Gene Polymorphisms and dietary preferences

Ahmed El-Sohemy

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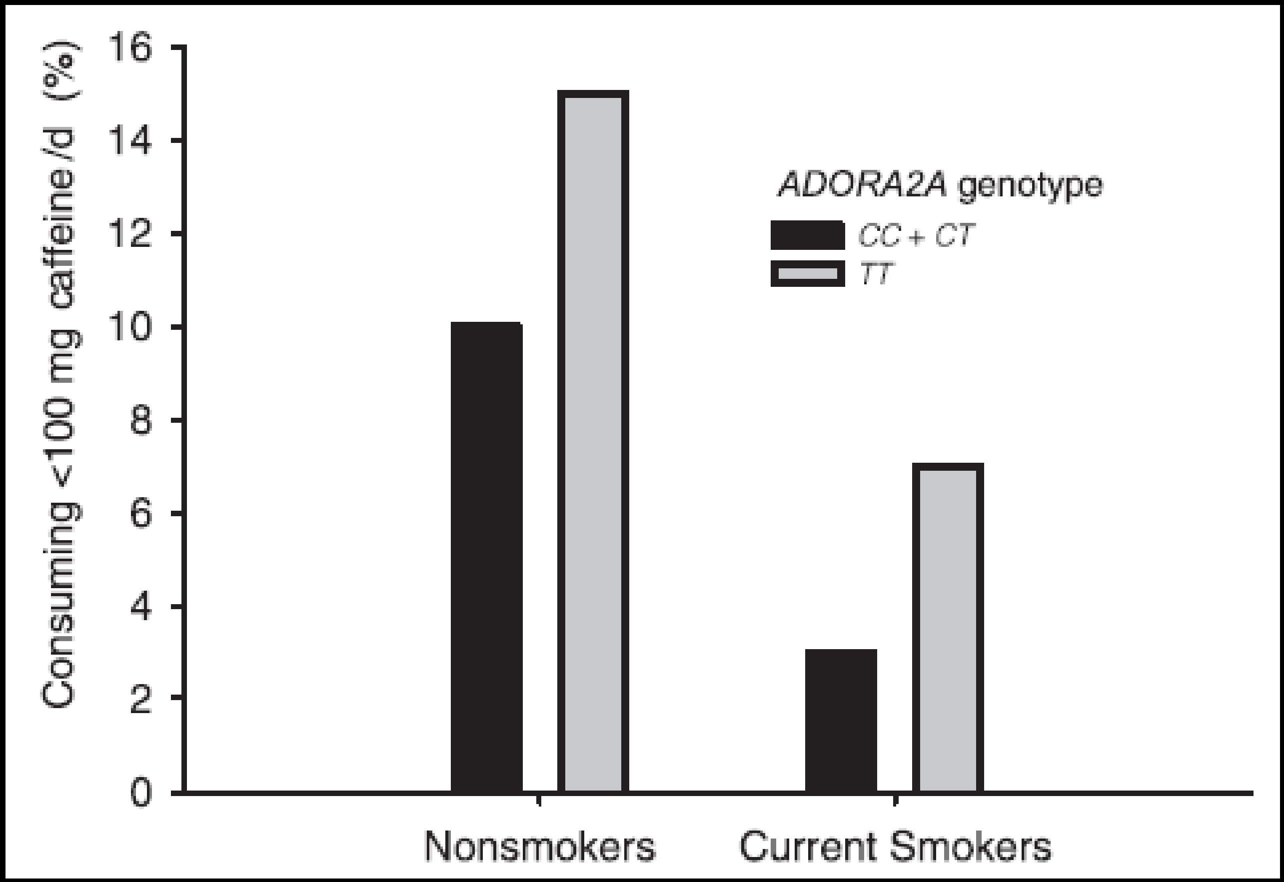
University of Toronto

Genetic polymorphism of the adenosine A_{2A} receptor is associated with habitual caffeine consumption[1−3]

Marilyn C Cornelis, Ahmed El-Sohemy, and Hannia Campos

Am J Clin Nutr 2007;86:240–4.



OBESITY PREVENTION

The Role of Brain and Society on Individual Behavior

Edited by
Laurette Dube, Antoine Bechara, Alain Dagher,
Adam Drewnowski, Jordan LeBel, Philip James,
and Rickey Y. Yada

CHAPTER

12

The Genetic Determinants of Ingestive Behavior: Sensory, Energy Homeostasis and Food Reward Aspects of Ingestive Behavior

