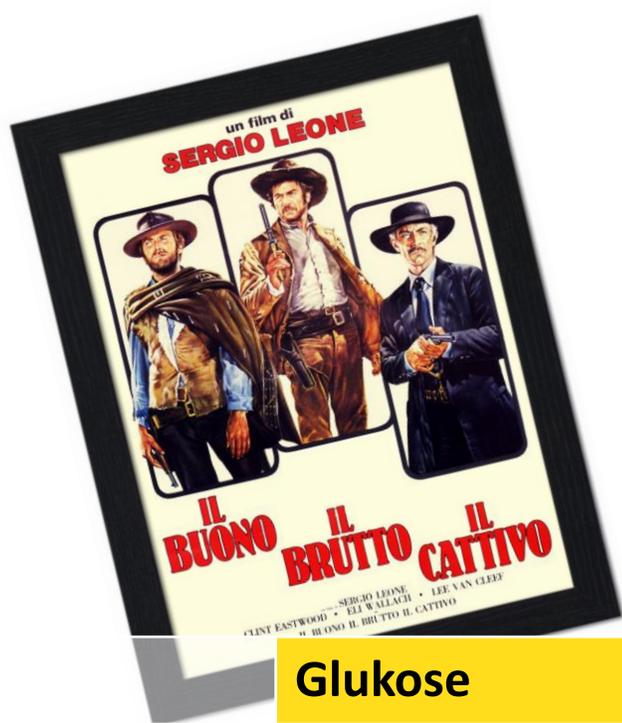
Quanhe Yang, PhD; Zefeng Zhang, MD, PhD; Edward W. Gregg, PhD; W. Dana Flanders, MD, ScD; Robert Merritt, MA; Frank B. Hu, MD, PhD

Figure 1. Adjusted Hazard Ratio (HR) of the Usual Percentage of Calories From Added Sugar for Cardiovascular Disease Mortality Among US Adults 20 Years or Older: National Health and Nutrition Examination Survey Linked Mortality Files, 1988-2006



Adjusted HRs were 1.30 (95% CI, 1.09-1.55) and 2.75 (1.40-5.42; $P = .004$), respectively, comparing participants who consumed 10.0% to 24.9% or 25.0% or more calories from added sugar with those who consumed less than 10.0% of calories from added sugar. These findings were largely consistent across age group, sex, race/ethnicity (except among non-Hispanic blacks), educational attainment, physical activity, health eating index, and body mass index.





THE GOOD THE BAD AND THE UGLY

Akute Effekte

Glukose

Sättigung

starker Anstieg von Blutglukose, Insulin

Fruktose

kaum Sättigung

Lipogenese in der Leber
-> Anstieg von Blutfetten,
hsCRP, oxidativer Stress

Saccharose

Sättigung

Bei ext. Zufuhr:
starker Anstieg von Blutglukose, Insulin

Chron. Effekte

Leberversfettung,
Blutfettstörung,
Insulinresistenz,
Hoher Blutdruck,
Herzkreislauferkrankungen
Übergewicht, Gicht, *AGEs
... Alzheimer? Krebs?

**Leberversfettung,
Blutfettstörung,
Insulinresistenz,
Hoher Blutdruck,
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Übergewicht, Gicht, *AGEs
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Leberversfettung,
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Alzheimer? Krebs?



THE THE AND THE
GOOD BAD UGLY

Glukose

Saccharose

Fruktose

... UGLY AND UGLIER

Kinder

- schutzbedürftig
- geringes Verteilungsvolumen
- Wachstum: spezielle Stoffwechsellage
- Konsequenz: ganzes Leben
- Zielgruppe von Werbung



kinder +MILCH
Schokolade -KAKAO®



HARIBO
MACHT KINDER FROH UND
ERWACHSENE EBENSO



Chronische Erkrankungen und Ernährung?

Fette, Cholesterin, Protein, Fleisch, Gluten, Antibiotika, Oestrogene, Nahrungsmittelzusätze, zu wenig Fasern, Salz ...
aber:

ZUCKER? *Echt jetzt ...?*



WARUM ist Zuckerkonsum
praktisch *unverwundbar* gegenüber
moralischen, ethischen, religiösen oder
gesundheitlichen Attacken?

