

Workshop

- Factors influencing food intake?
- How decrease food choice related morbidity/mortality
 - Modifiable behavioral traits?
 - Strength /weakness
 - Limits to success of interventions?
- Describe current research
- ID research gaps
- Prioritize research needs
- Cross-agency RFP/RFA document goal

Distillate

“Learning is more important for liking than taste...”

- Maternal influence on child behavior in food choice
 - Education and food choice
 - Unknown salt intake daily
 - Long term policy opportunity stealth lower NaCl intake via labeling campaign?
 - Target childhood obesity? Via nutrition policy?

Distillate

- **Biomarkers of food choice changes**
 - Dose-response & mechanism?
 - Phenotyping for food choice behaviors?
 - Genotyping (sensory receptors? predictors?)
 - Behavioral vs pharmacologic intervention
 - Addiction/disciplinary x-talk data sets (eg GWAS, target effectors)
 - New drugs to modulate dietary selection?
 - What is the nutritional importance of genetic variations? Value of GWAS studies & attributable risk? SNP importance?

Distillate

- Genetic modifiers of dietary choice
 - Examples
 - Adenosine A2A receptor, GLUT2, dopamine D2 receptor, TAS1R2 SNPS
 - Transgenic / knock-out animal models
- Gene-physiologic pathway dissection
 - Gene-dose effects & (inference v/ human SNP studies)
 - GWAS vs candidate gene approaches
 - Need = increased use of health endpoints in consideration of genotype-diet studies

Distillate

- Epigenome
 - Repertoire of imprinted genes in humans is not known
 - More susceptible to environmental influences vs genetic mutation based mechanisms
 - Fetal origins of adult disease susceptibility in mouse model (public health policies target maternal nutrition leverage?)
 - Food as drug
 - Responses due to imprinting dysregulation will be difficult to extrapolate between species (fund human studies instead?)

Distillate

Mechanism & Obesity

- Fructose utilization in fatty acid flux into tissue lipids contribution to obesity
- Denovo synthesis vs external sources
- Leptin & insulin resistance animal models
- SCD1 conditional knockouts
 - Tissues (eg liver) specific KO
 - High carbohydrate or fat diets & weight gain studies
- Carbohydrate induced lipogenesis
- Why/how gene expression modulated by diet?
- Oleic acid effect on gene methylation?

Distillate

“Taste is tops.”

Summary of Need

- Phenotypes or genotypes that are markers for dietary intake and/or differential risk of chronic conditions (susceptibility biomarker)
 - chemosensory-related genotypes
 - chemosensory phenotypes
 - preference phenotypes
- Consistent measures of phenotyping for multi-center clinical studies
- Measures that have utility, validity, and feasibility for epidemiological studies.
- Intervention studies that consider variation in taste and oral sensation
 - *“Flavor drives behavior.”*
 - *Learning is more important for liking than taste...*

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“OMICS” AND DIETARY BEHAVIORS

Kathleen Ellwood, Ph.D.
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Workshop
The Omics of Eating Behaviors
December 9, 2010

The genetics of eating behaviors and dietary choices

Louis Pérusse, Ph.D.



Département de médecine sociale et préventive
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Louis Perusse

