OMICS Group Conferences
Accelerating Scientific Discovery

Dr. Cristina Patassini

2° International Conference on Predictive, Preventive and Personalized Medicine and Molecular Diagnostics

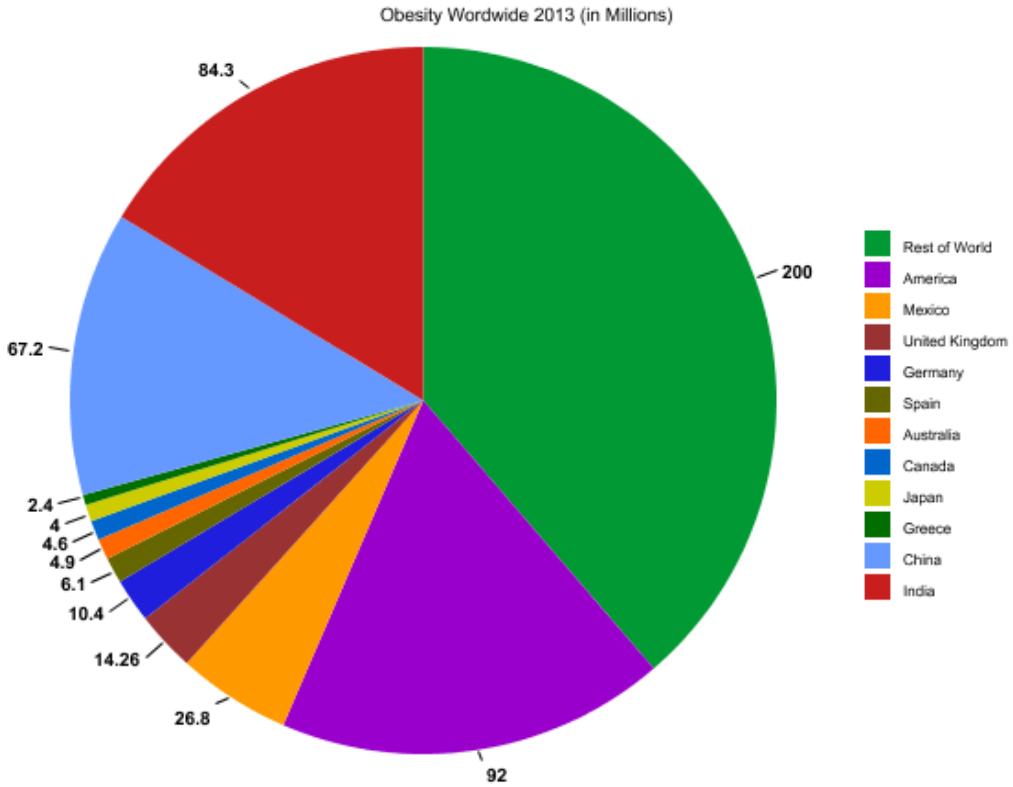
Las Vegas, 3-5 november 2014

Obesity worldwide

According to the World Health Organization (WHO):