1) Zucker = Währung der Zuneigung



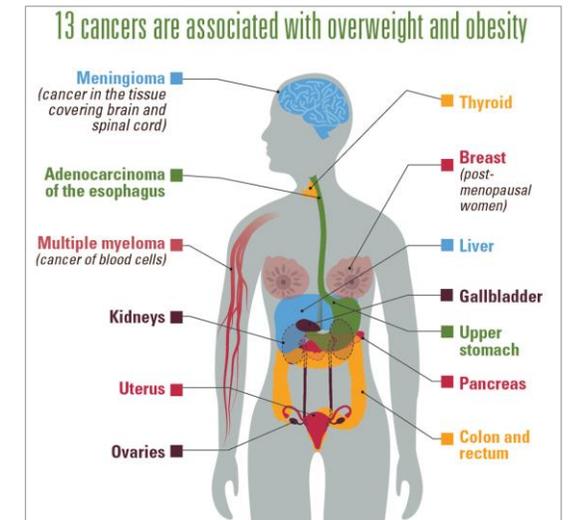
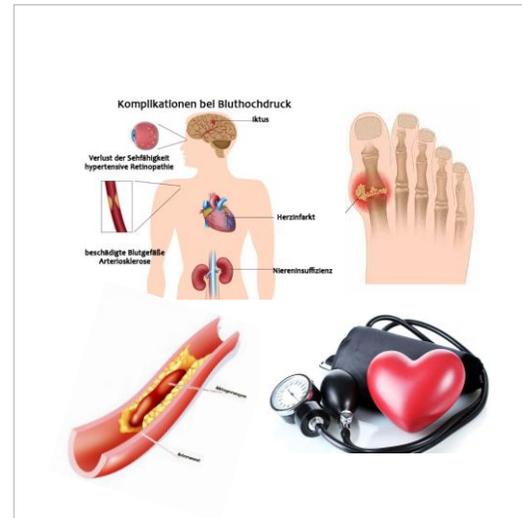
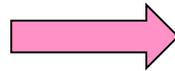
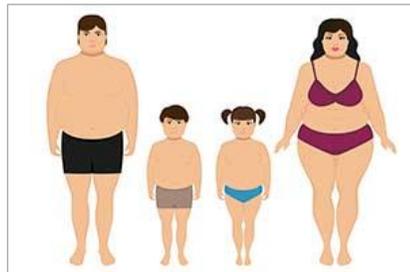
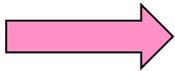
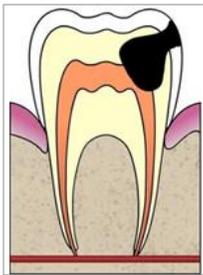
- Sweetie, Honey, Zuckermaus...
- Geburtstagskuchen, Traditionen
- Belohnung



2) Keine sofort sichtbaren schädlichen Auswirkungen

Exposition (“Westernization”)

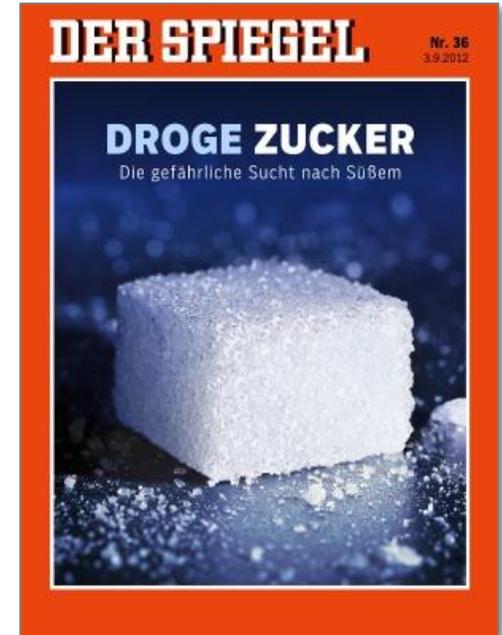
- Monate – Jahre: Karies
- 10-20 Jahre: Übergewicht, Diabetes, Gicht, Bluthochdruck
- 30-50 Jahre: Krebs, Herz/Gefässerkrankungen



2) Keine sofort sichtbaren schädlichen Auswirkungen

Droge?

- Zucker ist eine psychoaktive Substanz (Schmerzmittel, Stressreduktion)
- stimuliert Belohnungszentren (Dopamin), macht abhängig, Entzugssymptome



Aber: Keine kurzfristigen Effekte wie Stammeln, Schwindel, schneller Puls

3) Unglaublich starke Lobby

- **Übergewicht:** übermässigen Nahrungszufuhr, zu viele Kalorien *unabhängig* von der Nahrungszusammensetzung
“Calories in, calories out”
- **Gesättigte Fette, Salz** und zu wenig Bewegung
- **Karies:** schlechte Hygiene, zu wenig Fluorid



Eigenverantwortung



Zuckerkonsum

- **Negative Effekte:** auf verschiedene Organsysteme
- **Reduktion** dringend empfohlen (10g-25g/d)



Glukose, Fruktose oder Saccharose?

- **Negative Effekte:** alle drei
- **Fruktose:** akzentuiert

Glukose

Saccharose

Fruktose



Auswirkungen des Zuckers auf unseren Körper

Public Health Schweiz 26.4.2018

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Dr. phil. II Anne Christin Meyer-Gerspach*

St. Clara Forschung AG/St. Claraspital Basel