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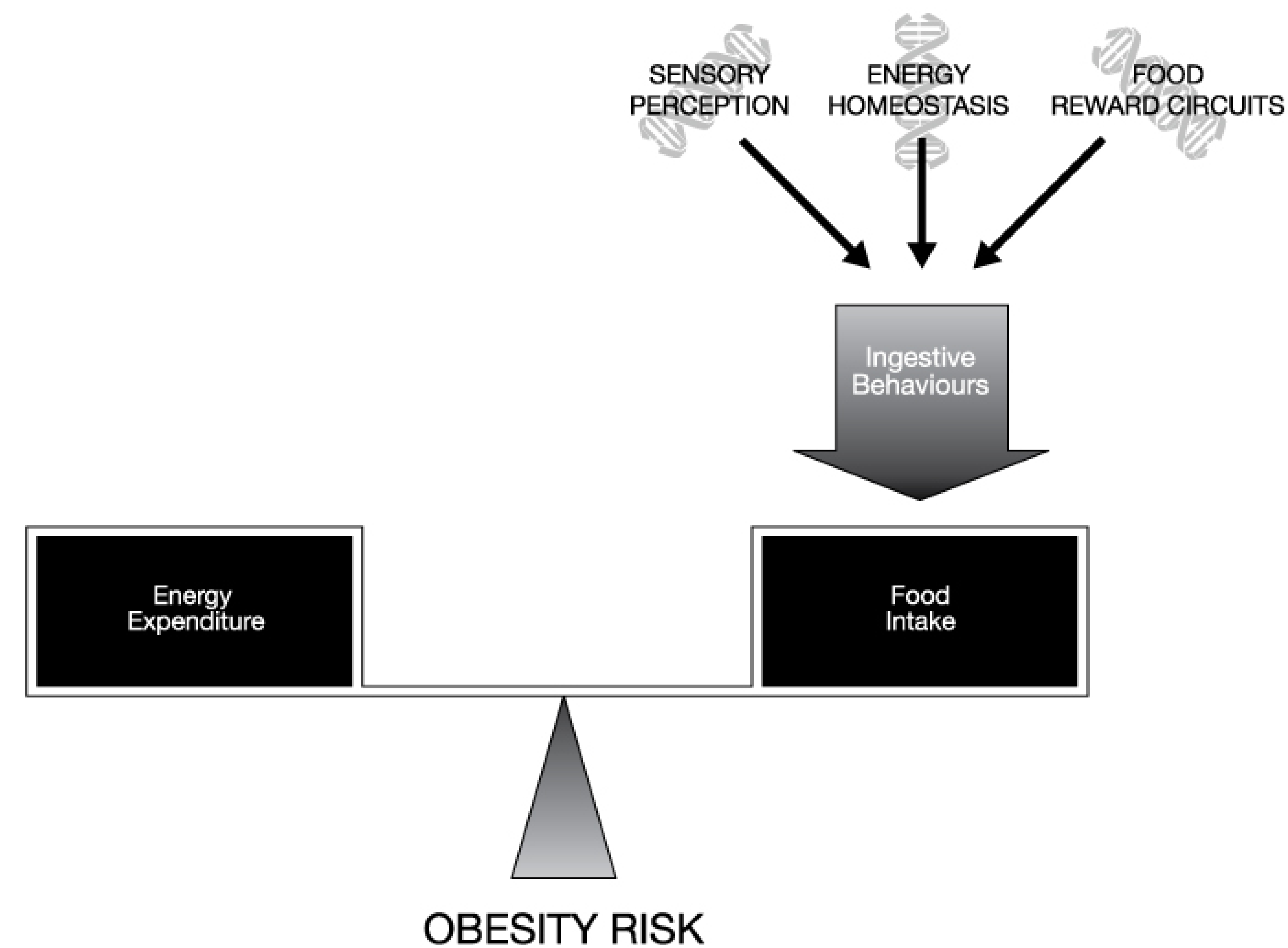
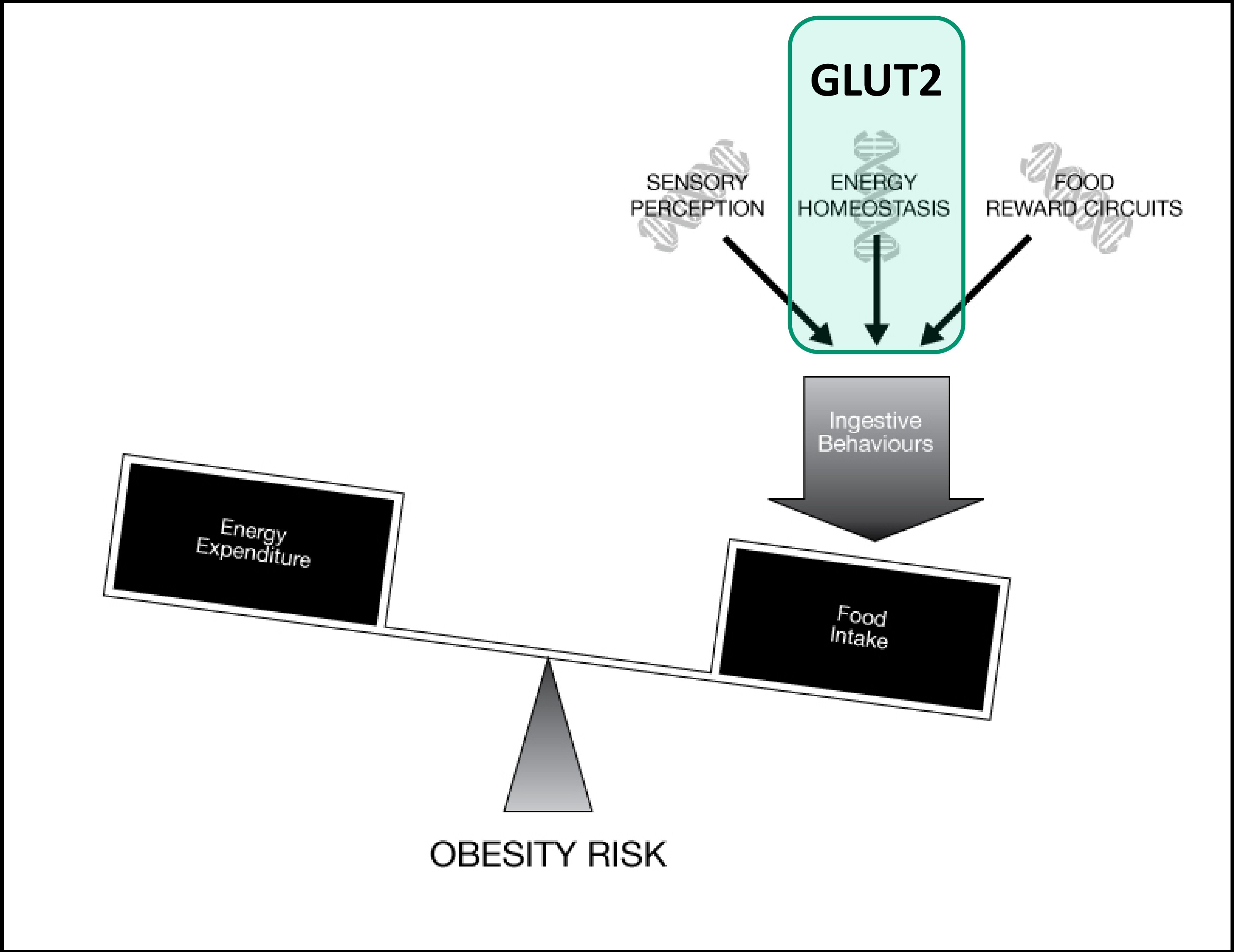
OUTLINE

