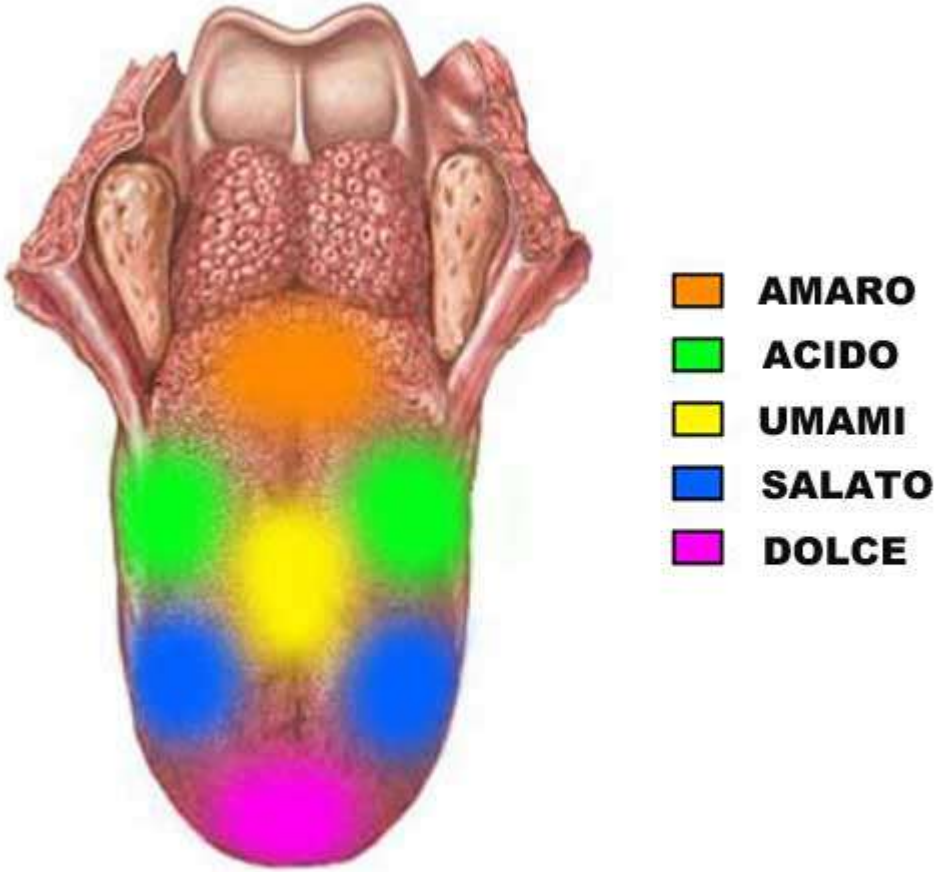
GRASSO, DOLCE, SALATO:

COME LA MANIPOLAZIONE DEL GUSTO PUO' CREARE DIPENDENZA

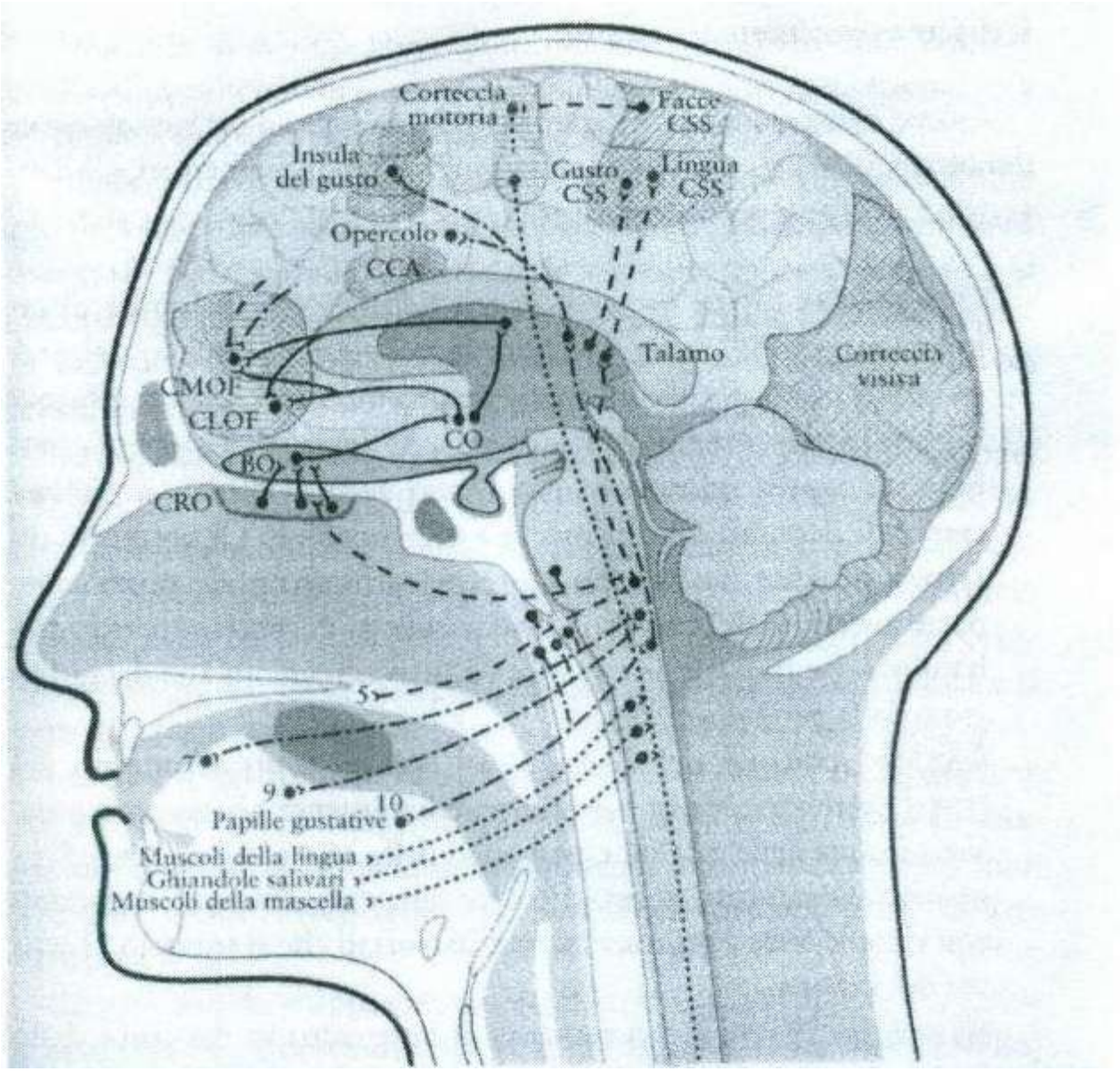
LA NEUROFISIOLOGIA DEL SAPORE

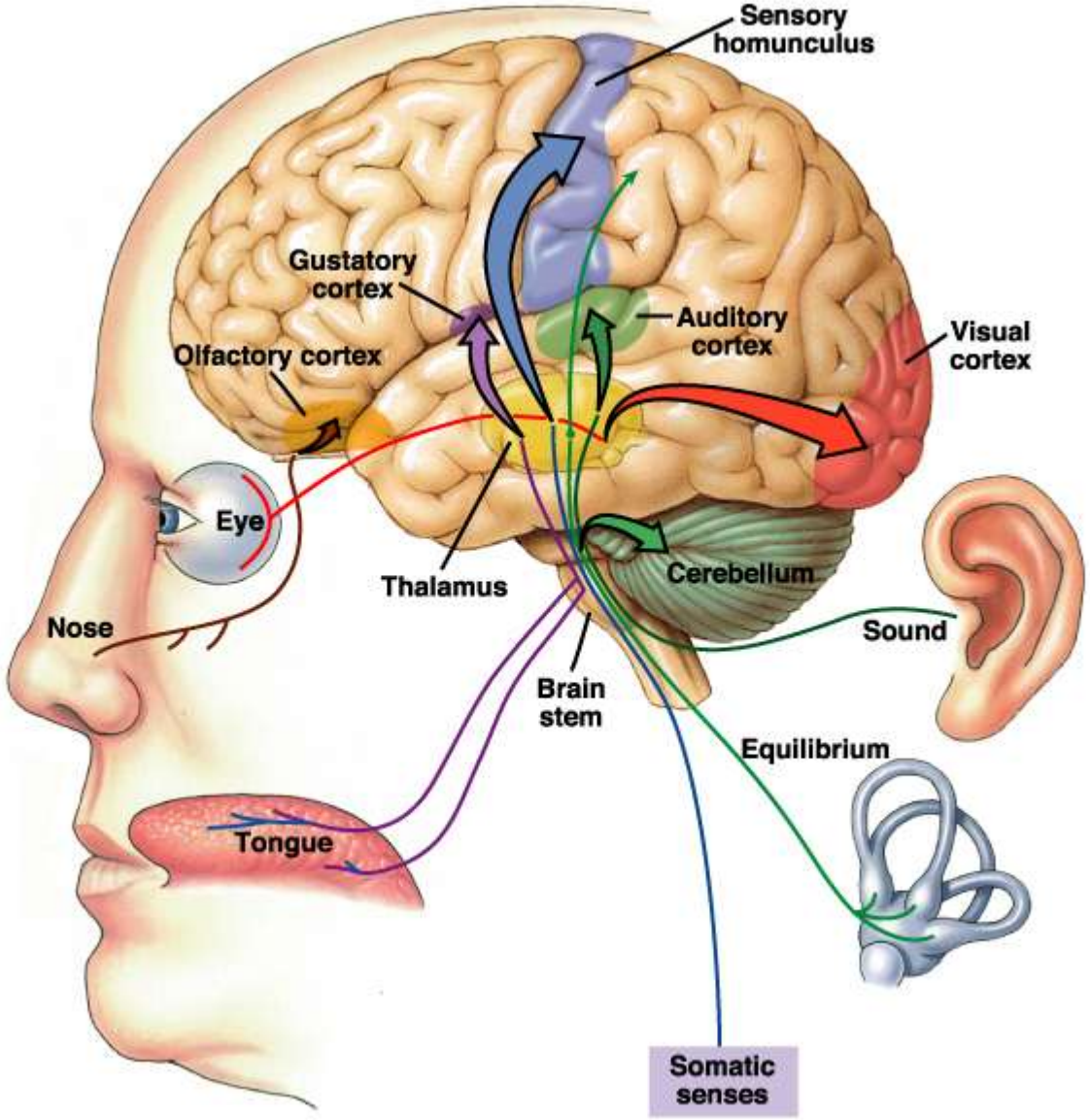
- **SCIENZATI DELL'ALIMENTAZIONE**
- **FISIOLOGI**
- **PSICOLOGI**
- **NEUROSCIENZIATI COGNITIVI**
- **NEUROFARMACOLOGI**
- **BIOCHIMICI**
- **ANTROPOLOGI**
- **BIOLOGI MOLECOLARI**
- **PSICOLOGI COMPORTAMENTALI**

PRIMITIVA DISTRIBUZIONE DELLE AREE RECETTORIALI DEL GUSTO

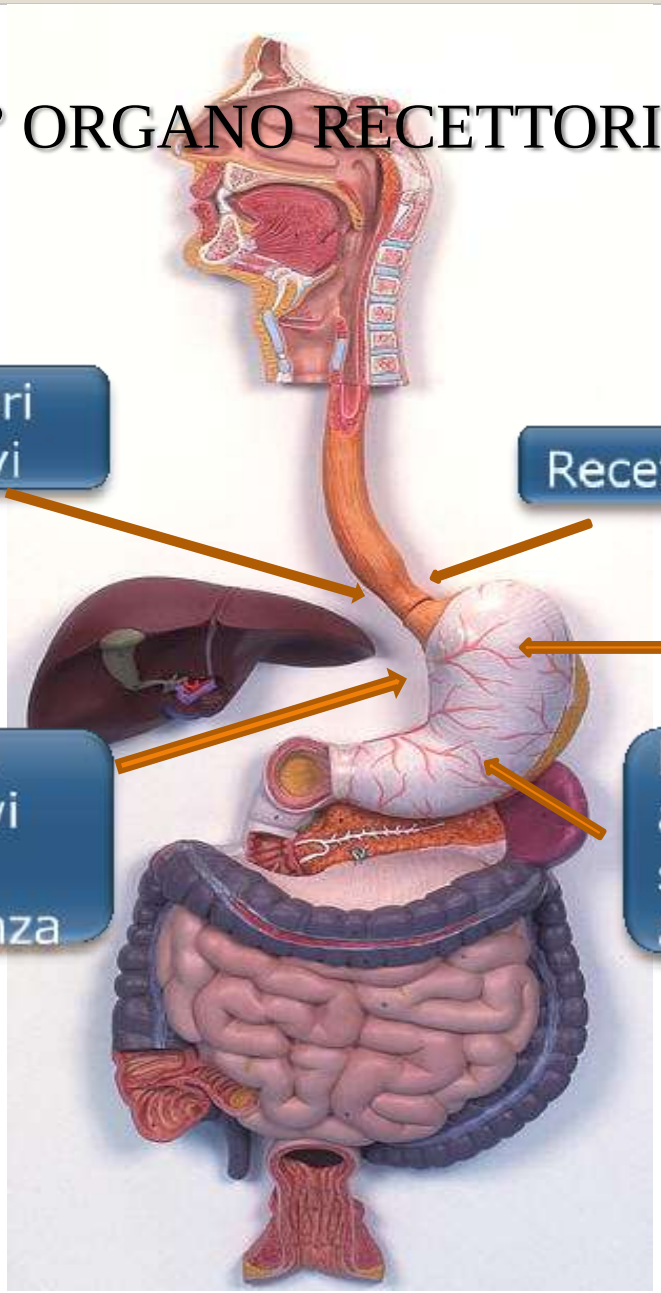


RECETTORI DEL GUSTO


Corteccia motoria
Facce CSS
Insula del gusto
Gusto CSS
Lingua CSS
Opercolo
CCA
Talamo
Corteccia visiva
CMOF
CLOF
CO
BO
CRO
5
7
9
10
Papille gustative
Muscoli della lingua
Ghiandole salivari
Muscoli della mascella