Summary and conclusion

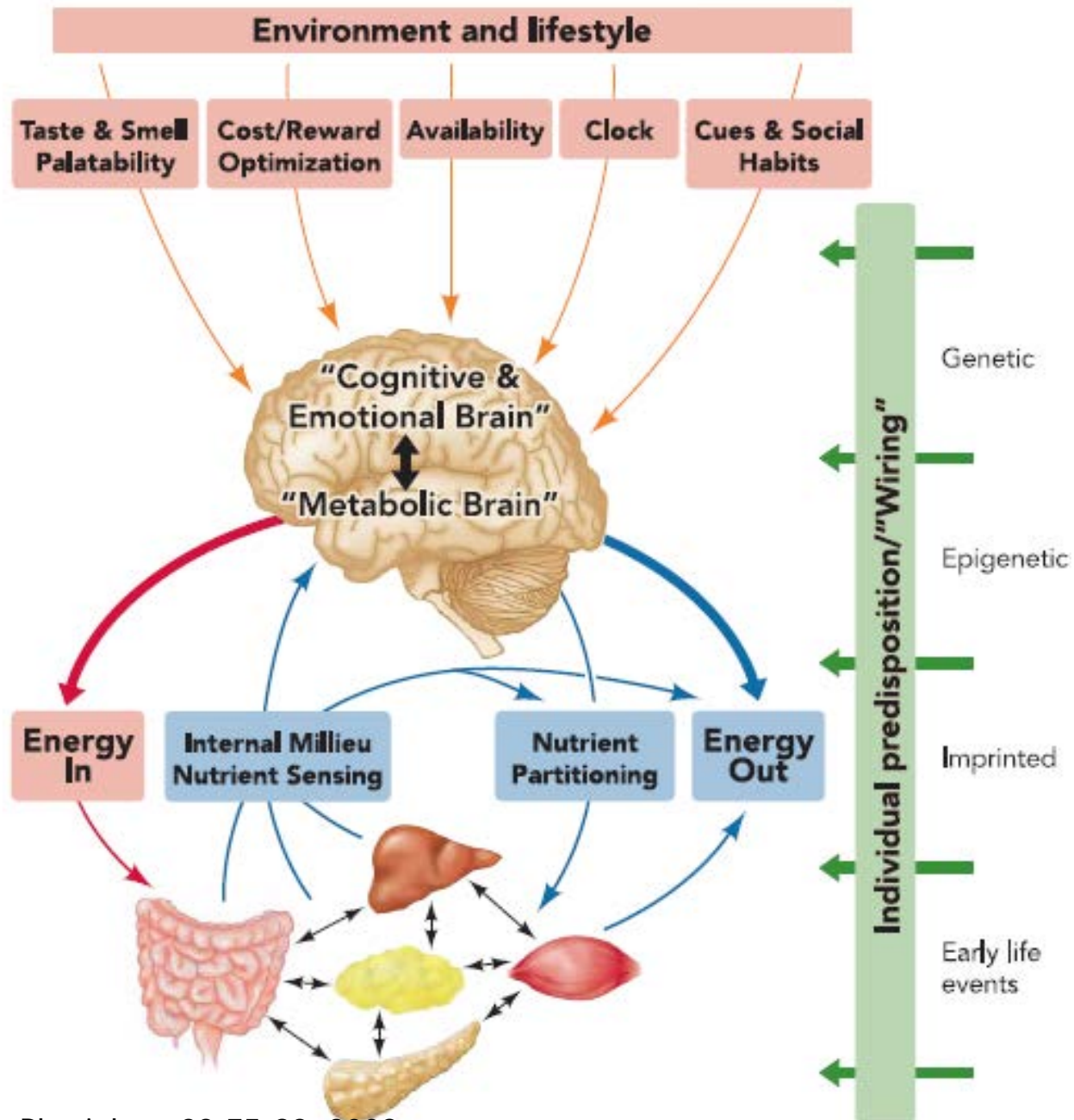
- Strong evidence of familial aggregation for total energy, macronutrient intakes, food choices and eating behaviors.
 - Stronger correlations between mothers and their children
- Several aspects of eating appears to be influenced by genetic factors
 - Heritability estimates are very heterogenous across studies and tend to be higher when derived from twin studies compared to family studies
 - Sex-differences: generally higher estimates for women
- Environmental factors are more important than genetic factors
 - Shared familial environment more important for children than adults
- Although specific genes have been associated with dietary intake and eating behaviors, relatively little is known about the genes influencing these traits.
 - Eating is a complex behavior, difficult to assess and under the influence of several systems/pathways.