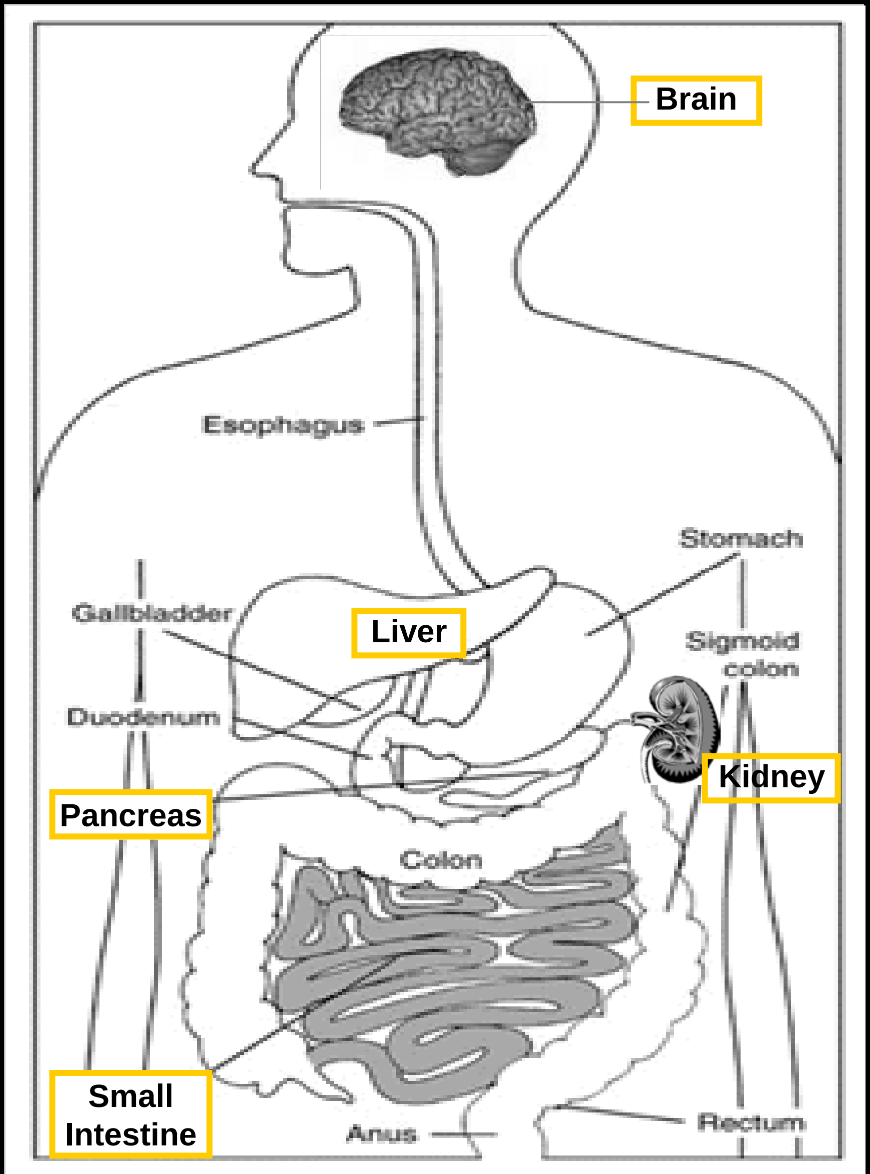


Eny and El-Sohemy, 2010



Eny and El-Sohemy, 2010

Glucose Transporter Type-2 (GLUT2)



Glucose Homeostasis

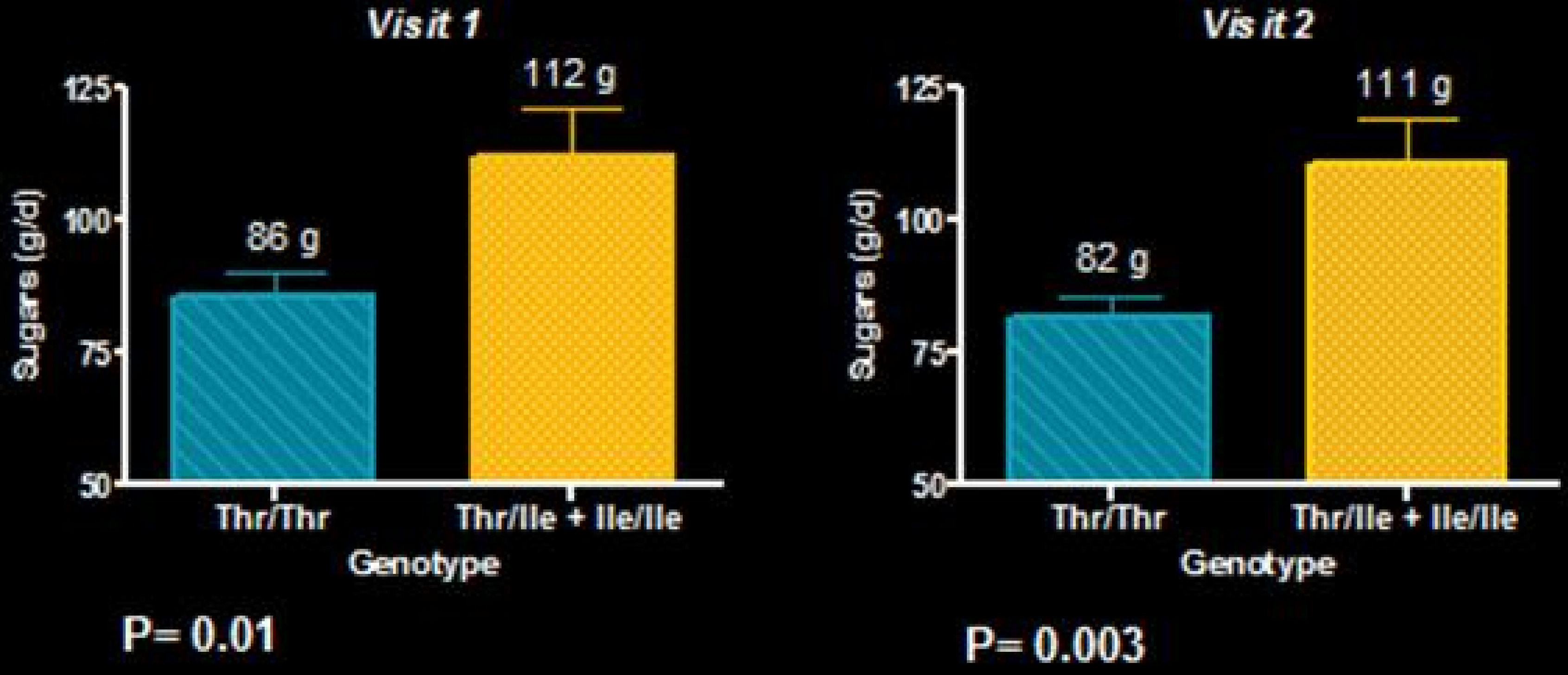
Thr 110 Ile

GLUT2 Protein

Study Population

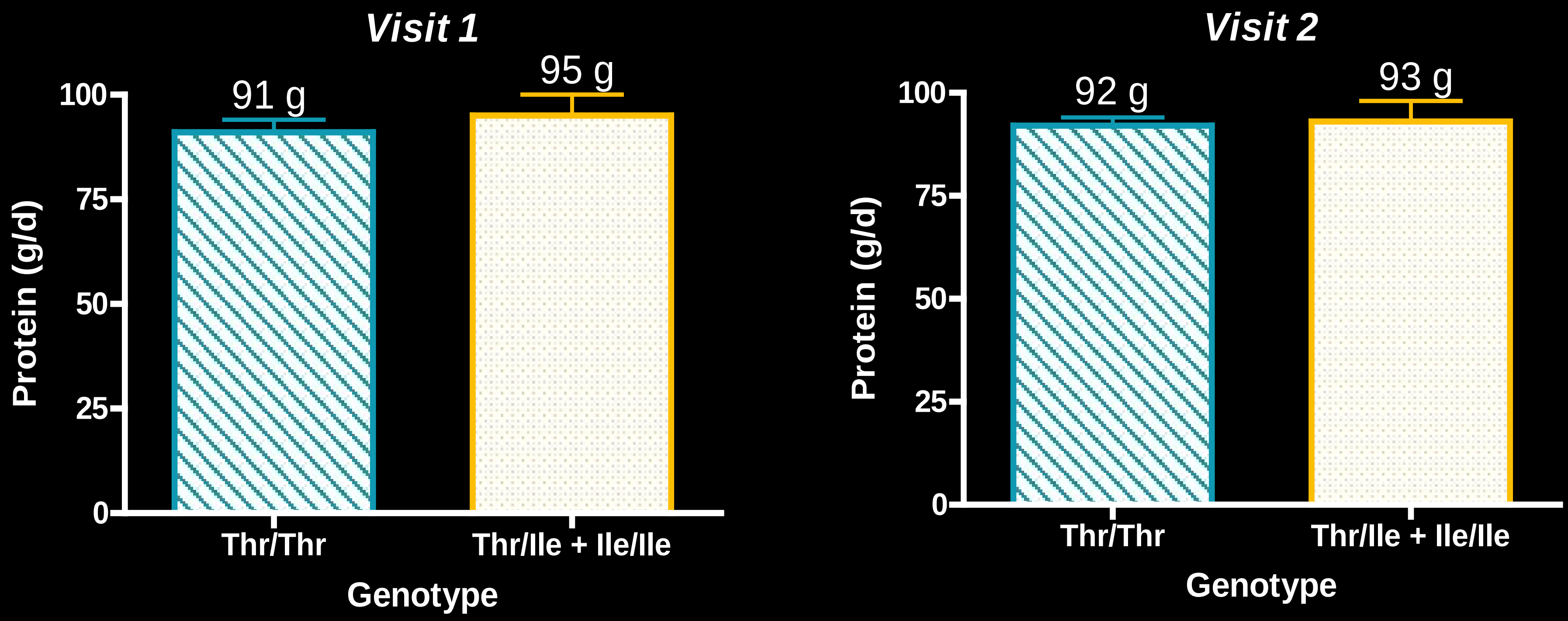
- 109 men and women (36-75 years)
- Overweight/obese with mild type 2 diabetes
- Diet: 3-day food records (repeated 2 weeks later)