Sensory homunculus
Gustatory cortex
Auditory cortex
Visual cortex
Olfactory cortex
Eye
Thalamus
Cerebellum
Nose
Sound
Brain stem
Equilibrium
Tongue
Somatic senses

STOMACO: 2° ORGANO RECETTORIALE ORALE



Rececettori nocicettivi

Recettori amaro e dolce

Osmorecettori

Meccanorecettori, Recettori nocicettivi vanilloidi, recettori di consistenza

Recettori per MSG, acidi grassi, glucosio, sapidità, acidità e amaro

SENSO DEL GUSTO

1. **MOTIVA** E DIRIGE L'INGESTIONE
2. **DIFFERENZIA** LE **TOSSINE** DAI **NUTRIENTI**

• AMARO	⇒	CATTIVO	PERICOLO
• DOLCE	⇒	BUONO	ENERGIA
• SALATO	⇒	ESSENZIALE	FLUIDI
• ASPRO	⇒	CIBO ANDATO A MALE	RISCHIO
• UMAMI	⇒	CIBO PROTEICO	

3. LA **SAZIETA' ALIMENTARE** SVILUPPA L'**ATTRAZIONE EDONICA**

OROSENSAZIONE:

VASTO CONTROLLO DELL'INNERVAZIONE TRIGEMINALE

Consistenza Temperatura Bruciore e dolore	Il sistema trigeminale contribuisce al controllo sensitivo-motorio dell'attività di ingestione	Somatosensazione: è più forte del gusto

Consumer researchers say people can be grouped by their food-texture preferences.

CHEWERS
43%

QUINTESSENTIAL FOOD
A chewy brownie

TYPICAL NEW PRODUCT
Chips Ahoy! Chewy Gooey cookies

A soft filling is extra appealing to 'chewers' and nudges chocolate-chip cookies into the evening indulgence category.

CRUNCHERS
33%

QUINTESSENTIAL FOOD
Crunchy cheese puffs

TYPICAL NEW PRODUCT
Doritos 'Jacked' chips

A 'tooth rattling' experience appeases the desire of 20-something 'crunchers' for the next bold snack.

SMOOSHERS
16%

QUINTESSENTIAL FOOD
Creamy mashed potatoes

TYPICAL NEW PRODUCT
Stonyfield Blends yogurt

This extra-creamy yogurt appeals to 'smooshers' who savor creamy food by pushing it with the tongue to the roof of the mouth.

SUCKERS
8%

QUINTESSENTIAL FOOD
Hard candy

TYPICAL NEW PRODUCT
Werther's Original Sugar-Free Caramel Chocolate hard candy

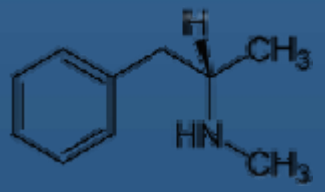
'Suckers' enjoy a hard candy to wind down, rolling it around to coat the mouth with flavor.


Gusto edonico:
Salato, Dolce
Umami, acqua
Gusto energia:
Sapore acidi grassi?
Gusto astringente
Gusto repulsivo:
Amaro
Gusto calore:
Recettori vanilloidi
Gusto edonico calcio
Gusto doloroso:
aspro
Sensazioni tattili:
Elettrico, alcalino, alcolico, metallico
Orosensazione trigemino:
Tatto, temperatura,dolore, pressione.

QUANTO E' POTENTE IL SAPORE?

E' IL 3° PIU' POTENTE STIMOLANTE DEL PIACERE

1. **DROGHE**: **metanfetamina**



2. **SESSO**

3. **SACCAROSIO/SALE**

TEORIE DELLA PALATABILITA' DEL CIBO

- **SAZIETA' SPECIFICA SENSORIALE** *Rolls*
- **APPRENDIMENTO DELI'AVVERSIONE DEL SAPORE** *Garcia*
- **CONTRASTO DINAMICO** *Hyde & Witherly*
- **EQUAZIONE DEL PIACERE ALIMENTARE** *Witherly & Capaldi*
- **GRADIMENTO AROMATICO INNATO** *Goff & Klee*
- **TEORIA DELLA SORPRESA** *Montauge*
- **STIMOLO SUPERNORMALE**
  - Più è grande meglio è!
- **APPRENDIMENTO DEL SAPORE**
  - Abitudini familiari
- **TEORIA DELL'EMULSIONE**
  - Sale & Zucchero/Grasso
- **QUALITA' EVOCATE**
  - Memorie del piacere
- **EFFETTO DELLA SEMPLICE ESPOSIZIONE**
  - Spesso è meglio!

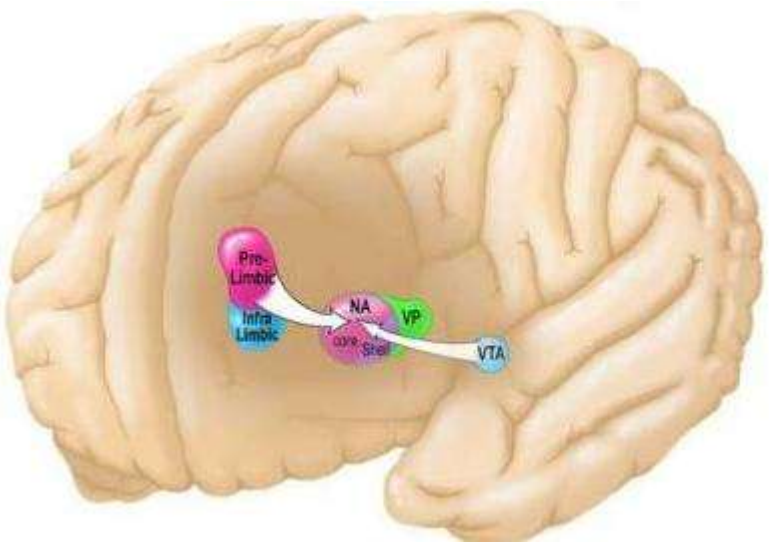
FOOD PLEASURE EQUATION

F.P. = ∫ (SENSAZIONE)+(CALORIE)

Percezione	Contenuto calorico
GUSTO • **Sale, MSG, 5?Nuc.** • **Dolce, Acqua** • **Sapore dei grassi**	**PROTEINE** • **Casomorfine** • **Gluteomorfine**
ODORATO • Aroma • Trigemino	**CARBOIDRATI** • Neuroni «amano» Glucosio • Adipociti «amano» Fruttosio

CONTRASTO DINAMICO
• Variazione termica
• Schiocco, crepitio, frizzante
	LIPIDI
	• Acidi grassi Essenziali
	  • Ac. Linoleico
	  • Ac. Liolenico

IL PIACERE DEL CIBO: ATTRAZIONE + CARENZA



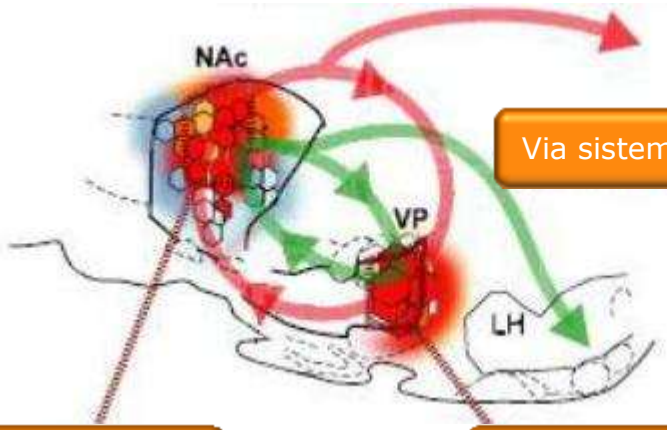
I segnali di **ricompensa**, mediati dall'area prelimbica, attivano il rilascio del glutammato nel centro del **nucleus accumbens (NA)**.

L'eccessivo rilascio del glutammato all'interno del centro del nucleus accumbens **aumenta la motivazione o il desiderio**.

La dopamina originata **dall'area tegmentale ventrale (VTA)** aumenta la funzione del glutammato, e in associazione **provocano sintomi di brama insaziabile**.

CARENZA **CONTRO** PIACERE

Via del sistema oppioide del piacere

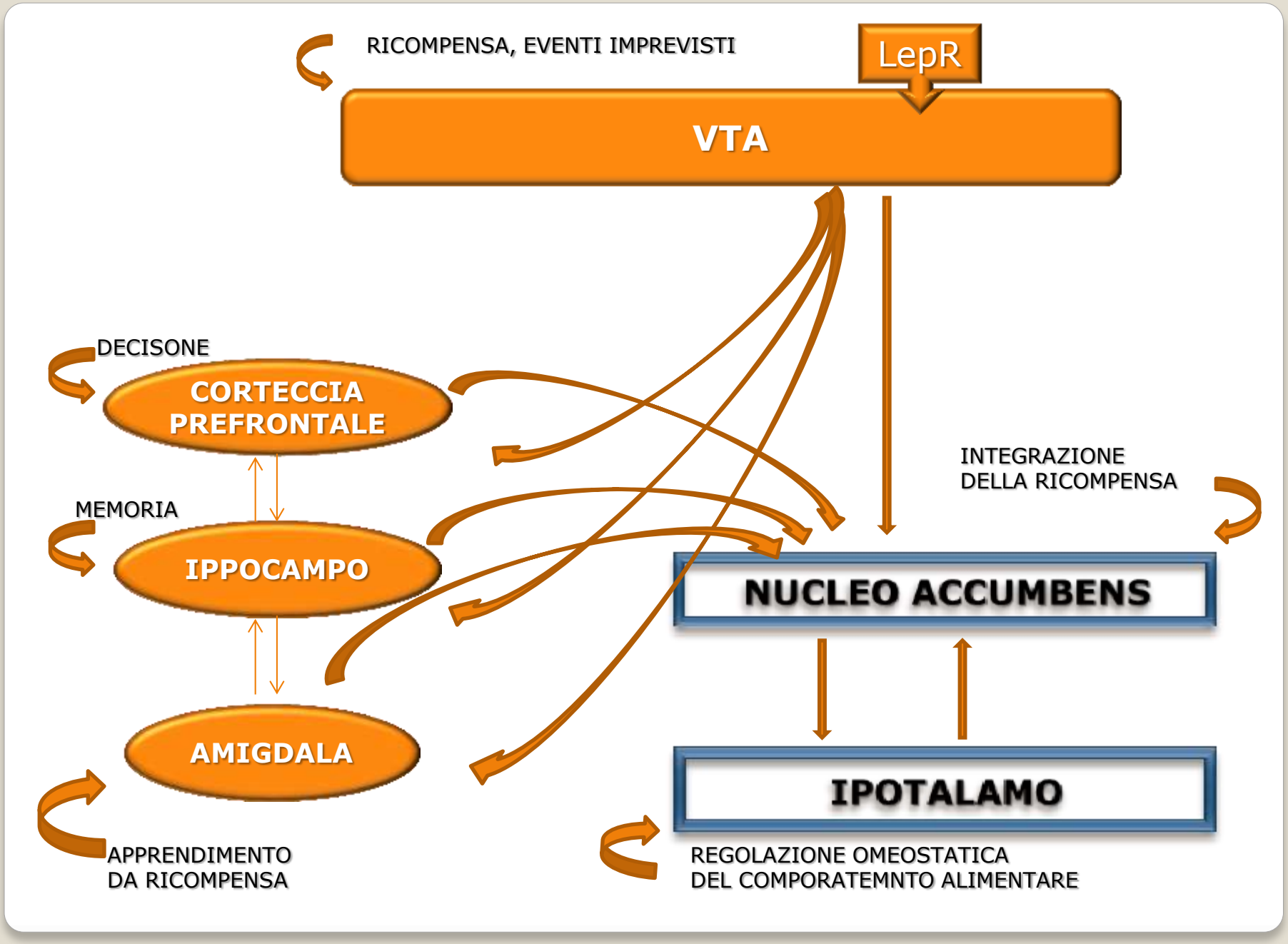


Via sistema oppioide della carenza

NUCLEO ACCUMBENS

NUCLEO VENTRALE PALLIDUM

DUE MECCANISMI CEREBRALI DIVERSI INFLUENZANO LA SCELTA ALIMENTARE


RICOMPENSA, EVENTI IMPREVISTI
LepR
VTA
DECISONE
CORTECCIA PREFRONTALE
MEMORIA
IPPOCAMPO
AMIGDALA
APPRENDIMENTO DA RICOMPENSA
INTEGRAZIONE DELLA RICOMPENSA
NUCLEO ACCUMBENS
IPOTALAMO
REGOLAZIONE OMEOSTATICA DEL COMPORATEMNTO ALIMENTARE