Louis Perusse

- Genetic foundations of eating related behaviors
- Cultural vs genetic traditions
- Family vs twin studies, foster children
- Familial resemblance nutrient intake Framingham children's study
- **Mother's influence predominant on children food intake choices total energy and fat**
- Macronutrient intake (Quebec studies)
- Adopted children/offspring influences
- Family influence greater than genetic for some nutrients energy intake, but fat intake more 19% genetic influence
- Mother to daughter/mother child strongest influences?
- Heredity affects aspects of eating
 - energy intake & macronut. Twin studies:
 - eating patterns (factor analysis health vs high fat high salt, sugar)

Needs

- Better phenotyping tools for eating behaviors
- Biomarkers of eating behavior
- Influence of education?
- Food taste and smell factors (genetic) leading to food preference



Research needs identified

- Understanding salt taste reception and salt taste development throughout the lifespan.
 - Mechanisms of salt taste reception
 - Importance of childhood exposure
 - Develop innovative methods to reduce sodium in foods while maintaining palatability, physical properties and safety.
 - Enhance current understanding of factors that impact consumer awareness and behavior relative to sodium reduction.
 - Monitoring sodium intake and salt taste preference.
 - How can consumers know how much they are consuming?
 - Has the reduction in salt in the food supply reduced preference?
-

Beauchamp

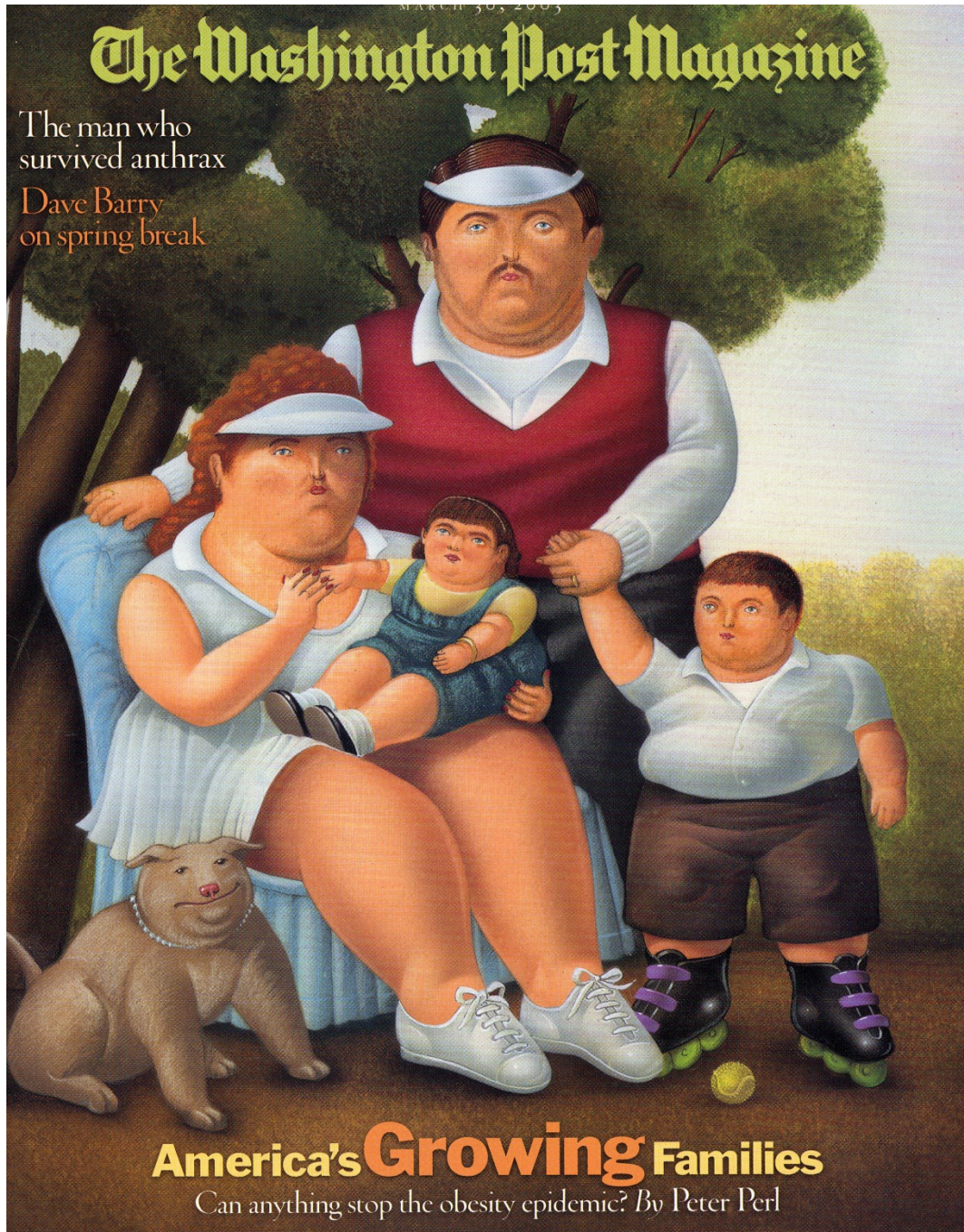
- Excess food intake and flavor
- Washington Post Magazine cover photo
- Flavor drives behavior
- Smells like....?
 - “Learning is more important for liking than taste”
 - Effects of experience
- Taste
 - Innate response but learning involved
 - 5 receptor classes
 - SALT no longer GRAS (if >50yrs?)
 - Novel compound salt-substitutes?
 - Enhancers?
 - Complex salt-taste mechanisms
 - Behavior changes?
 - Diminish preference for salty via long term small changes?
 - **Drug/food additives vs behavioral changes re salt intake via policy?**
 - TASTE throughout the body (eg taste cells in gut?)
 - Effect of artificial sweeteners on these? Pituitary gland etc?