Sugar



Eny *et al.*, *Physiol. Genomics*, 33:355-60, 2008

Protein



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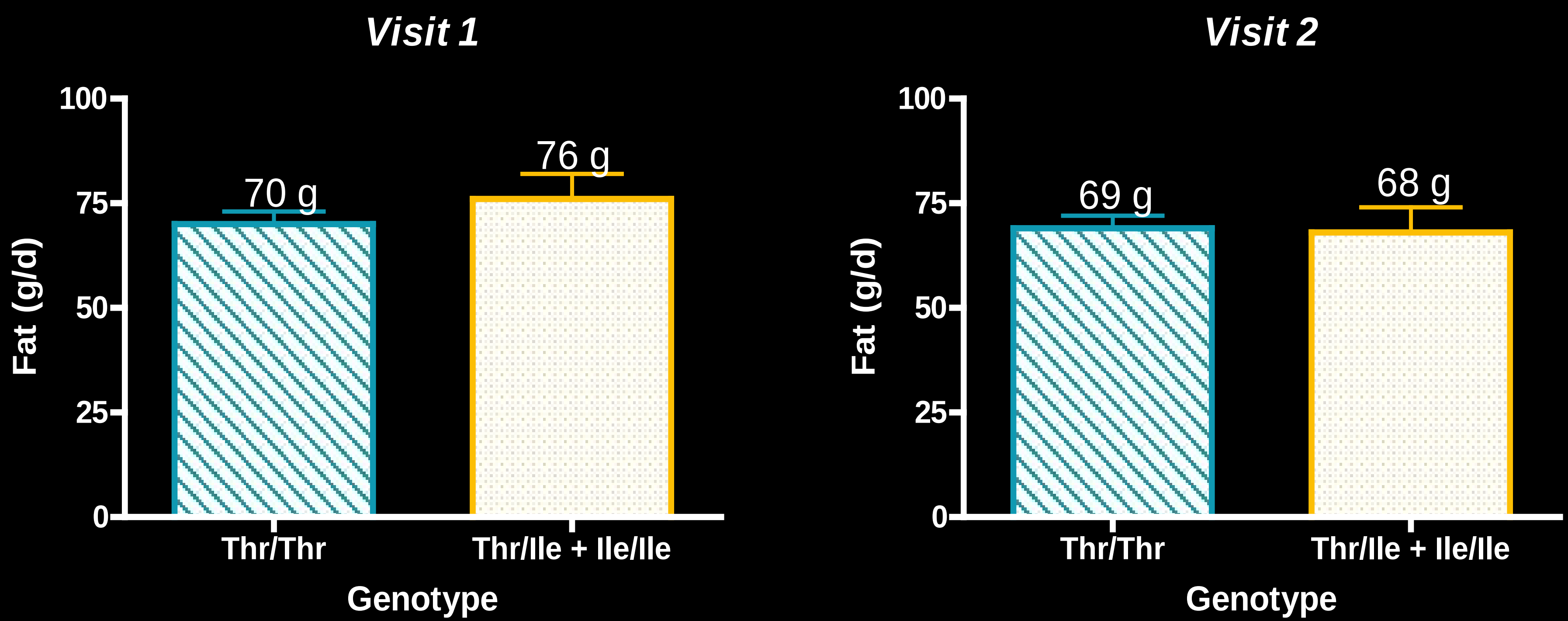
Eny *et al.*, *Physiol. Genomics*, 33:355-60, 2008

Fat



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P= 0.95

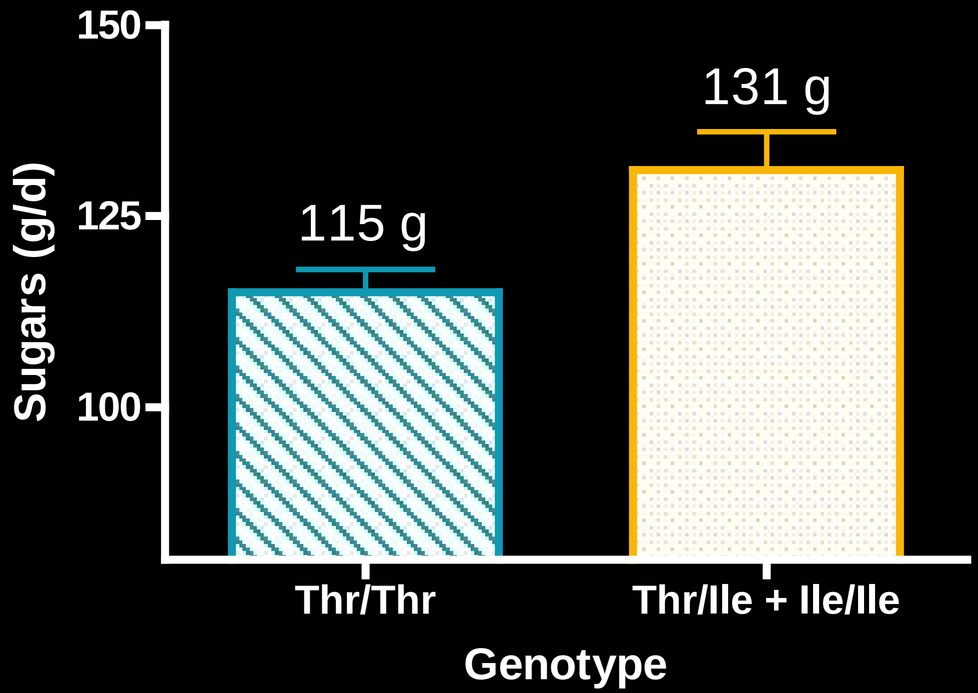
Eny *et al*., *Physiol. Genomics*, 33:355-60, 2008

Replication Study

- Population 1
  - 109 men and women (36-75 years)
  - Overweight/obese with mild type 2 diabetes
  - Diet: 3-day food records (repeated 2 weeks later)

- Population 2
  - 954 young men and women (20-29 years) (Toronto Nutrigenomics and Health Study)
  - Mostly lean and healthy
  - Diet: Food Frequency Questionnaire