PIACERE ALIMENTARE

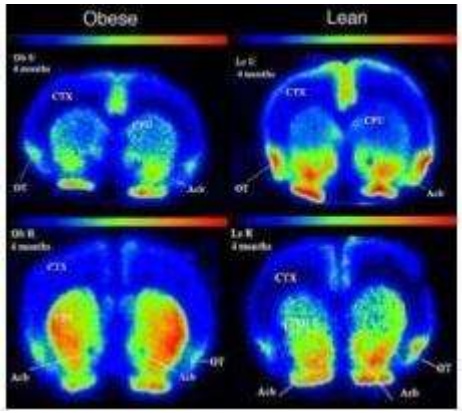
SISTEMA OPPIOIDE

SISTEMA CANNABINOIDE

CIRCUITO SEROTONINERGICO

LEPTINA-INSULINA

CIRCUITI DOPAMINERGICI



IMMAGINI INFERIORI: LA RESTRIZIONE ALIMENTARE AUMENTA I RECETTORI DELLA DOPAMINA

ANTHONY SCLAFANI

1968

- Ratti di laboratorio alimentati con Froot Loops sottoposti ai test d'ansia

1976

- L'aggiunta di zucchero negli alimenti ad alto contenuto di grassi per ratti di laboratorio evoca desiderio compulsivo

1980

- Università Princeton: ratti privati di una dieta zuccherina mostrano segni di astinenza

International Journal of Obesity (2009) **33,** S54–S58;

Reward systems and food intake: role of opioids

B A Gosnell[1] and A S Levine[1,2]

[1]Department of Food Science & Nutrition, University of Minnesota, Food Science & Nutrition, St Paul, MN, USA

[2]Office of the Dean, College of Food, Agricultural and Natural Resource Sciences, University of Minnesota, St Paul, MN, USA

Humans eat for many reasons, including the rewarding qualities of foods. A host of neurotransmitters have been shown to influence eating behavior and some of these appear to be involved in reward-induced eating. Endogenous opioid peptides and their receptors were first reported more than 30 years ago, and studies suggesting a role of opioids in the regulation of food intake date back nearly as far. Opioid agonists and antagonists have corresponding stimulatory and inhibitory effects on feeding. In addition to studies aimed at identifying the relevant receptor subtypes and sites of action within the brain, there has been a continuing interest in the role of opioids on diet/taste preferences, food reward, and the overlap of food reward with others types of reward. Data exist that suggest a role for opioids in the control of appetite for specific macronutrients, but there is also evidence for their role in the stimulation of intake based on already-existing diet or taste preferences and in controlling intake ***motivated by hedonics rather than by energy needs***. Finally, various types of studies indicate an overlap between mechanisms mediating drug reward and palatable food reward. Preference or consumption of sweet substances often parallels the self-administration of several drugs of abuse, and under certain conditions, the termination of intermittent access to sweet substances produces symptoms that resemble those observed during opiate withdrawal. The overconsumption of readily available and highly palatable foods likely contributes to the growing rates of obesity worldwide. An understanding of the role of opioids in mediating food reward and promoting the overconsumption of palatable foods may provide insights into new approaches for preventing obesity.

MONELL CENTER

ADVANCING DISCOVERY IN TASTE AND SMELL

Monell's mission is to advance scientific understanding of the mechanisms and functions of the chemical senses to benefit human health and well-being."Our work here at Monell holds great promise for understanding the basic mechanisms of the chronic diseases that will challenge us in the 21st century, from the role of inflammation in programmed cell death to the possibility of tissue regeneration. The cells involved in taste and smell are some of the most promising cells for this kind of research, and nowhere are they being studied so well as at Monell."
JOE BRAND, PH.D., MEMBER EMERITUS,*Biophysicist*

- 300 fisiologi, chimici, neuroscienziati, biologi, genetisti.
- 1975: studi sulle differenze delle preferenze del gusto per età ed etnia.
- Il desiderio dello zucchero del bambino è aumentato dalla sua presenza nel cibo stesso.
- 2001: identificata la proteina **T1R3** delle papille gustative responsabile della percezione dello zucchero.
- 2009: i recettori del gusto dolce sono eccitati dagli endocannabinoidi, spiegata la fame chimica indotta dalla marijuana.
- 2011: *Julie Mennella* ricerche sul **BLISS POINT** degli alimenti, l'esatta quantità di dolcezza che rende massima la gradevolezza del cibo.

BLISS POINT

CONCETTO SVILUPPATO DA **JOSEPH BALINFTY** NEL CORSO DEGLI STUDI MATEMATICI, RIVOLTI ALLA PREVISIONE DEL COMPORTAMENTO ALIMENTARE NEGLI ANNI ‘70.

HOWARD MOSKOWITZ: LAUREA IN MATEMATICA DOTTORATO IN PSICOLOGIA SPERIMENTALE, HA INTRODOTTO LA RICERCA SPERIMENTALE NELLO SVILUPPO DEI PRODOTTI ALIMENTARI AD ALTO POTERE ATTRATTIVO. INIZIALI STUDI PER L’U.S. ARMY CON LO SVILUPPO DEL ***M.R.E.*** (meal ready to eat)

JOSEPH BALINFTY

A Mathematical Programming System for Food Management Applications

Joseph L. Balintfy
School of Business Administration, University of Massachusetts, Amherst,

The Cost of Decent Subsistence

Joseph L. Balintfy
University of Massachusetts,
Permalink: http://dx.doi.org/10.1287/mnsc.25.10.980
Published Online: October 1, 1979

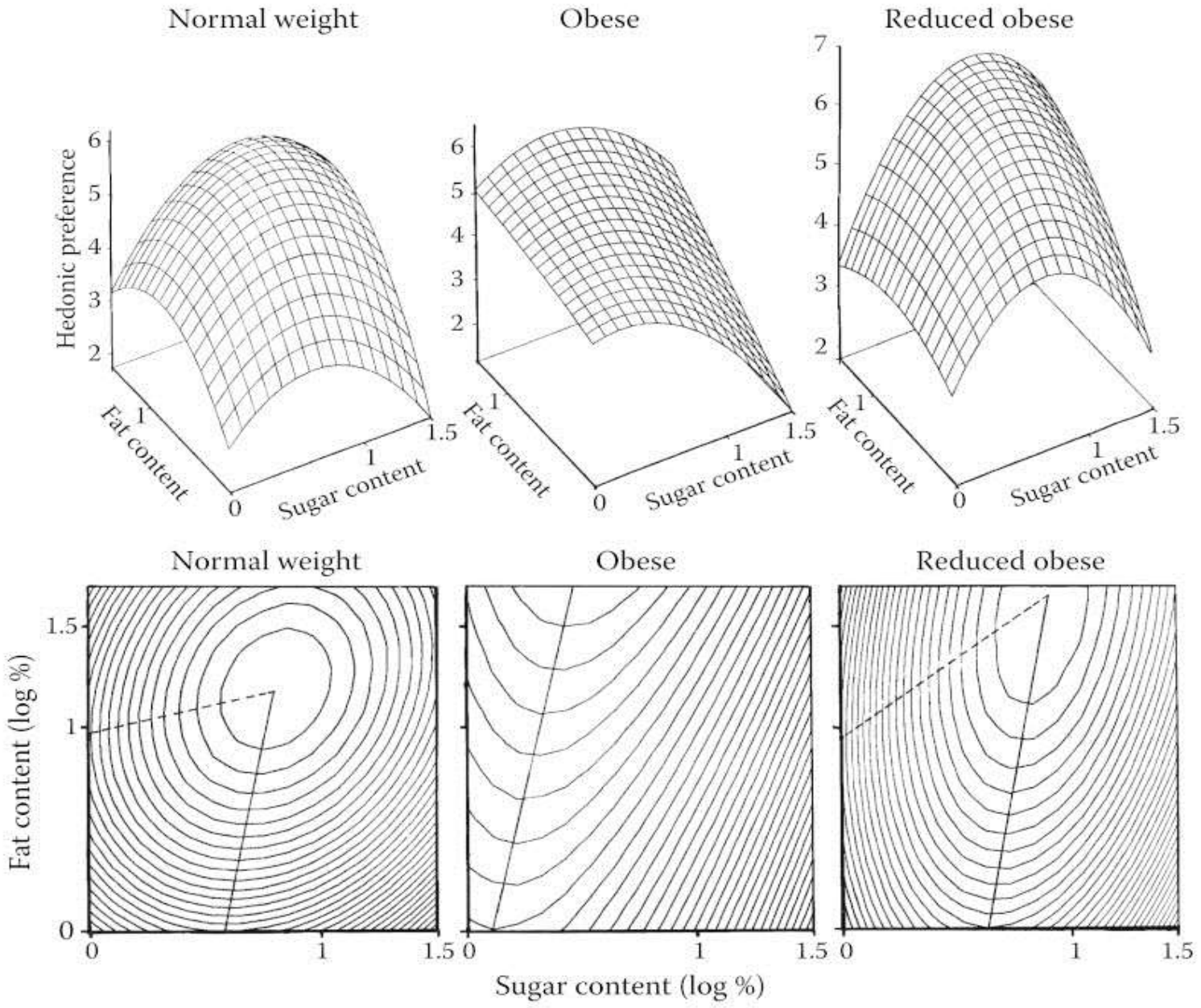
Modeling Food Preferences Over Time

Joseph L. Balintfy
University of Massachusetts, Amherst, Massachusetts,

HOWARD MOSKOWITZ

RICERCA SUI SOGGETTI SPERIMENTATORI

- RAGGRUPPATI IN **GRUPPI OMOGENEI** PER CARATTERISTICHE PSICOLOGICHE
- ESPOSTI AD ALIMENTI CON ATTRIBUTI **MODIFICATI GRADUALMENTE**
- **RAPPRESENTAZIONE** DELLA CURVA DELLA DISTRIBUZIONE DELLE RISPOSTE
- **MODELLIZZAZIONE** MATEMATICA DEI DATI
- UTILIZZAZIONE DELL'**ANALISI CONGIUNTA**
- **COMBINAZIONE** DI ELEMENTI DIVERSI DI ALIMENTI E SAPORI
- SVILUPPO DELLE COMBINAZIONI CHE CREANO **DESIDERIO COMPULSIVO**


Normal weight
Obese
Reduced obese
Hedonic preference
Fat content
Sugar content
Normal weight
Obese
Reduced obese
Fat content (log %)
Sugar content (log %)

ROBERT McBRIDE

ASSOCIATES FOR RESEARCH INTO THE SCIENCE OF ENJOYMENT

"LA GENTE PRENDE I PRODOTTI DAGLI SCAFFALI IN BASE ALLE PROPRIE ASPETTATIVE SUL GUSTO E SULLA SENSAZIONE CHE PROVERA'. LA NUTRIZIONE **NON E'** AL PRIMO POSTO NELLA MENTE, **MENTRE LO SONO** IL GUSTO, L'AROMA, LA SODDISFAZIONE SENSORIALE" MEETING VENEZIA 1991

ROBERT McBRIDE 2

LA QUALITA' PIU' POTENTE E' IL GUSTO DEL DOLCE.