MARCH 30, 2003

The Washington Post Magazine

The man who
survived anthrax

Dave Barry
on spring break



America's **Growing** Families

Can anything stop the obesity epidemic? By Peter Perl



Gene Polymorphisms and dietary preferences

Ahmed El-Sohely

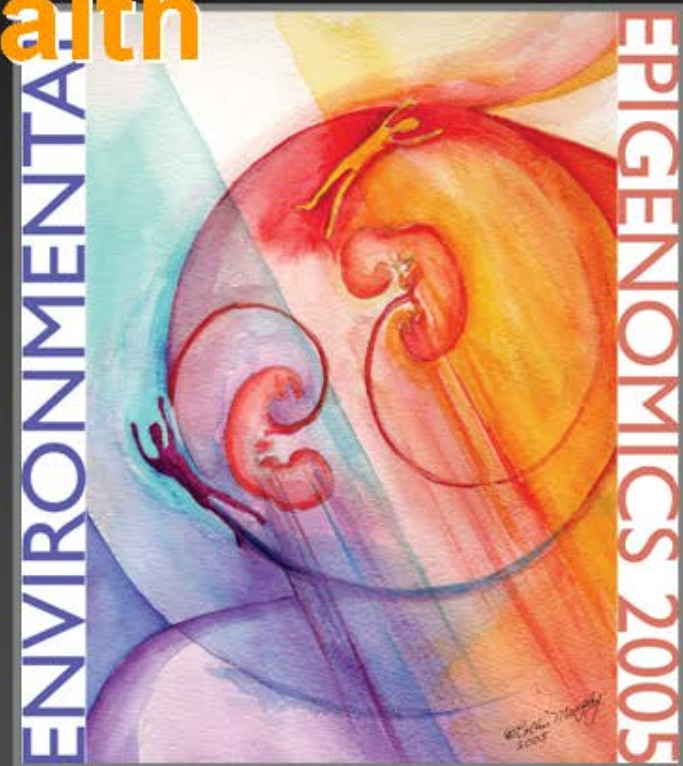
Department of Nutritional Sciences
University of Toronto