Sugar



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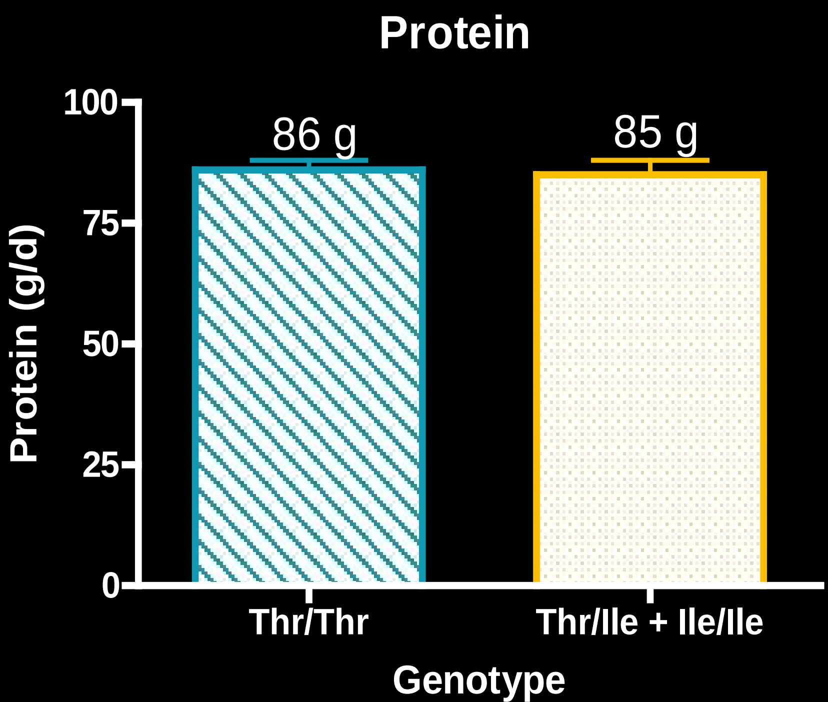
Eny *et al*., *Physiol. Genomics*, 33:355-60, 2008

Protein and Fat



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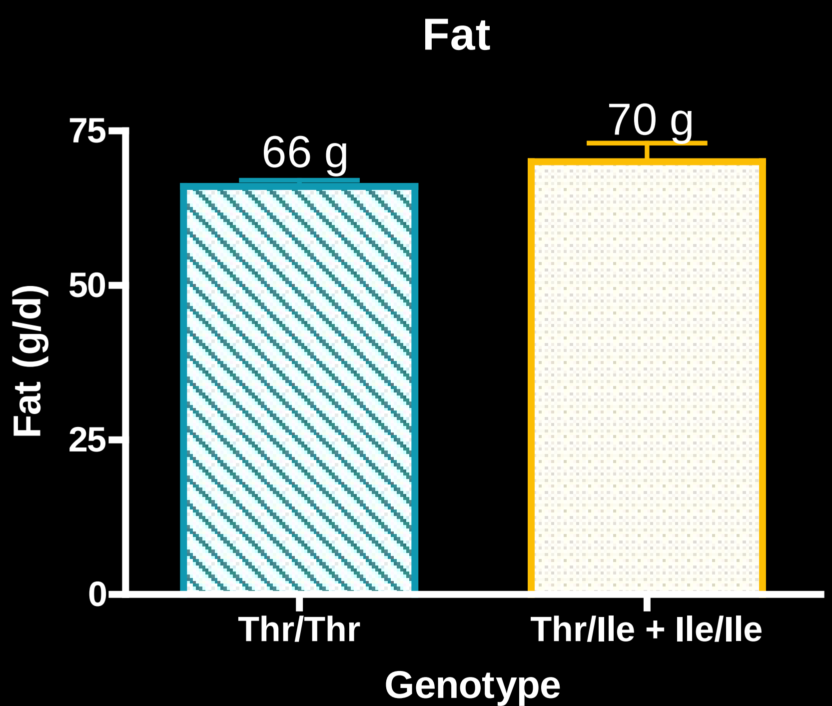

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Eny *et al*., *Physiol. Genomics*, 33:355-60, 2008

Physiol Genomics 33: 355–360, 2008.
First published March 18, 2008; doi:10.1152/physiolgenomics.00148.2007.

Genetic variant in the glucose transporter type 2 is associated with higher intakes of sugars in two distinct populations

Karen M. Eny,[1] Thomas M. S. Wolever,[1,2] Bénédicte Fontaine-Bisson,[1] and Ahmed El-Sohemy[1]
[1]*Department of Nutritional Sciences, University of Toronto; and* [2]*St. Michael's Hospital, Toronto, Canada*

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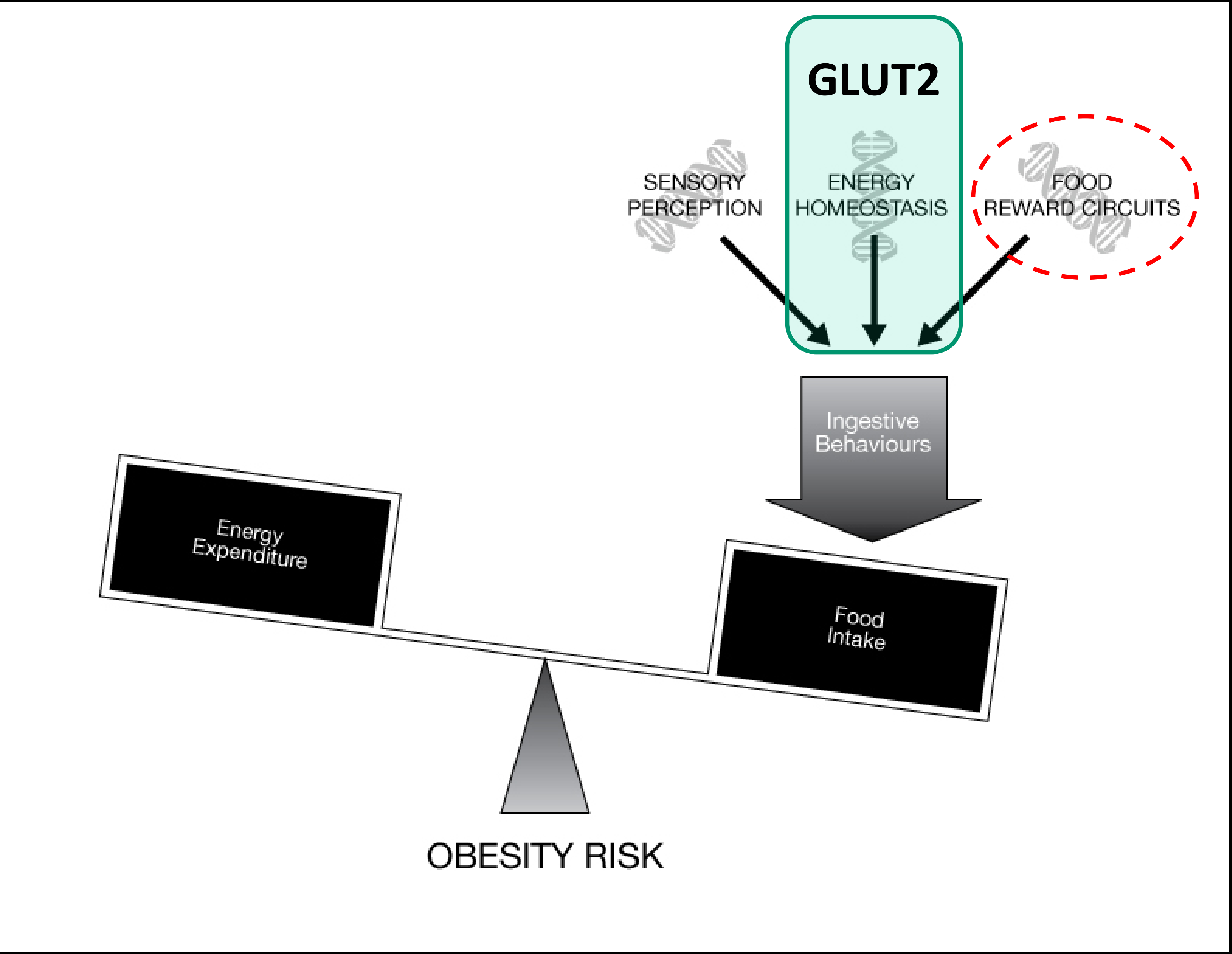
Eny *et al*., *Physiol. Genomics*, 33:355-60, 2008