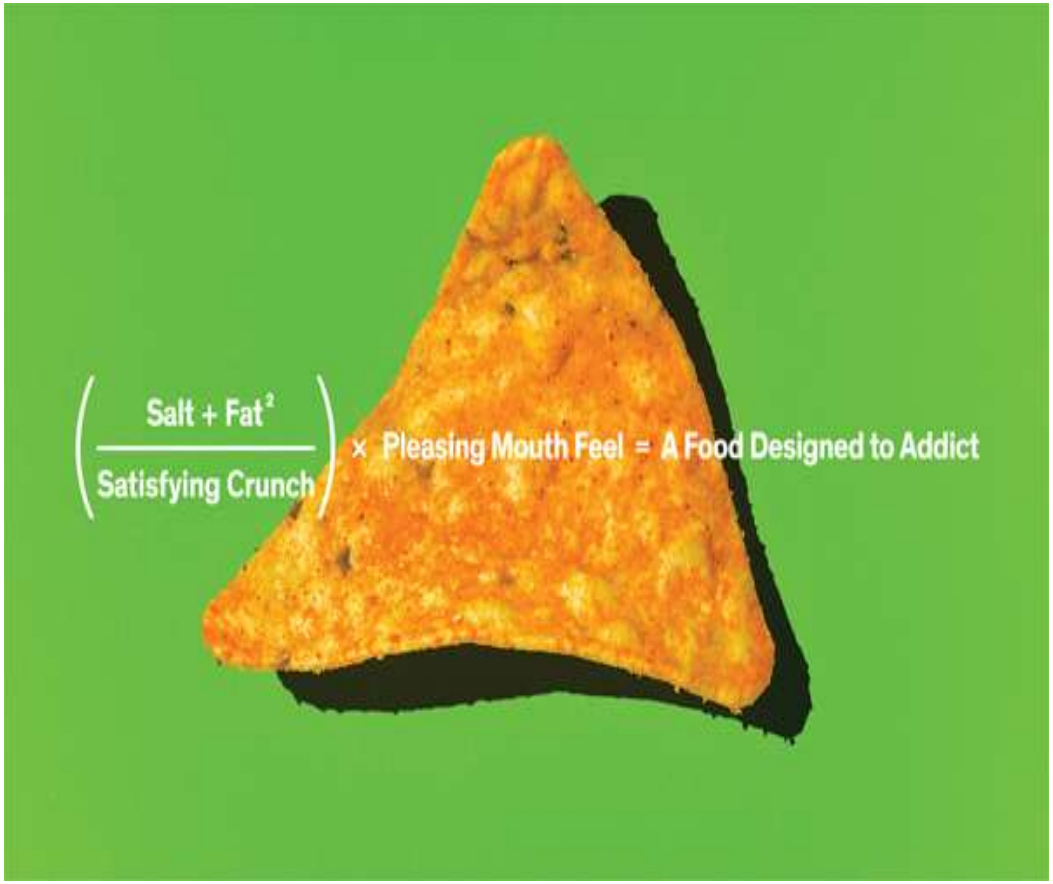
QUANTO DEVE ESSERE DOLCE UN ALIMENTO?

GLI ALIMENTI DEVONO AVERE UNA CONCENTRAZIONE OTTIMALE DEGLI INGREDIENTI CORRISPONDENTE AL MASSIMO PIACERE SENSORIALE:

BLISS POINT

ROBERT McBRIDE 3

IL BLISS POINT



ROBERT I-SAN LIN

MODELLO PER LO SNACK IDEALE

Ogni volta che un Consumatore decide di acquistare lo snack, se la Resistenza fosse superiore alla Gratificazione, non vi sarebbe l'Acquisto

$$\mathbf{P}=(A_1\mathbf{T}+A_2\mathbf{C}+A_3\mathbf{U})-(B_1\mathbf{\$}-B_2\mathbf{H}-B_3\mathbf{Q})$$

H = health**, $**=costo penalizzante azienda, **Q** = difetti qualità
P = purchase, **T** = taste, **C** = convenient, **U** = utilitarian
A e **B** coefficienti di ponderazione matematica

Neural Correlates of Food Addiction

Ashley N. Gearhardt, MS, MPhil; Sonja Yokum, PhD; Patrick T. Orr, MS, MPhil; Eric Stice, PhD; William R. Corbin, PhD; Kelly D. Brownell, PhD

Context: Research has implicated an addictive process in the development and maintenance of obesity. Although parallels in neural functioning between obesity and substance dependence have been found, to our knowledge, no studies have examined the neural correlates of addictive-like eating behavior.

Objective: To test the hypothesis that elevated "food addiction" scores are associated with similar patterns of neural activation as substance dependence.

Design: Between-subjects functional magnetic resonance imaging study.

Setting: A university neuroimaging center.

Participants: Forty-eight healthy young women ranging from lean to obese recruited for a healthy weight maintenance trial.

Main Outcome Measure: The relation between elevated food addiction scores and blood oxygen level–dependent functional magnetic resonance imaging activation in response to receipt and anticipated receipt of palatable food (chocolate milkshake).

Results: Food addiction scores (N=39) correlated with greater activation in the anterior cingulate cortex, medial orbitofrontal cortex, and amygdala in response to anticipated receipt of food ($P<.05$, false discovery rate corrected for multiple comparisons in small volumes). Participants with higher (n=15) vs lower (n=11) food addiction scores showed greater activation in the dorsolateral prefrontal cortex and the caudate in response to anticipated receipt of food but less activation in the lateral orbitofrontal cortex in response to receipt of food (false discovery rate–corrected $P<.05$).

Conclusions: Similar patterns of neural activation are implicated in addictive-like eating behavior and substance dependence: elevated activation in reward circuitry in response to food cues and reduced activation of inhibitory regions in response to food intake.

Arch Gen Psychiatry. 2011;68(8):808-816.
Published online April 4, 2011.
doi:10.1001/archgenpsychiatry.2011.32

Appetite 52 (2009) 430–436

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Research report

Preliminary validation of the Yale Food Addiction Scale

Ashley N. Gearhardt *, William R. Corbin, Kelly D. Brownell

Yale University, 2 Hillhouse Ave., New Haven, CT 06520, United States

ABSTRACT

Previous research has found similarities between addiction to psychoactive substances and excessive food consumption. Further exploration is needed to evaluate the concept of "food addiction," as there is currently a lack of psychometrically validated measurement tools in this area. The current study represents a preliminary exploration of the Yale Food Addiction Scale (YFAS), designed to identify those exhibiting signs of addiction towards certain types of foods (e.g., high fat and high sugar). Survey data were collected from 353 respondents from a stratified random sample of young adults. In addition to the YFAS, the survey assessed eating pathology, alcohol consumption and other health behaviors. The YFAS exhibited adequate internal reliability, and showed good convergent validity with measures of similar constructs and good discriminant validity relative to related but dissimilar constructs. Additionally, the YFAS predicted binge-eating behavior above and beyond existing measures of eating pathology, demonstrating incremental validity. The YFAS is a sound tool for identifying eating patterns that are similar to behaviors seen in classic areas of addiction. Further evaluation of the scale is needed, especially due to a low response rate of 24.5% and a non-clinical sample, but confirmation of the reliability and validity of the scale has the potential to facilitate empirical research on the concept of "food addiction".

Psychol Rev. 1991 Oct;98(4):488-505.

The eating paradox: how we tolerate food.

Woods SC[1].

[1]Department of Psychology, University of Washington, Seattle 98195.

Abstract

It is hypothesized that food, which is certainly a necessary commodity with powerful positive reinforcing qualities, also provides a potential threat to organisms, including humans. The act of eating, although necessary for the provision of energy, is a particularly disruptive event in a homeostatic sense. Just as humans learn responses to help them tolerate the administration of dangerous drugs, so do they learn to make anticipatory responses that help minimize the impact of meals on the body, to limit the amount of food consumed within any individual meal, to recruit several parts of the protective stress-response system while meals are being processed, and to limit postprandial behaviors so as to minimize the possibility of disrupting homeostatic systems even more. It is further hypothesized that defenses against eating too much may become activated inappropriately and contribute to clinical problems such as reactive hypoglycemia.

PMID: 1961770 [PubMed - indexed for MEDLINE]

Curr Pharm Des. 2011;17(12):1173-9.

Drug withdrawal and hyperphagia: lessons from tobacco and other drugs.

Edge PJ[1], Gold MS.

Abstract

'Globesity' is a descriptive term for the obesity epidemic now facing the U.S. and indeed, the world. Hyperphagia (i.e. overeating) can lead to metabolic syndrome which in turn can lead to Type 2 diabetes mellitus, heart disease, stroke and some cancers. The World Health Organization even states that more people die each year from the consequences of obesity than from hunger. Something must be done to stem the tsunami of obesity and its resultant medical complications. ***Our work and that of others suggests that new obesity treatments and anti-obesity medications should be based on those already successful in treating other addictions***. This paper looks at empirical evidence linking addictions to food and to drugs such as tobacco, alcohol, cannabis, amphetamines, and cocaine. Hypotheses are put forth as to why hyperphagia is so difficult to treat. Additionally, prenatal programming for addiction is explored. Lessons from successful drug treatment are elucidated and potential pharmaceutical targets for hyperphagia and obesity are suggested.

SIMILITUDINI TRA OBESITA' E DIPENDENZA

	CIBO	DROGHE
CAPACITA' DI RINFORZO	++	orali, ++ sniffate, +++fumate, ++++ iniettate
SOMMINISTRAZIONE	Orale	orali, inalate, fumate, iniettate.
MECCANISMI DI RICOMPENSA	Somatosensoriali (palatabilità), chimici (glucosio)	Chimici (droghe)
RILEVANZA DELLA CINETICA	Non studiata	Più veloce la stimolazione, più potente l'effetto di rinforzo
REGOLAZIONE DELL'APPORTO	Fattori centrali e periferici	Principalmente fattori centrali
ADATTAMENTO	Fisiologico	Sovrafisiologico
RUOLO FISIOLOGICO	Necessario per la sopravvivenza	Non necessario
APPRENDIMENTO	Risposte condizionate dalle abitudini	Risposte condizionate dalle abitudini
RUOLO DELLO STRESS	+++	+++

Volkow et al. Philos Trans R Soc Lond B Biol Sci. 2008 363:3191, 2008

SIMILITUDINI TRA OBESITA' E DIPENDENZA

FUNZIONI PERTURBATE	REGIONI CEREBRALI COINVOLTE
CONTROLLO INIBITORIO DETERIORATO •Per l'apporto di droghe nella dipendenza •Per l'apporto di cibo nell'obesità	1. CORTECCIA PREFRONTALE 2. GIRO CINGOLATO ANTERIORE 3. CORTECCIA ORBITOFRONTALE LATERALE
RICOMPENSA MAGGIORATA •Per la droga nella dipendenza •Per il cibo nell'obesità	1. NUCLEO ACCUMBENS 2. NUCLEO VENTRALE PALLIDO 3. IPOTALAMO
CONDIZIONAMENTI/ABITUDINI •Alle droghe e agli stimoli voluttuari nella dipendenza •Al cibo e agli stimoli alimentari nell'obesità	1. AMIGDALA 2. IPPOCAMPO 3. STRIATO DORSALE
MOTIVAZIONE /IMPULSO MAGGIORATI •Al consumo di droghe nella dipendenza •Al consumo di cibo nell'obesità	1. CORTECCIA ORBITOFRONTALE MEDIALE 2. NUCLEO DOPAMINA MESENCEFALICO 3. STRIATO DORSALE
REATTIVITA' EMOTIVA	1. AMIGDALA 2. GIRO CINGOLATO VENTRALE

Volkow et al. Philos Trans R Soc Lond B Biol Sci. 2008 363:3191, 2008

Is fast food addictive?

Andrea K. Garber, Robert H. Lustig

Curr Drug Abuse Rev 4:132, 2011

OPINION

Obesity and the brain: how convincing is the addiction model?

Hisham Ziauddeen, I. Sadaf Farooqi and Paul C. Fletcher

Nature Rev Neurosci 13:279, 2012


ZUCCHERO
• Addolcisce, sostituisce ingredienti costosi, aumenta volume e consistenza
GRASSI
• Stimolano iperalimentazione e migliorano la sensazione del palato
SALE
• Economico esaltatore del sapore

UTILIZZAZIONE DEL SALE

- **ECCITA** LE PAPILLE GUSTATIVE
- E' IL GRANDE **RIPARATORE** DEGLI ALIMENTI LAVORATI

- **EVITA** IL GUSTO METALLICO DEI CORN FLAKES
- I CRACKERS **NON** DIVENTANO AMARI, MOLLICCI, APPICICOSI

- **EVITA** LA GOMMOSITA' DEL PROSCIUTTO
- **EVITA** IL DETERIORAMENTO DEGLI ALIMENTI SUGLI SCAFFALI

- **AMPLIFICA** LA DOLCEZZA DELLO ZUCCHERO
- **MASCHERA** IL GUSTO AMARO

- **SOSTITUISCE** GLI INGREDIENTI PIU' COSTOSI
- **AUMENTA** VOLUME E CONSISTENZA DEI PRODOTTI

- **PERMETTE** LA LAVORAZIONE INDUSTRIALE DEL PANE IMPEDENDO LA ROTTURA DEI MACCHINARI
- **RALLENTA** LA LIEVITAZIONE PERMETTENDO AI FORNI DI RISPETTARE I RITMI DI PRODUZIONE

UTILIZZAZIONE DEL SALE

BASSO COSTO

SOSTITUISCE ALTRI INGREDIENTI

CREA DIPENDENZA

Physiology & Behavior
Volume 94, Issue 5, 6 August 2008, Pages 709–721
Proceedings from the 2007 Meeting of the Society for the Study of Ingestive Behavior
Review

Salt craving: The psychobiology of pathogenic sodium intake

Michael J. Morris[1], Elisa S. Na[1], Alan Kim Johnson,

Abstract
Ionic sodium, obtained from dietary sources usually in the form of sodium chloride (NaCl, common table salt) is essential to physiological function, and in humans salt is generally regarded as highly palatable. This marriage of pleasant taste and physiological utility might appear fortunate — an appealing taste helps to ensure that such a vital substance is ingested. However, the powerful mechanisms governing sodium retention and sodium balance are unfortunately best adapted for an environment in which few humans still exist. Our physiological and behavioral means for maintaining body sodium and fluid homeostasis evolved in hot climates where sources of dietary sodium were scarce. For many reasons, contemporary diets are high in salt and daily sodium intakes are excessive. High sodium consumption can have pathological consequences. Although there are a number of obstacles to limiting salt ingestion, high sodium intake, like smoking, is a modifiable behavioral risk factor for many cardiovascular diseases. This review discusses the psychobiological mechanisms that promote and maintain excessive dietary sodium intake. Of particular importance are experience-dependent processes including the sensitization of the neural systems underlying sodium appetite and the effects of sodium balance on hedonic state and mood. Accumulating evidence suggests that plasticity within the central nervous system as a result of experience with high salt intake, sodium depletion, or a chronic unresolved sodium appetite fosters enduring changes in sodium related appetitive and consumatory behaviors.