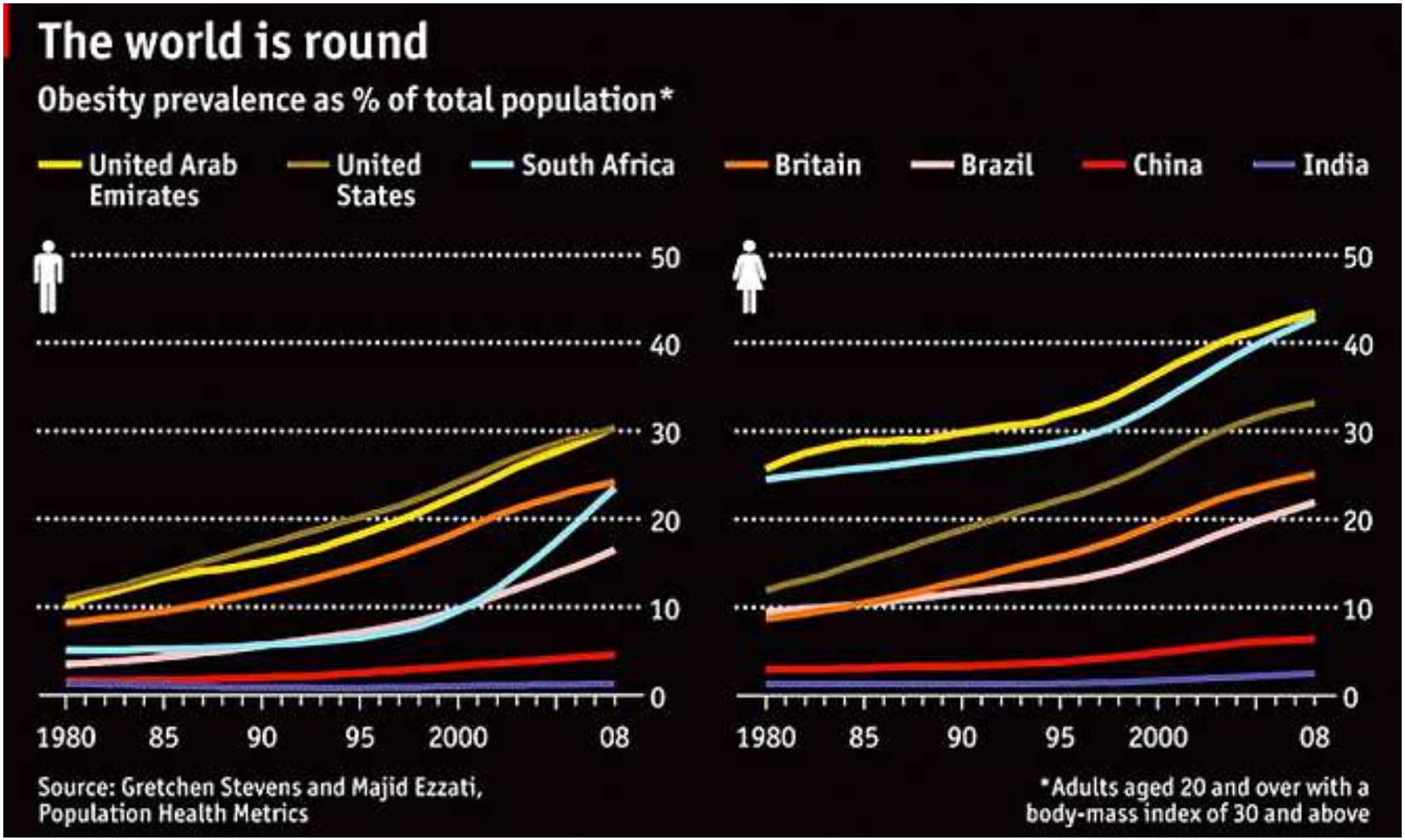
- Approximately **1.6 billion** adults (age 15+) are **overweight**
- More than **500 million** adults were **obese**
- At least **20 million children** under 5 years are **overweight**

The WHO also projected that by **2015**, approximately **2.3 billion adults** will be **overweight** and more than **700 million** will be **obese**.



Obesity worldwide

Increased of obesity in populations worldwide



Obesity-related health care

Obesity increased risk of

- type 2 diabetes
- Stroke
- coronary artery disease
- Hyperlipidaemia
- hypertension
- several cancers

Economic burden of obesity worldwide

- between 0.7% and 2.8% of a country's total healthcare expenditures.
- **U.S.**: obesity-related health care = about $200 billion
- **Europe**: obesity-related health care = more than $10 billion

(Muller-Riemenschneider et al., 2008; Withrow et al., 2011)