Eny and El-Sohemy, 2010

Original Paper

Journal of Nutrigenetics and Nutrigenomics

J Nutrigenet Nutrigenomics 2009;2:235–242
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Dopamine D2 Receptor Genotype (C957T) and Habitual Consumption of Sugars in a Free-Living Population of Men and Women

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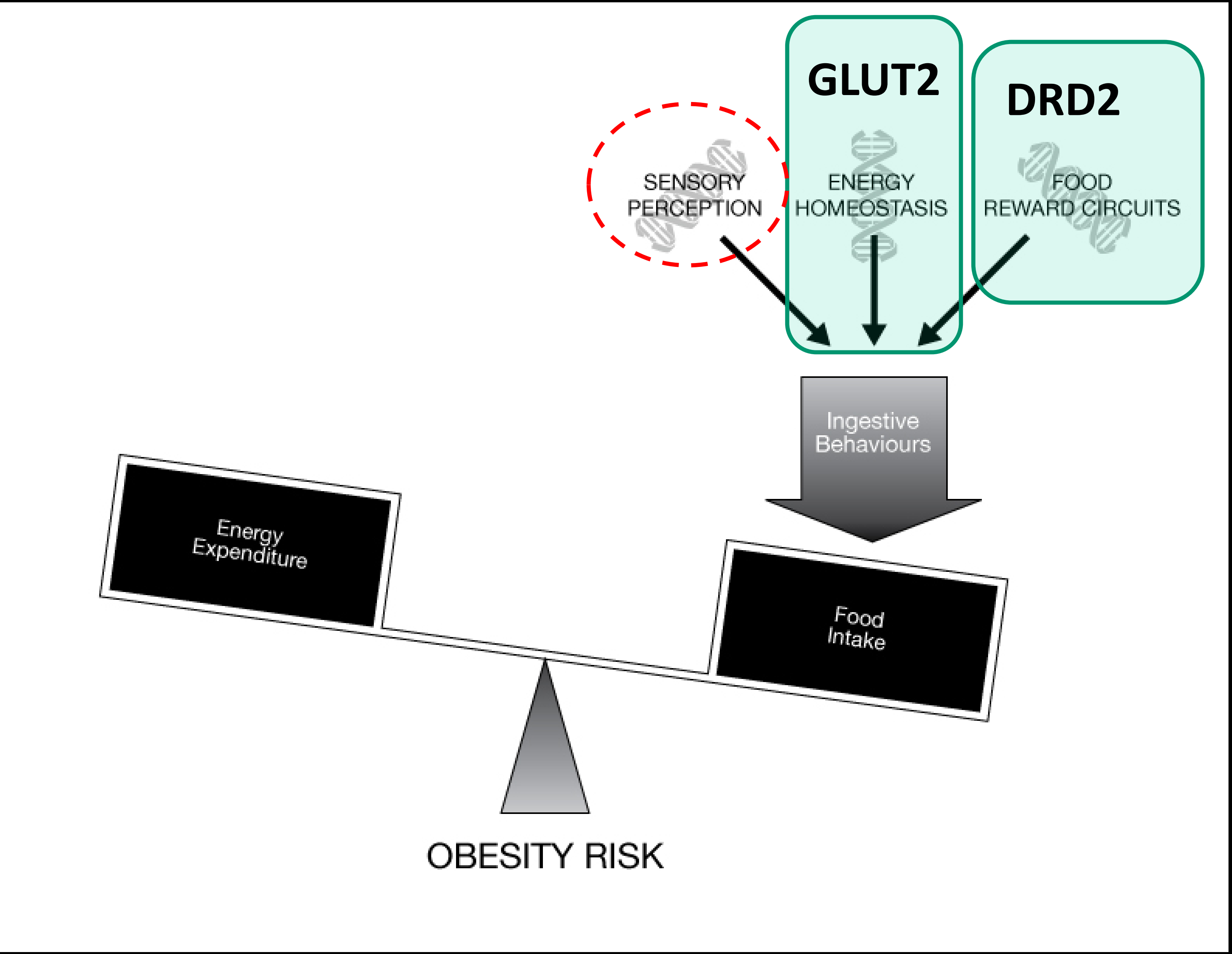
[a]Department of Nutritional Sciences and [b]Dalla Lana School of Public Health, University of Toronto, Toronto, Ont., Canada

Table 3. Macronutrient intake by DRD2 genotypes in men

	CC (n = 19)	CT (n = 50)	TT (n = 27)	Unbiased ANCOVA p value
Calories, kcal/day	2,242 ± 159	2,150 ± 101	1,988 ± 141	0.44
Protein, g/day	86 ± 9	89 ± 5	83 ± 8	0.71
Fat, g/day	71 ± 7	71 ± 4	69 ± 6	0.94
Total carbohydrate, g/day	304 ± 22	285 ± 14	258 ± 20	0.26
Fiber, g/day	22 ± 3	24 ± 2	24 ± 3	0.72
Available carbohydrate, g/day	282 ± 20	261 ± 13	234 ± 18	0.19
Starch, g/day	135 ± 11	135 ± 7	123 ± 10	0.53
Sugars, g/day	147 ± 13	126 ± 8	111 ± 12	0.11
Sucrose, g/day	60 ± 6[a]	48 ± 4[a, b]	39 ± 5[b]	0.03
Lactose, g/day	20 ± 3	18 ± 2	16 ± 3	0.46
Maltose, g/day	2.8 ± 0.3	2.7 ± 0.2	2.6 ± 0.3	0.87
Fructose, g/day	33 ± 4	29 ± 3	28 ± 3	0.69
Glucose, g/day	30 ± 3	28 ± 2	26 ± 3	0.51
Cholesterol, mg/day	278 ± 39	262 ± 25	244 ± 34	0.50
Alcohol, g/day	14 ± 3	10 ± 2	11 ± 2	0.93