The development of salty taste acceptance is related to dietary experience in human infants: a prospective study[1–3]

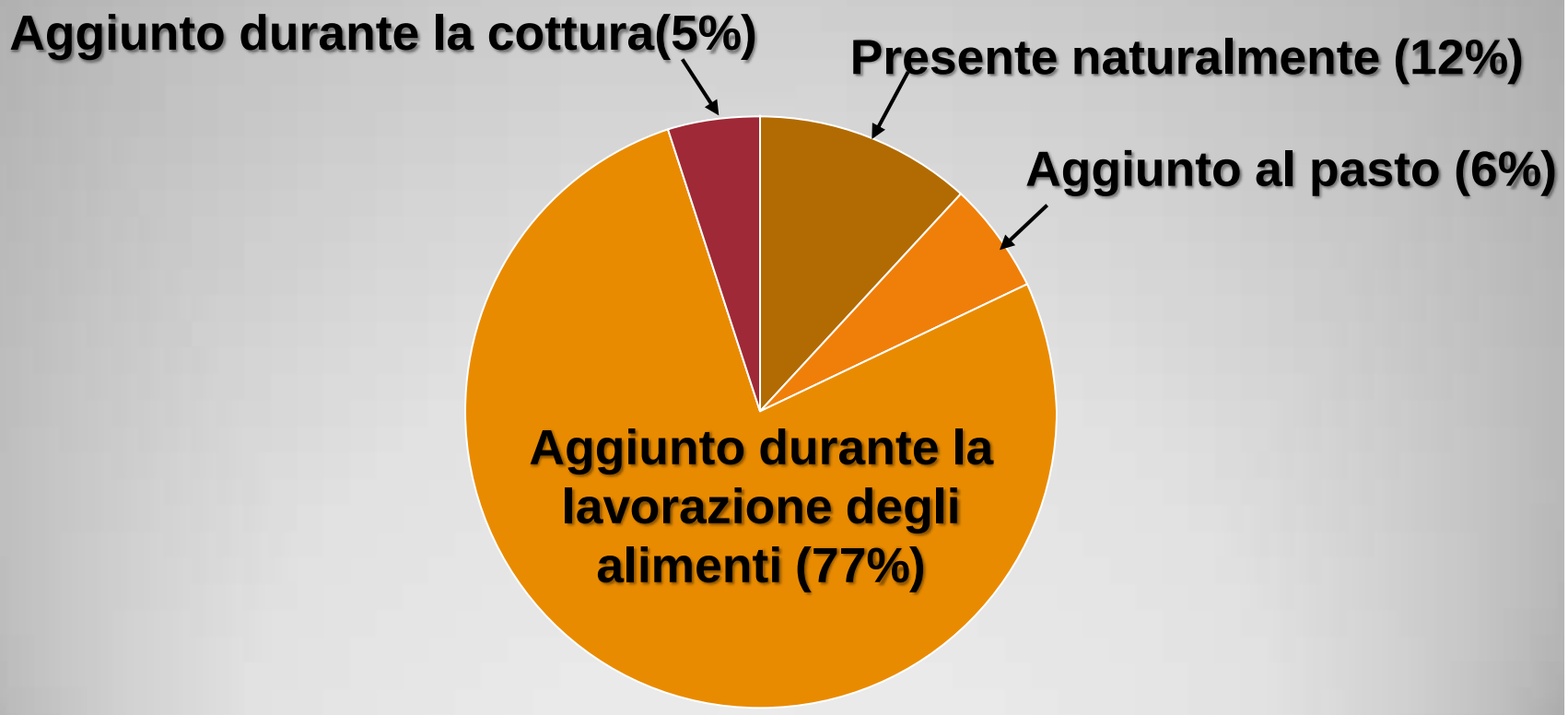
Leslie J Stein, Beverly J Cowart, and Gary K Beauchamp

1 From **Monell Chemical Senses Center**, Philadelphia, PA.
2 Supported by the **NIH** (DC 00882).
3 Address correspondence to LJ Stein, Monell Chemical Senses Center, 3500 Market Street, Philadelphia, PA 19104-3308. E-mail: stein@monell. org.

Am J Clin Nutr 2012;94:123–9.

Gli alimenti di produzione industriale sono la principale fonte di sodio

Fonti relative del sodio alimentare



Fonti: 2005 U.S. Dietary Guidelines; Mattes, Donnelly D. Relative contributions of dietary sodium sources. *J Am Coll Nutr.* 1991 Aug; 10(4):383-93.

Daily Sodium Recommendations for Americans

1980 – National Academy of Sciences' *Recommended Dietary Allowances:* **1,100–3,000 *mg***

1989 – National Academy of Sciences' *Diet and Health:* Obiettivo iniziale di **2,400 mg; "una maggiore riduzione… [a 1,800 mg o meno] può probabilmente dare un maggiore beneficio**

2004 – Institute of Medicine's "Acceptable Intake":

- età inferiore a 50: **1,500 mg**
- età compresa tra 50–70: **1,300 mg**
- età superiore a 70: **1,200 mg**

2005 – Dietary Guidelines Advisory Committee:

- giovani e giovani adulti: **non più di 2,300 mg**
- individui ipertesi, etnia nera, età media e anziani: **non più di 1,500 mg**

Meno Sale e più Salute
contro l'ipertensione e le malattie cardiovascolari

Leggi l'etichetta, ti aiuterà a scegliere con più attenzione

Come considerare i valori riportati in etichetta ?

	Sodio	Sale
ALTO	superiore a 0,4-0,5 g/100 g	superiore a 1-1,2 g /100 g
MEDIO	da 0,12 a 0,4-0,5 g/100 g	da 0,3 a 1-1,2 g /100 g
BASSO	inferiore a 0,12 g/100 g	inferiore a 0,3 g /100 g

Diversi alimenti, naturalmente poveri in sale, subiscono un trattamento tecnologico di trasformazione o conservazione che li rende più salati. Leggendo l'etichetta puoi comprendere quanto sale consumi ogni giorno insieme alla tua famiglia.

N.B.: I nomi che indicano la presenza del sale aggiunto sono: sodio (o Na), cloruro di sodio, fosfato monosodico, glutammato di sodio, benzoato di sodio, citrato di sodio.

Elaborato dalla Società Italiana di Nutrizione Umana (SINU), in collaborazione con il Gruppo di lavoro Intersocietario per la Riduzione del Consumo di Sodio in Italia (GIRCSSI), in occasione della campagna organizzata da World Action on Salt and Health (WASH) per promuovere la riduzione dell'assunzione di sale da cucina nell'alimentazione quotidiana, durante la Settimana Mondiale per la Riduzione di Sale (21 - 27 Marzo 2011).

www.sinu.it
www.menosalepiusalute.it
www.worldactiononsalt.com

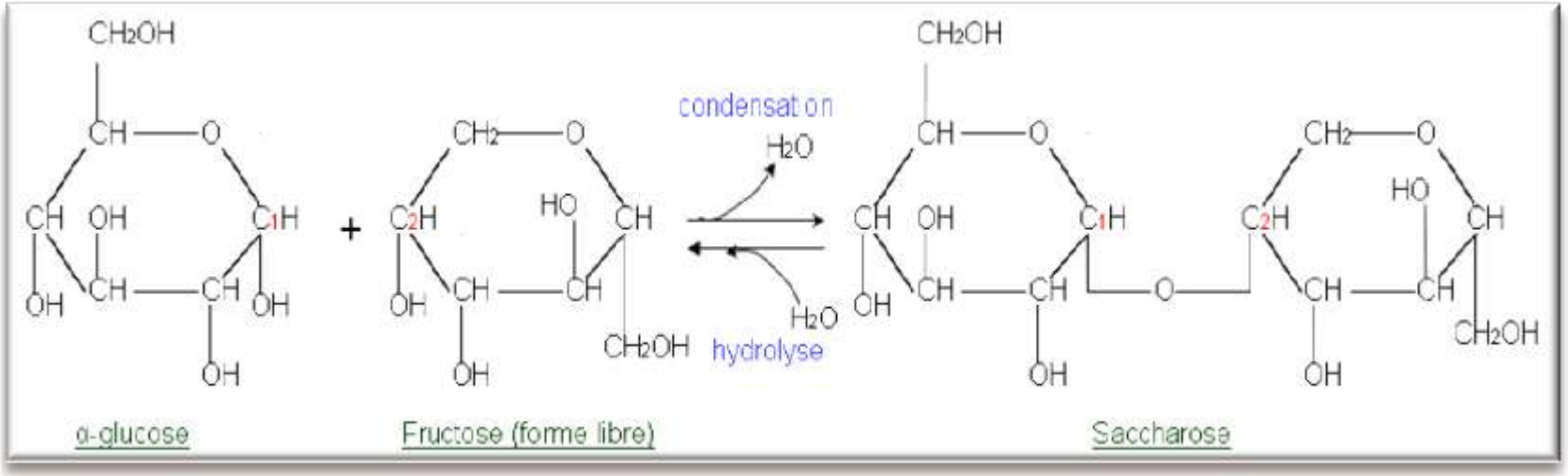
Aderisce alla Campagna

Logo Aderisce

GLI ZUCCHERI INDUSTRIALI

CANNA DA ZUCCHERO 1516	BARBABIETOLA 1807	DOLCIFICANTI A BASE DI SCIROPPO DI MAIS 1972

SACCAROSIO E FRUTTOSIO



ZUCCHERI ASSOCIATI A GRASSI

- ZUCCHERO→BLISS POINT **PRESENTE**
- GRASSI→BLISS POINT **ASSENTE**

AMPLIFICAZIONE DEL SAPORE

- LO ZUCCHERO SI "SENTE"→OLTRE UN LIMITE CALA L'ATTRAZIONE
- IL GRASSO NON VIENE PERCEPITO→NON SI PROVOCA SEGNALE DELLA SAZIETA'

EFFETTI

- L'AGGIUNTA DELLO ZUCCHERO RIDUCE LA PERCEZIONE DEL GRASSO
- I GRASSI DIVENTANO LA FONTE PIU' INFIDA DELL'APPORTO CALORICO

MASCHERANO I SAPORI

ESALTANO I SAPORI

SI ESPANDONO GRADUALMENTE

EFFETTI GUSTATIVI SINCRONI

LO **ZUCCHERO**, CON IL SUO DECISO E VELOCISSIMO ASSALTO AL CERVELLO E' LA *METANFETAMINA* DEGLI INGREDIENTI DEI CIBI A PREPARAZIONE INDUSTRIALE

I **GRASSI** SONO GLI *OPPIACEI*, INCANTATORI DAGLI EFFETTI MENO EVIDENTI, MA NON MENO POTENTI

I GRASSI ALIMENTARI CONTRIBUISCONO ALL'ACCETTABILITA', ALL'APPETIBILITA' E AL GODIMENTO DEGLI ALIMENTI

LATTICINI

- CREMOSITA'
- LEVIGATEZZA

SALUMI

CONSISTENZA PIU' SOLIDA

EVITA GOMMOSITA', ESALTA COLORE

CONSERVAZIONE

PROLUNGA LA DURATA SUGLI SCAFFALI

PASTICCERIA

- MORBIDEZZA
- UMIDITA'

ALIMENTI DA FORNO

- CROCCANTEZZA
- FRIABILITA'

http://www.ncbi.nlm.nih.gov/books/NBK53541/

Appetite. 1990 Jun;14(3):203-17.

Invisible fats: sensory assessment of sugar/fat mixtures.

Drewnowski A[1], Schwartz M.

Abstract

Fifty normal-weight college females tasted and rated 15 stimuli resembling cake frostings and composed of sucrose (20-77% weight/weight), butter (15-35% weight/weight), polydextrose and distilled water. Sweetness intensity ratings rose as a function of sucrose levels. In contrast, ratings of fat content were only poorly related to stimulus fat. Rather, the perception of fat depended on stimulus texture and was a combined function of fat, polydextrose and water. Increasing sucrose levels suppressed fatness ratings: sweeter stimuli were judged to be lower in fat content. The finding that sugar masks the sensory assessment of fats in some solid foods may help explain why so many sweet, high-fat desserts are commonly viewed as carbohydrate-rich foods. The acceptability of the frostings was a combined function of both sucrose and fat levels. Hedonic response profiles to sucrose solutions in water predicted sensory preferences for sweet frostings containing 15% fat, but not those containing 35% fat.