Personalized Genetic Diet

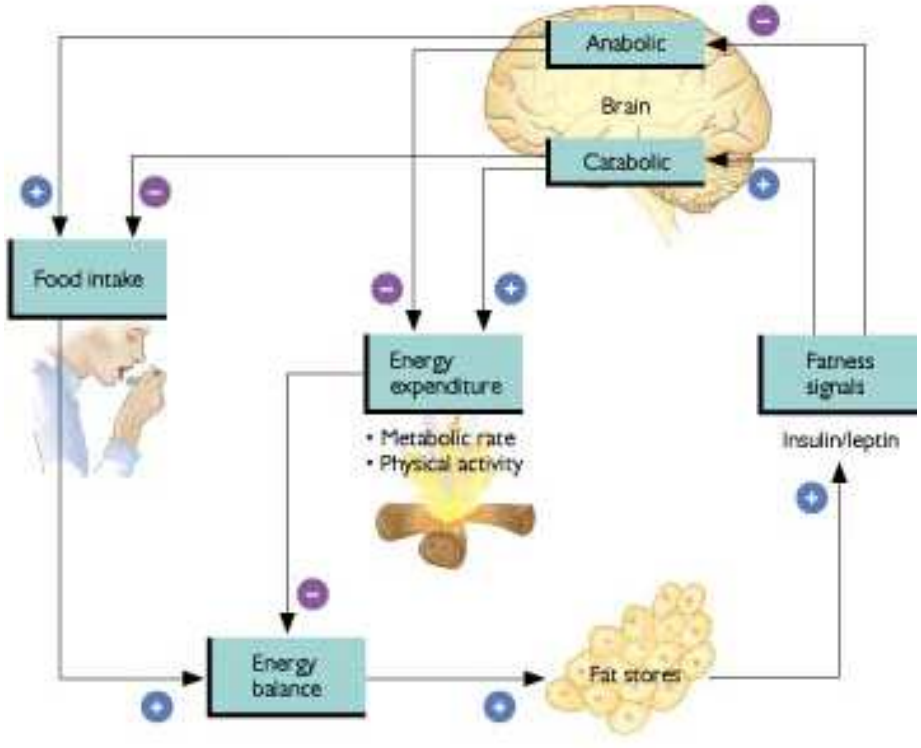
The ways in which we metabolize food, the modulation of the sense of hunger and the response of our body to physical activity are regulated by several environmental and genetic factors.

Personalization of diet and physical activity, based on genetic characteristics

Not a diet to lose weight in 6 months,
but learn how to eat better for life

DNA influences how we metabolize food…

Single Nucleotide Polymorphisms (SNPs) in several genes encoding for proteins involved in hypothalamic control of food intake, energy balance and lipid metabolism have been associated with common (non-Mendelian) obesity.



LABORATORIO GENETYX ANALISI MOLECOLARI

PubMed

Dieta Naturale Ad-hoc

Sense of hunger

FTO
LEPR
DNMT3B

Am J Clin Nutr. 2009 Nov;90(5):1426-32. doi: 10.3945/ajcn.2009.28053. Epub 2009 Sep 30.

Postprandial responses in hunger and satiety are associated with the rs9939609 single nucleotide polymorphism in FTO.

den Hoed M[1], Westerterp-Plantenga MS, Bouwman FG, Mariman EC, Westerterp KR.

Food Nutr Res. 2013 Apr 12;57. doi: 10.3402/fnr.v57i0.20028. Print 2013.

Genetic variation in the fat mass and obesity-associated gene (FTO) in association with food preferences in healthy adults.

Brunkwall L[1], Ericson U, Hellstrand S, Gullberg B, Orho-Melander M, Sonestedt E.

Br J Nutr. 2013 Sep 28;110(6):1151-6. doi: 10.1017/S0007114513000147. Epub 2013 Feb 22.

The impact of obesity-related SNP on appetite and energy intake.

Dougkas A[1], Yaqoob P, Givens DI, Reynolds CK, Minihane AM.