Table 4. Macronutrient intake by DRD2 genotypes in women

	CC (n = 47)	CT (n = 124)	TT (n = 46)	Unbiased ANCOVA p value
Calories, kcal/day	1,889 ± 83	2,065 ± 53	1,954 ± 84	0.14
Protein, g/day	79 ± 4	83 ± 3	81 ± 4	0.66
Fat, g/day	64 ± 4	70 ± 2	67 ± 4	0.35
Total carbohydrate, g/day	245 ± 13	275 ± 8	256 ± 13	0.10
Fiber, g/day	24 ± 2	26 ± 1	26 ± 2	0.49
Available carbohydrate, g/day	222 ± 12	249 ± 8	230 ± 12	0.09
Starch, g/day	112 ± 6	115 ± 4	110 ± 6	0.80
Sugars, g/day	110 ± 8[a]	134 ± 5[b]	120 ± 8[a, b]	0.02
Sucrose, g/day	42 ± 4[a]	53 ± 2[b]	44 ± 4[a, b]	0.01
Lactose, g/day	18 ± 2	21 ± 1	19 ± 2	0.42
Maltose, g/day	2.0 ± 0.2	2.2 ± 0.1	2.2 ± 0.2	0.41
Fructose, g/day	25 ± 2[a]	30 ± 1[b]	28 ± 2[a, b]	0.04
Glucose, g/day	23 ± 2[a]	28 ± 1[b]	27 ± 2[a, b]	0.07
Cholesterol, mg/day	228 ± 16	223 ± 10	214 ± 16	0.80
Alcohol, g/day	7 ± 1	7 ± 1	5 ± 1	0.70



Eny and El-Sohemy, 2010

Genetic variation in *TAS1R2* (Ile191Val) is associated with consumption of sugars in overweight and obese individuals in 2 distinct populations[1–3]

Karen M Eny, Thomas MS Wolever, Paul N Corey, and Ahmed El-Sohemy

Am J Clin Nutr 2010;92:1501–10.

Carriers of the Val allele consume less sugar.

Genetic variation in *TAS1R2* (Ile191Val) is associated with consumption of sugars in overweight and obese individuals in 2 distinct populations[1–3]

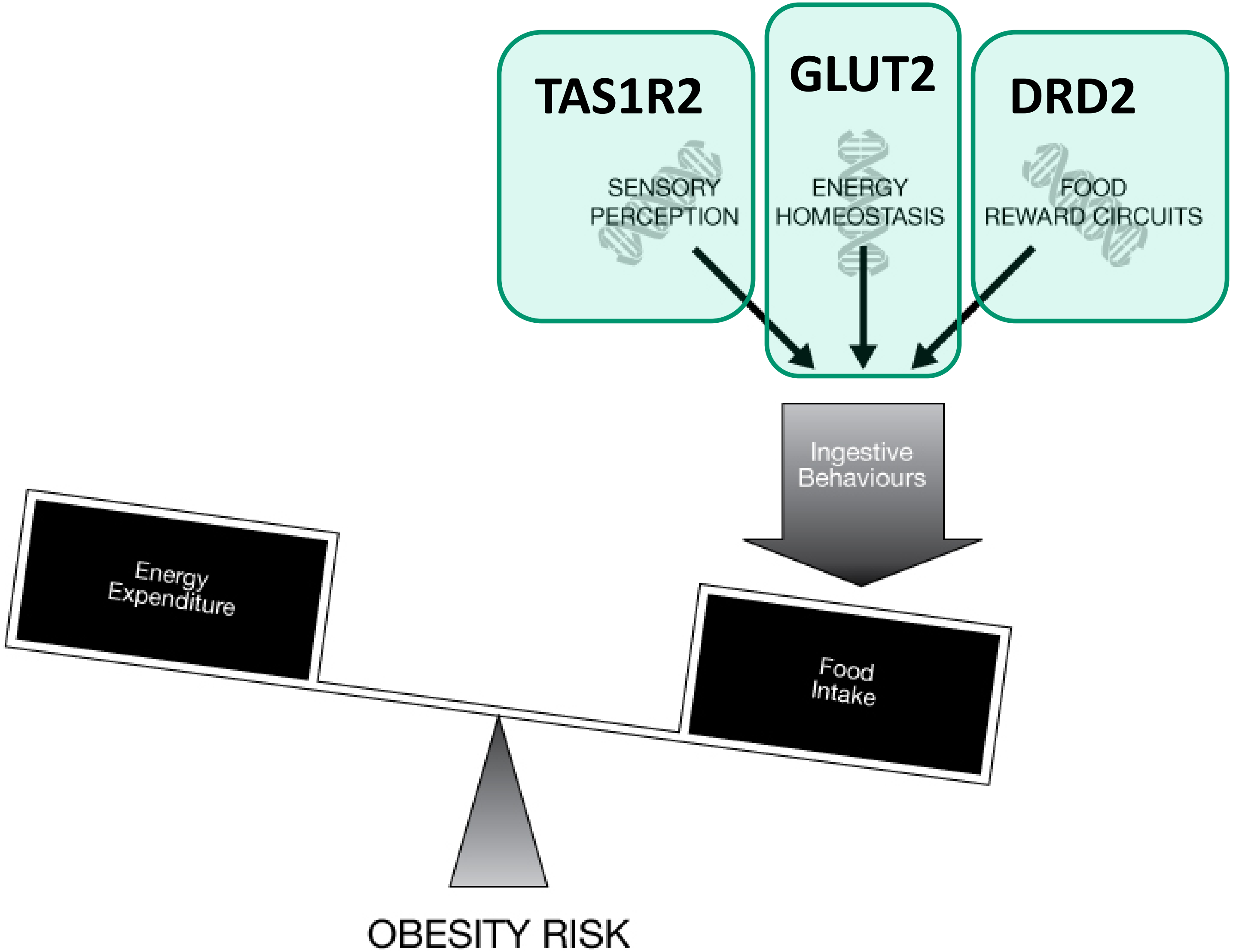
Karen M Eny, Thomas MS Wolever, Paul N Corey, and Ahmed El-Sohemy

Am J Clin Nutr 2010;92:1501–10.

TABLE 8
Diet changes between food records 1 and 2 by Ile191Val genotype in population 2[1]

	Ile/Ile (n = 47)		Val carriers (n = 53)	
	Mean ± SEM	*P*	Mean ± SEM	*P*
Energy (kcal/d)	41.73 ± 55.20	0.45	−69.25 ± 58.16	0.24
Protein (g/d)	3.56 ± 3.34	0.29	−2.17 ± 2.26	0.34
Fat (g/d)	0.65 ± 3.36	0.85	−5.71 ± 3.85	0.14
Total carbohydrates (g/d)	3.63 ± 7.63	0.64	0.49 ± 6.82	0.94
Fiber	1.63 ± 0.91	0.08	1.18 ± 0.99	0.24
Available carbohydrates	2.00 ± 7.20	0.78	−0.69 ± 6.35	0.91
Starch	−1.35 ± 4.30	0.75	8.37 ± 5.12	0.11
Sugars	3.35 ± 5.21	0.52	−9.07 ± 3.74	0.02
Cholesterol (mg/d)	23.27 ± 23.71	0.33	−20.04 ± 17.85	0.27
Alcohol (g/d)	1.59 ± 1.22	0.20	−0.85 ± 0.98	0.39

[1] All values are mean ± SEM changes. Paired *t* tests were used to measure the within-person change in nutrient consumption that occurred between food records 1 and 2. Population 2 consisted of older men and women with type 2 diabetes.