The Journal of Nutrition Ingestive Behavior and Neurosciences

Hidden Fat Facilitates Passive Overconsumption

Mirre Viskaal-van Dongen,* Cees de Graaf, Els Siebelink, and Frans J. Kok Division of Human Nutrition, Wageningen University, 6700 EV Wageningen, The Netherlands

Abstract Food intake regulation may be disturbed when sensory signals from foods are disconnected from their metabolic properties. Consumption of high-fat, energy-dense foods may stimulate passive overconsumption, because these foods do not provide sensory signals in accordance with the actual nutrient content. We examined the effects of perception of fat on energy intake in adults after overfeeding (Study 1) and on energy intake during a meal (Study 2). In study 1, 57 participants consumed 6 mandatory lunches differing in energy level (100, 200, and 300% of a standard lunch intake) and fat condition (visible fat and hidden fat). Ad libitum energy intake was measured during subsequent meals. In Study 2, 51 participants consumed 2 lunches that were high in visible or hidden fats. We measured ad libitum energy intake during lunch. In Study 1, the energy intake at dinner was 8% higher in the hidden fat condition than in the visible fat condition (P ¼ 0.0046). A main effect was also found for the energy level of the lunch (P , 0.0001), with the highest intake following the 100% energy level and the lowest intake following the 300% energy level. In Study 2, the energy intake was 9% higher in the hidden fat condition than in the visible fat condition (P ¼ 0.013). Perception of fat influences energy intake. **In the presence of visible fats, energy intake was lower than in the presence of hidden fats, suggesting that hidden fats may contribute to overconsumption. Appropriate sensory signals may be important in preventing overconsumption.** J. Nutr. 139: 394–399, 2009.

	2009	2010	2011	2012	2013	2014
Consumi italiani pro-capite per anno espresso in kg						
Burro	2,5	2,6	2,3	2,3	2,3	2,3
Formaggi (HS.0406)	23	23	23	23	22	
Latti Fermentati (yogurt e altri)	8,1	8,5	8,6	8,7	8,6	7,4
Latte ad uso alimentare	52	53	52	51	50	45
% Tasso di autoapprovigionamento	68,59%	67,68%	67,17%	67,22%	69,08%	69,90%

FORMAGGIO

- CONSUMO ANNUO PROCAPITE: **22 KG**
- Kcal TOTALI: **88.000**

ACIDI GRASSI SATURI

- QUANTITA' ANNUA TOTALE: **4,554 KG**
- QUANTITA' DIE MEDIA: **12,5 GRAMMI**

FABBISOGNI

- 88.000 Kcal= **FABBISOGNO DI 6 SETTIMANE** PER ADULTO 70 KG
- 12,5 GRAMMI AC. GRASSI SATURI= **FABBISOGNO GIORNALIERO** PER ADULTO 70 KG

CARATTERISTICHE DEL FRUTTOSIO

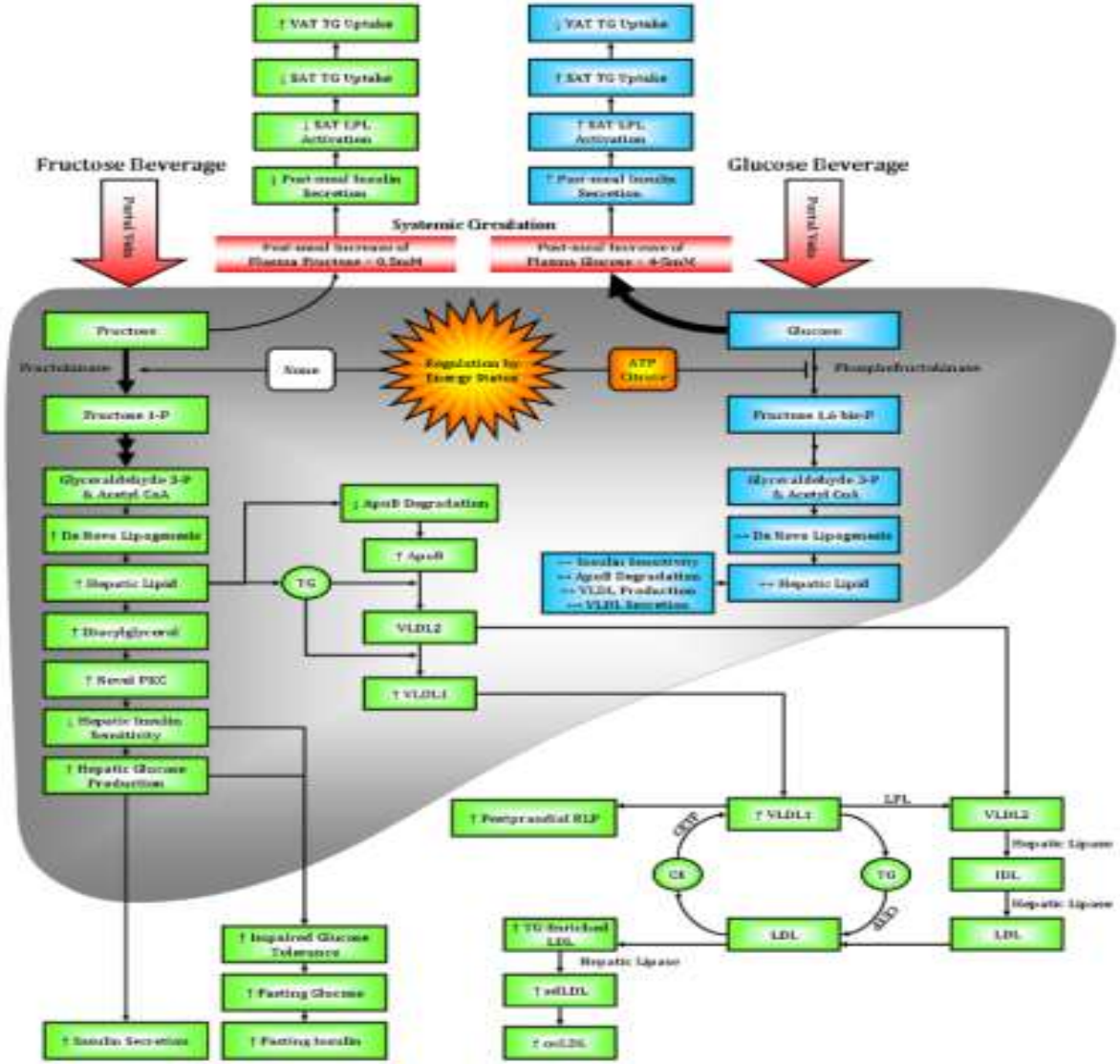
1. **ALTA SOLUBILITA'**
2. **NON SI SCOMPONE**: rimane efficace nella conservazione prolungata degli alimenti.
3. **LUNGA RESISTENZA**: forma cristalli che impediscono agli alimenti morbidi di seccare.
4. **AROMA**: nella cottura in forno rilascia aroma invitante, rende la superficie croccante e dorata.
5. **BLOCCA LA FORMAZIONE DEL GHIACCIO**: favorisce la conservazione delle caratteristiche degli alimenti surgelati.
6. **GRANDE POTERE DOLCIFICANTE**: 74 % maggiore del saccarosio, emerge e scompare rapidamente, senza mascherare gli aromi speziati e fruttati.
7. **RIDUCE COSTI PRODUZIONE, AUMENTA PROFITTI**
8. **AZIONE SINERGICA:** con i carboidrati aumentandone la dolcezza, la lievitazione dei prodotti da forno, la viscosità degli alimenti e bevande.
9. **FAVORISCE:** il mantenimento dell'umidità, sostituendo il sorbitolo e la glicerina negli alimenti.
10. **COTTURA:** favorisce il colore e l'aroma degli alimenti arrostiti e da forno, interagendo chimicamente con aminoacidi e carboidrati durante la cottura

Ann N Y Acad Sci. 2010 March ; 1190: 15–24.

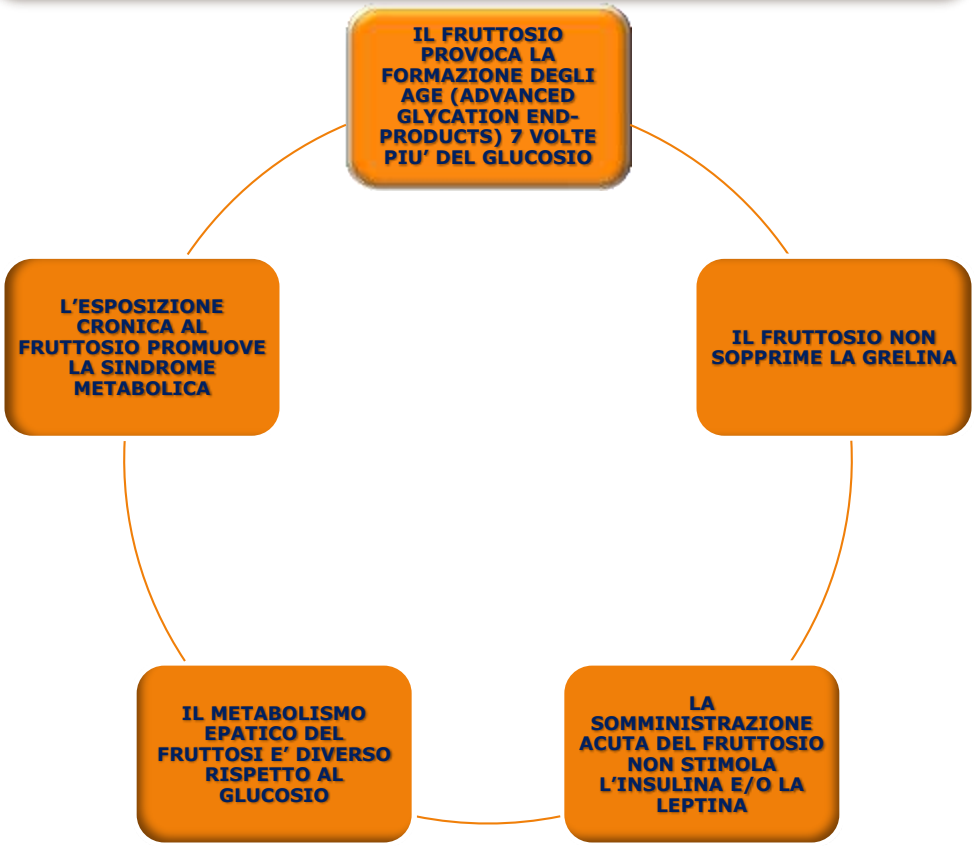
Fructose consumption: Recent results and their potential implications

Kimber L. Stanhope1,2 and Peter J. Havel1,2
1 Department of Molecular Biosciences, School of Veterinary Medicine, University of California, Davis, Davis, CA 95616
2 Department of Nutrition, University of California, Davis, Davis, CA 95616

Abstract
In addition to acquiring a better understanding of foods that may have intrinsic health benefits, increasing our knowledge of dietary components that may adversely impact health and wellness, and the levels of consumption at which these adverse effects may occur, should also be an important priority for the Foods for Health initiative. This review discusses the evidence that additional research is needed to determine the adverse effects of consuming added sugars containing fructose. Current guidelines recommend limiting sugar consumption in order to prevent weight gain and promote nutritional adequacy. However recent data suggests that fructose consumption in humans results in increased visceral adiposity, lipid dysregulation, and decreased insulin sensitivity, all of which have been associated with **increased risk for cardiovascular disease and type 2 diabetes**. A proposed model for the differential effects of fructose and glucose is presented. The only published study to directly compare the effects of fructose with those of commonly consumed dietary sweeteners, high fructose corn syrup and sucrose, indicates that high fructose corn syrup and sucrose increase postprandial triglycerides comparably to pure fructose. Dose-response studies investigating the metabolic effects of prolonged consumption of fructose by itself, and in combination with glucose, on lipid metabolism and insulin sensitivity in both normal weight and overweight/obese subjects are needed.