Ahmed El-Sohemy

- Nutrigenomics
- Diet-gene-food preference interactions
- GWAS vs Gene candidate studies
- Genotype-phenotype
 - Caffeine & smoking
 - cyp1A2 & adenosine A2A receptor
 - Glucose OGTT
 - GLUT2 & Thr110IIE SNP, diabetes T-2 assn.
 - Transgenic / knock-out animal models
 - Gene-physiologic pathway dissection

Epigenetics, Imprinting and Human Health

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Origins
Artist: Collin Murphy



Randy Jirtle

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Neo-Rosetta Stone



Artist: James Jirtle

Future Objectives

- Identify human imprinted genes and their epigenetically-controlled regulatory elements - *The Imprintome*.
- Determine the role of imprinting in human diseases and neurological disorders.

Gene Polymorphisms and Carbohydrate Diets

James M. Ntambi Ph.D



James Ntambi

Mechanism & Obesity

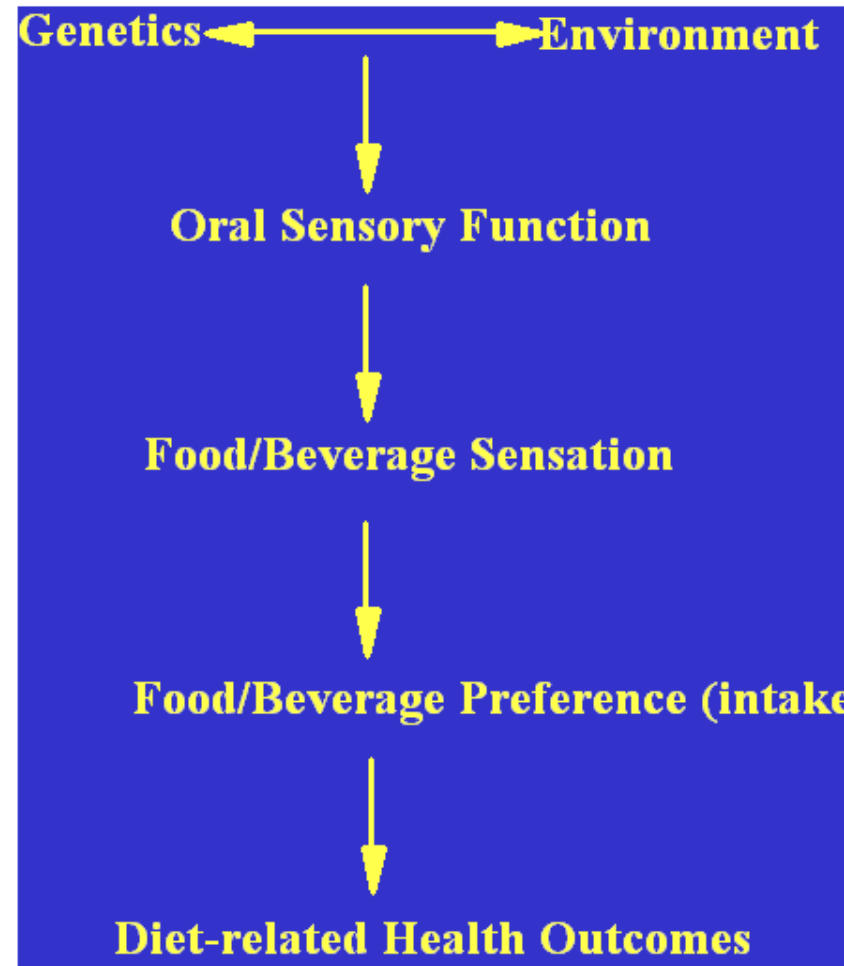
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Genetic Variations, “Taste” and Dietary Behaviors

Valerie B. Duffy

The Omics of Eating Behaviors:

December 9, 2010



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