Eny and El-Sohemy, 2010

Sensory Evaluation

Subjects

- N =118
- Caucasian, Age 20-33, Non Smokers

Solutions

- NaCl, Sucrose, Citric Acid, PROP, FAs

Visit 1- Threshold Testing	**Visit 2-Supra-threshold Testing**
Method: 3 Alternative Forced Choice Staircase	Method : Scaling with the general Limited Magnitude Scale

Genome Wide Association Scans

Affymetrix 6.0 chip

- 906,000 SNPs
- 946,000 Copy Number Variation probes

Subjects

- n=550
- Caucasian

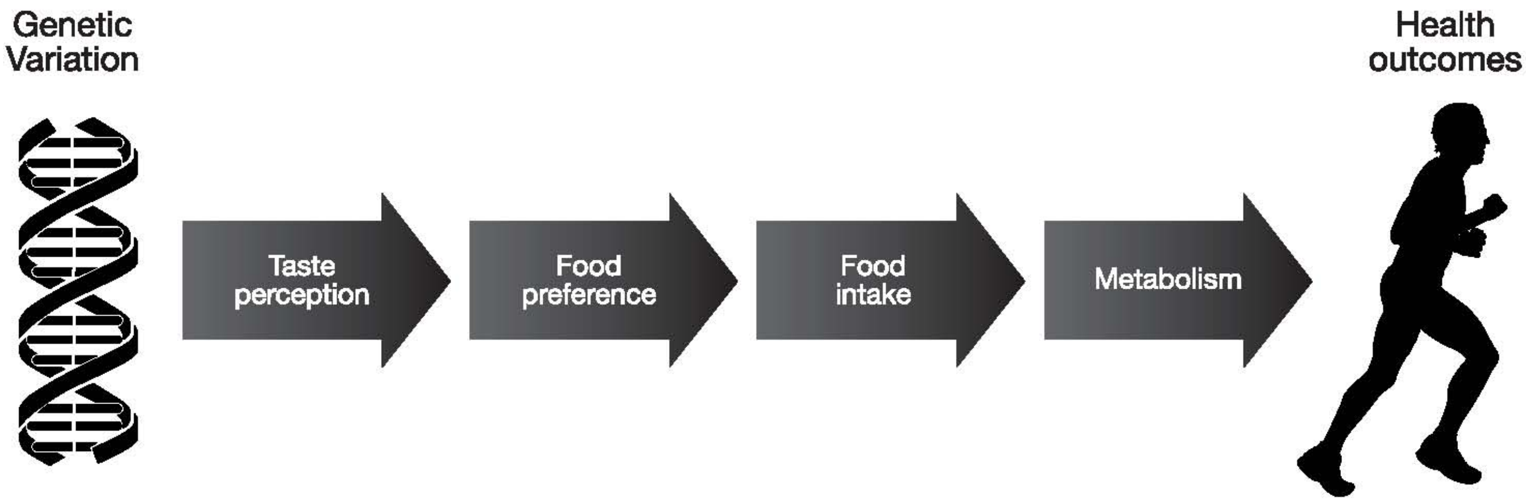
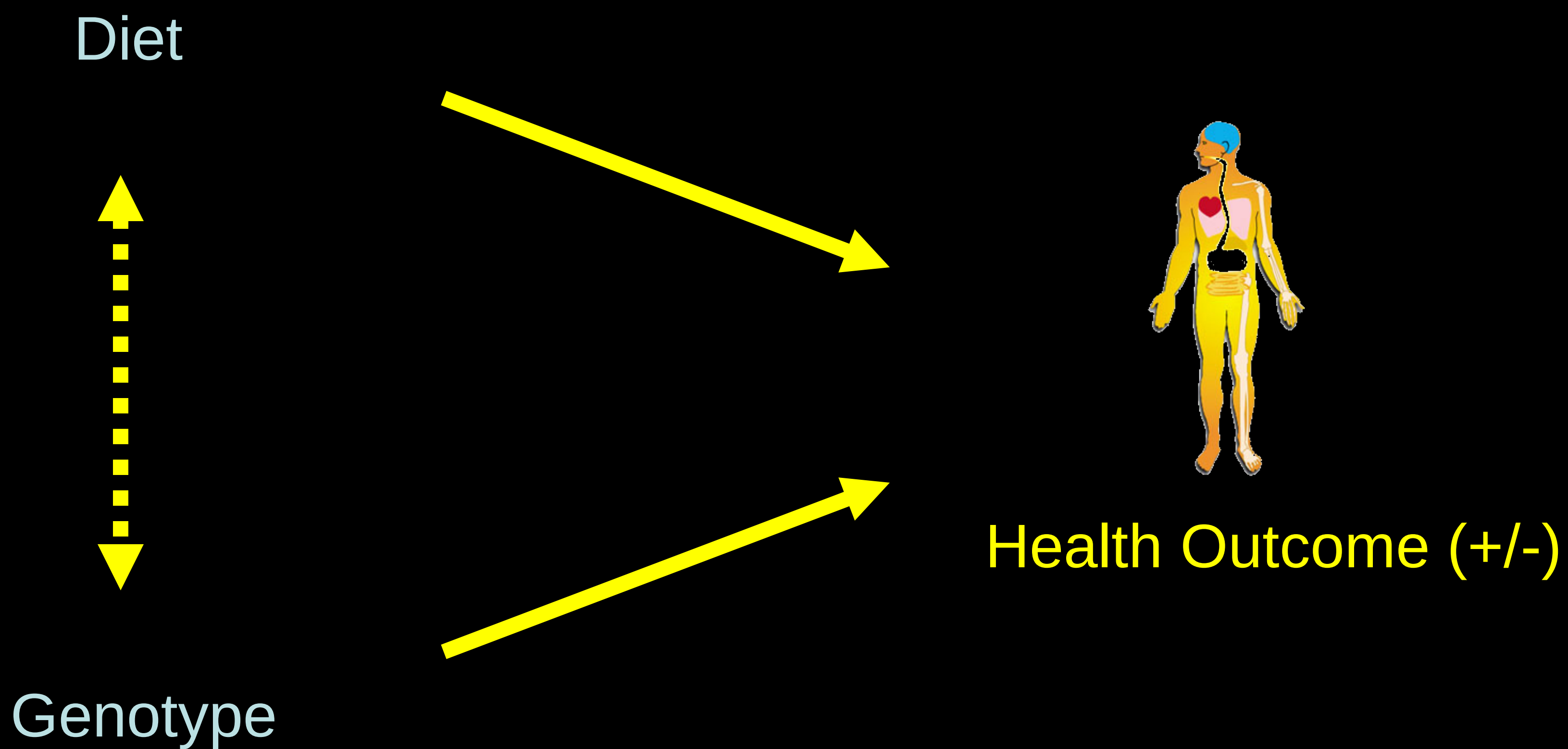


Figure 1

Garcia-Bailo *et al*., *OMICS*, 13:69-80, 2009

Implications



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