↑ VAT TG Uptake
↓ SAT TG Uptake
↓ SAT LPL Activation
↓ Post-meal Insulin Secretion
↓ VAT TG Uptake
↑ SAT TG Uptake
↑ SAT LPL Activation
↑ Post-meal Insulin Secretion
Fructose Beverage
Glucose Beverage
Portal Vein
Portal Vein
Systemic Circulation
Post-meal Increase of Plasma Fructose ~ 0.2mM
Post-meal Increase of Plasma Glucose ~ 4-5mM
Fructose
Glucose
Fructokinase
None
Regulation by Energy Status
ATP Citrate
Phosphofructokinase
Fructose 1-P
Fructose 1,6 bis-P
Glyceraldehyde 3-P & Acetyl CoA
Glyceraldehyde 3-P & Acetyl CoA
↓ ApoB Degradation
↑ De Novo Lipogenesis
↑ ApoB
-- De Novo Lipogenesis
↑ Hepatic Lipid
TG
-- Insulin Sensitivity
-- ApoB Degradation
-- VLDL Production
-- VLDL Secretion
-- Hepatic Lipid
↑ Diacylglycerol
VLDL2
↑ Novel PKC
↑ VLDL1
↓ Hepatic Insulin Sensitivity
↑ Hepatic Glucose Production
↑ Postprandial RLP
↑ VLDL1
LPL
VLDL2
CETP
CE
TG
Hepatic Lipase
IDL
Hepatic Lipase
LDL
LDL
↑ TG-Enriched LDL
Hepatic Lipase
↑ sdLDL
↑ ox-LDL
↑ Impaired Glucose Tolerance
↑ Fasting Glucose
↑ Fasting Insulin
↑ Insulin Secretion

IL FRUTTOSIO NON E' IL GLUCOSIO



The Journal of Clinical Investigation http://www.jci.org Volume 119 Number 5 May 2009

Consuming fructose-sweetened, not glucosesweetened, beverages increases visceral adiposity and lipids and decreases insulin sensitivity in overweight/obese humans

Kimber L. Stanhope,1,2 Jean Marc Schwarz,3,4 Nancy L. Keim,5 Steven C. Griffen,6
Andrew A. Bremer,7 James L. Graham,1,2 Bonnie Hatcher,2 Chad L. Cox,2 Artem Dyachenko,3
Wei Zhang,6 John P. McGahan,8 Anthony Seibert,8 Ronald M. Krauss,9 Sally Chiu,9
Ernst J. Schaefer,10 Masumi Ai,10 Seiko Otokozawa,10 Katsuyuki Nakajima,10,11 Takamitsu Nakano,11
Carine Beysen,12 Marc K. Hellerstein,12,13 Lars Berglund,6,14 and Peter J. Havel1,2

Studies in animals have documented that, compared with glucose, dietary fructose induces dyslipidemia and insulin resistance.

To assess the relative effects of these dietary sugars during sustained consumption in humans, overweight and obese subjects consumed glucose- or fructose-sweetened beverages providing 25% of energy requirements for 10 weeks. Although both groups exhibited similar weight gain during the intervention, visceral adipose volume was significantly increased only in subjects consuming fructose. Fasting plasma triglyceride concentrations increased by approximately 10% during 10 weeks of glucose consumption but not after fructose consumption. In contrast, hepatic de novo lipogenesis (DNL) and the 23-hour postprandial triglyceride AUC were increased specifically during fructose consumption. Similarly, markers of altered lipid metabolism and lipoprotein remodeling, including fasting apoB, LDL, small dense LDL, oxidized LDL, and postprandial concentrations of remnant-like particle–triglyceride and –cholesterol significantly increased during fructose but not glucose consumption.

In addition, fasting plasma glucose and insulin levels increased and insulin sensitivity decreased in subjects consuming fructose but not in those consuming glucose. **These data suggest that dietary fructose specifically increases DNL, promotes dyslipidemia, decreases insulin sensitivity, and increases visceral adiposity in overweight/obese adults**

Sugar Sweetened Beverages, Obesity, Type 2 Diabetes and Cardiovascular Disease risk

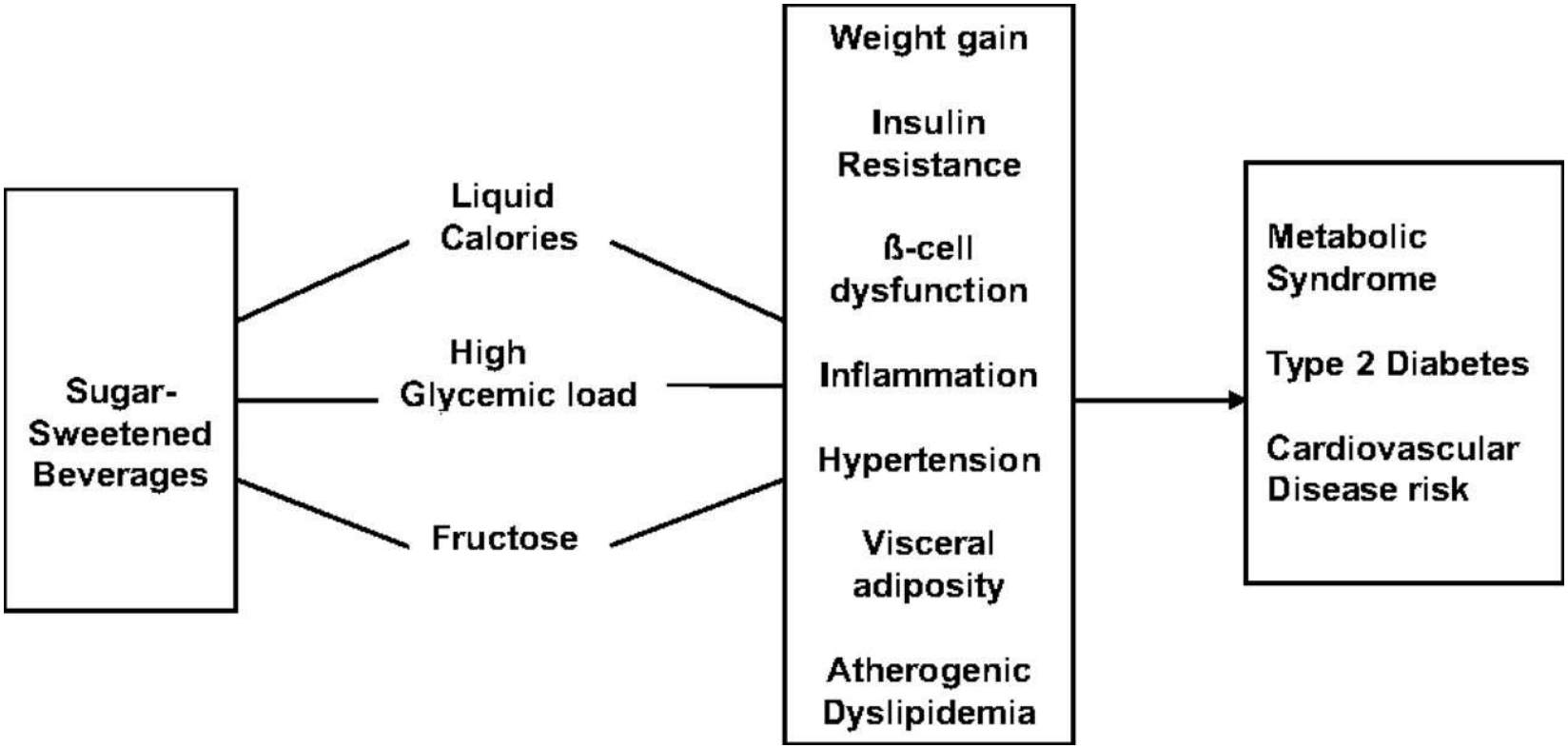
Vasanti S. Malik, **Barry M. Popkin**, **George A. Bray**, **Jean-Pierre Després**, **Frank B. Hu**, **Channing Laboratory**,.

Circulation. 2010 March 23; 121(11): 1356–1364.

Obesity has recently emerged as a major global health problem. According to World Health Organization (WHO) estimates, approximately 1.6 billion adults worldwide were overweight (BMI ≥ 25 kg/m2) and at least 400 million were obese (BMI ≥ 30 kg/m2) in 2005, numbers which are expected to reach 2.3 billion and 700 million respectively, by 2015. In the United States, the percentage of overweight and obese adults increased markedly from 47% and 15% in 1976-1980 to over 66% and 33% in 2005-2006, with the greatest proportion of increase seen among Non-Hispanic black and Mexican-American women . The implications of excess body weight are far reaching. Epidemiologic studies indicate that overweight and obesity are important risk factors for of type 2 diabetes (T2DM), cardiovascular disease (CVD), cancer and premature death . In the US, health care expenditures attributable to overweight and obesity are estimated to be $147 billion or 9.1% of total health care costs per year. Such excess costs could have serious repercussions for resource-poor countries, which must manage dual burdens of chronic and infectious disease.

In the setting of a pandemic of obesity and related chronic diseases, the American Heart Association recently released a scientific statement recommending reductions in added sugar intake to no more than 100-150 kcal per day for most Americans. The statement identified sugar sweetened beverages (SSB) as the primary source of added sugars in the American diet. While it has long been suspected that SSBs contribute at least in part to the obesity epidemic, only in recent years have large epidemiologic studies been able to substantiate the relationship between SSB consumption and long-term weight gain, T2DM and cardiovascular risk. It is thought that SSB's contribute to weight gain due to their high added sugar content, low satiety and potential incomplete compensation for total energy leading to increased energy intake. In addition, because of their high amounts of rapidly absorbable carbohydrates such as various forms of sugar and high-fructose corn syrup (HFCS), and large quantities consumed, SSB's may increase T2DM and cardiovascular risk, independent of obesity as a contributor to a high dietary glycemic load (GL) leading to inflammation, insulin resistance, and impaired ßcell function . Fructose from any sugar or HFCS may also increase blood pressure, and promote accumulation of visceral adiposity, dyslipidemia and ectopic fat deposition due to increased hepatic *de novo lipogenesis. Here, we review temporal patterns in SSB* consumption, and clinically relevant effects on obesity, T2DM and cardiovascular disease risk, emphasizing potential underlying biological mechanisms, clinical implications and consideration of methodological issues inherent in the literature.

.. SSBs may lead to weight gain as a result of incomplete compensation for liquid calories at subsequent meals, resulting in positive energy balance.



Vasanti S. Malik et al. Circulation. 2010;121:1356-1364

Effects of Sugar-Sweetened Beverages on Children

Andrew A. Bremer, MD, PhD; and Robert H. Lustig, MD

Pediatric Annals 41:23, 2012

Toward a Unifying Hypothesis of Metabolic Syndrome

Andrew A. Bremer, M.D., Ph.D.[a], Michele Mietus-Snyder, M.D.[b], Robert H. Lustig, M.D.[c]

Pediatrics 129:557, 2012

Fructose: It's "Alcohol Without the Buzz"[1–3]

Robert H. Lustig*
Department of Pediatrics and the Philip R. Lee Institute for Health Policy Studies, University of California, San Francisco, CA

Advances in Nutrition 4:1, 2013

What is metabolic syndrome, and why are children getting it?

Ram Weiss,[1] Andrew A. Bremer,[2] and Robert H. Lustig[3,4]

Annals NY Academy of Sciences, 1, 2013

LETTERATURA RECENTE

Fast Food, Central Nervous System Insulin Resistance, and Obesity

Arterioscler Throm Vasc Biol 25:2451, 2005

Is fast food addictive?

Andrea K. Garber, Robert H. Lustig

Curr Drug Abuse Rev 4:146, 2011

The role of fructose in the pathogenesis of NAFLD and the metabolic syndrome

Jung Sub Lim, Michele Mietus-Snyder, Annie Valente, Jean-Marc Schwarz and Robert H. Lustig

Nat Rev Gastroenterol Hepatol 7:251, 2010

eat right. American Dietetic Association

RESEARCH

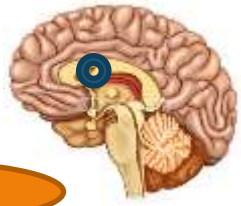
Review

Fructose: Metabolic, Hedonic, and Societal Parallels with Ethanol

ROBERT H. LUSTIG, MD

J Am Diet Assoc 110:1305, 2010

METIUS-SNYDER AND LUSTIG, ANN REV MED 59:147, 2008



AMIGDALA

STRESS

CORTISOLO

DIETA ALTO CONTENUTO
•CHO
•GRASSI
•FRUTTOSIO

SEDENTARIETA'

IPERSECREZIONE INSULINICA

INSULINORESISTENZA

VAGO

IPERINSULINEMIA

APPETITO

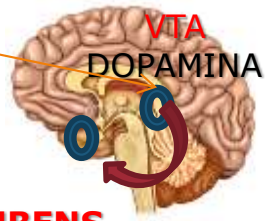
S.N.S.

OBESITA'

LEPTINA

LEPTINORESISTENZA

LEPTINORESISTENZA



VTA
DOPAMINA

NUCLEO VENTROMEDIALE
FAME

NUCLEO ACCUMBENS
RICOMPENSA

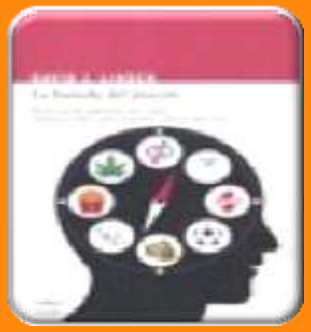

Domino
SUGAR
1 can of regular soda
per day for a year adds up
to 31.4 pounds of sugar
consumed
Center for Science in the Public Interest
Coca-Cola

MICHAEL MOSS

- GRASSI,DOLCI, SALATI
- MONDADORI

GORDON SHEPHERD

- ALL'ORIGINE DEL GUSTO
- CODICE EDIZIONI



DAVID LINDEN

- LA BUSSOLA DEL PIACERE
- CODICE EDIZIONI

MICHAEL POLLAN

- IL DILEMMA DELL'ONNIVORO
- ADELPHI

STEPHEN WITHERLY

- WHY HUMANS LIKE JUNK FOOD
- iUNIVERSE INC. PUBLISHING

HARRIS MARVIN

- BUONO DA MANGIARE
- EINAUDI

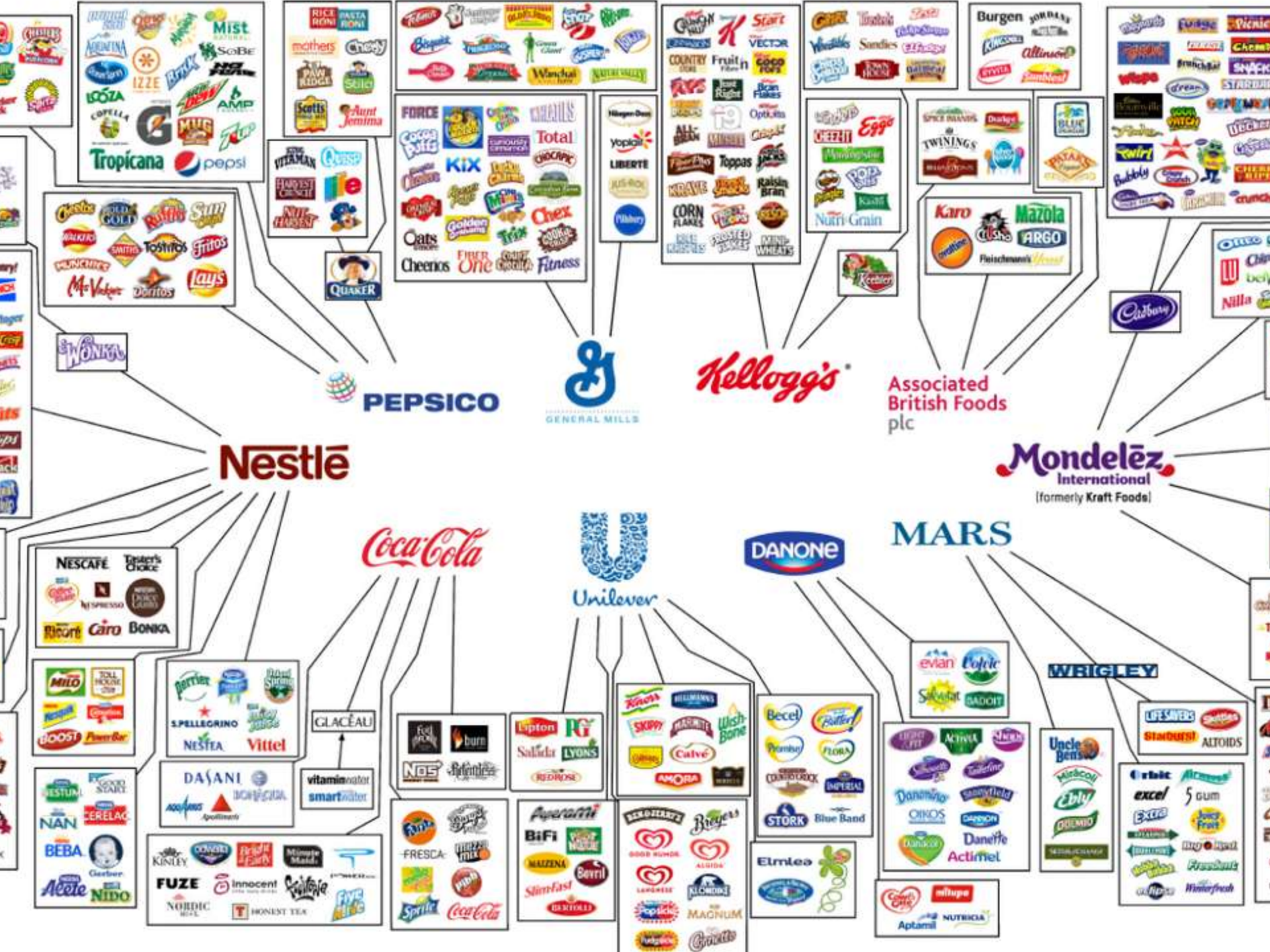
The 2008 Ig Nobel Prize Winners

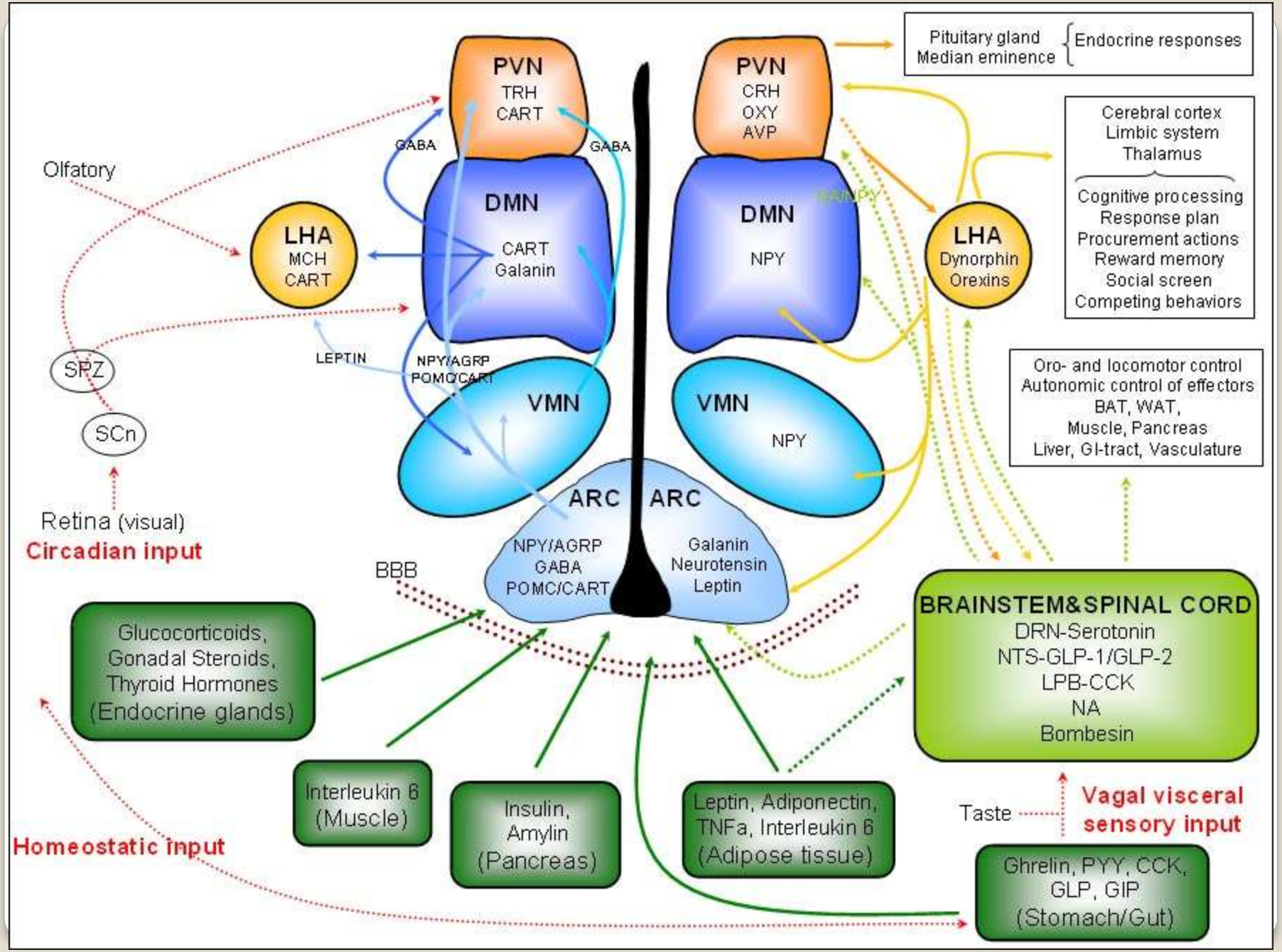
The 2008 Ig Nobel Prizes were awarded on Thursday night, October 2nd, 2008 at the 18th First Annual Ig Nobel Prize Ceremony, at Harvard's Sanders Theatre. The ceremony was webcast live. You can watch the video on our youTube Channel.

NUTRITION PRIZE. Massimiliano Zampini of the University of Trento, Italy and Charles Spence of Oxford University, UK, for electronically modifying the sound of a potato chip to make the person chewing the chip believe it to be crisper and fresher than it really is.

REFERENCE: "The Role of Auditory Cues in Modulating the Perceived Crispness and Staleness of Potato Chips," Massimiliano Zampini and Charles Spence , Journal of Sensory Studies, vol. 19, October 2004, pp. 347-63.

WHO ATTENDED THE CEREMONY: Massimiliano Zampini. unable to attend the ceremony, was presented with the prize at a special ceremony, later in the month, at the Genoa Science Festival.


PEPSICO
GENERAL MILLS
Kellogg's
Associated British Foods plc
Nestlé
Mondelēz International (formerly Kraft Foods)
Coca-Cola
Unilever
DANONE
MARS
WRIGLEY


Pituitary gland
Median eminence
Endocrine responses
PVN
TRH
CART
PVN
CRH
OXY
AVP
GABA
GABA
DMN
CART
Galanin
DMN
NPY
GABA/NPY
Olfatory
LHA
MCH
CART
LHA
Dynorphin
Orexins
Cerebral cortex
Limbic system
Thalamus
Cognitive processing
Response plan
Procurement actions
Reward memory
Social screen
Competing behaviors
LEPTIN
NPY/AGRP
POMC/CART
SPZ
SCn
VMN
VMN
NPY
Oro- and locomotor control
Autonomic control of effectors
BAT, WAT,
Muscle, Pancreas
Liver, GI-tract, Vasculature
ARC
ARC
NPY/AGRP
GABA
POMC/CART
Galanin
Neurotensin
Leptin
Retina (visual)
Circadian input
BBB
BRAINSTEM&SPINAL CORD
DRN-Serotonin
NTS-GLP-1/GLP-2
LPB-CCK
NA
Bombesin
Glucocorticoids,
Gonadal Steroids,
Thyroid Hormones
(Endocrine glands)
Interleukin 6
(Muscle)
Insulin,
Amylin
(Pancreas)
Leptin, Adiponectin,
TNFa, Interleukin 6
(Adipose tissue)
Taste
Vagal visceral
sensory input
Homeostatic input
Ghrelin, PYY, CCK,
GLP, GIP
(Stomach/Gut)

A

What is Sweet-Ease™? ▪Sweet-Ease™ is a 24% sucrose oral solution used to decrease pain during painful or stressful procedures. Research has shown significant decreases in crying, grimacing, heart rate and pain relief following the administration of sucrose prior to painful/stressful procedures. ▪Sweet-Ease™ is intended for oral use only. There is no evidence of benefit when administered through NG tube. How does sucrose help relieve pain? Although not fully understood, the mechanism of action of sucrose is thought to involve the activation of the endogenous opioid system through taste. It is the patient's detection of the sweet taste, not the volume that produces the analgesic effect. When is it appropriate for use? ▪Sucrose is to be used for relief of pain during minor procedures such as, but not limited to, heel stick or lance, venipuncture, IV insertion, naso or orogastric tube placement, intramuscular or subcutaneous injections, arterial punctures, eye exams, bladder catheterization, dressing changes, tape removal, suturing, arterial blood draw, and nasal or endotracheal tube suctioning. ▪Use sucrose for additional pain relief in conjunction with other pharmacologic agents for procedures such as PICC or other line insertions, lumbar punctures, chest tube insertion/removal, circumcision block, and cut-down procedures. ▪Patient must be at least 32 weeks corrected gestational age. Use in patients greater than 6 months postconceptual age must be evaluated for effectiveness. What are contraindications for use of sucrose? ▪Prematurity (less than 32 weeks corrected gestational age) ▪Critical illness ▪Confirmed or suspected gastrointestinal pathology at high risk for necrotizing enterocolitis (may include premature infants), unrepaired cardiac lesions, history of asphyxia, feeding intolerance, lack of bowel sounds ▪Preoperative sedated patients. For patients NPO for OR, it should be cleared with the anesthesiologist before giving to patient. ▪Paralyzed infants ▪Infants sedated on an opioid and/or other sedative continuous infusions

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Drug withdrawal and hyperphagia: lessons from tobacco and other drugs.

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Abstract

'Globesity' is a descriptive term for the obesity epidemic now facing the U.S. and indeed, the world. Hyperphagia (i.e. overeating) can lead to metabolic syndrome which in turn can lead to Type 2 diabetes mellitus, heart disease, stroke and some cancers. The World Health Organization even states that more people die each year from the consequences of obesity than from hunger. Something must be done to stem the tsunami of obesity and its resultant medical complications. ***Our work and that of others suggests that new obesity treatments and anti-obesity medications should be based on those already successful in treating other addictions***. This paper looks at empirical evidence linking addictions to food and to drugs such as tobacco, alcohol, cannabis, amphetamines, and cocaine. Hypotheses are put forth as to why hyperphagia is so difficult to treat. Additionally, prenatal programming for addiction is explored. Lessons from successful drug treatment are elucidated and potential pharmaceutical targets for hyperphagia and obesity are suggested.