Saturated fatty acids metabolism

THRA

Int J Obes (Lond). 2013 Nov;37(11):1499-505. doi: 10.1038/ijo.2013.11. Epub 2013 Feb 12.

Thyroid hormone receptor alpha gene variants increase the risk of developing obesity and show gene-diet interactions.

Fernández-Real JM[1], Corella D, Goumidi L, Mercader JM, Valdés S, Rojo Martínez G, Ortega F, Martinez-Larrad MT, Gómez-Zumaquero JM, Salas-Salvadó J, Martinez González MA, Covas MI, Botas P, Delgado E, Cottel D, Ferrieres J, Amouyel P, Ricart W, Ros E, Meirhaeghe A, Serrano-Rios M, Soriguer F, Estruch R.

Physical activity

ADRB2

J Nutr. 2003 Aug;133(8):2549-54.

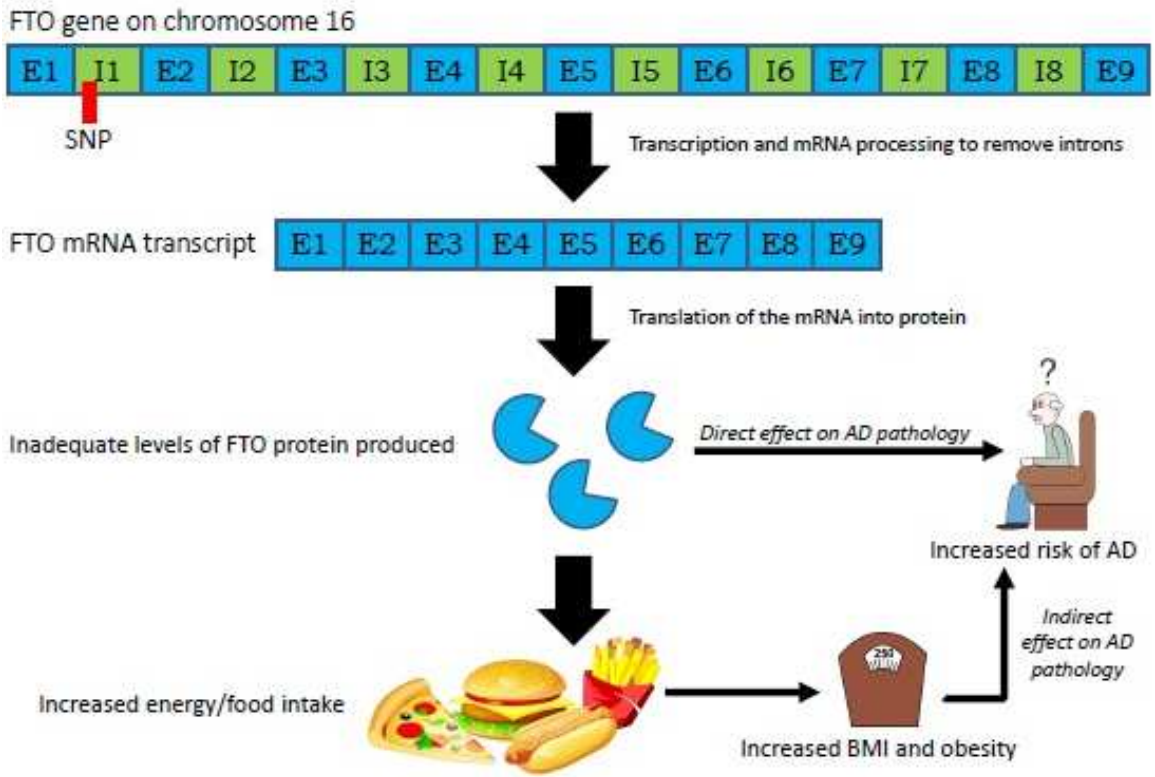
Obesity risk is associated with carbohydrate intake in women carrying the Gln27Glu beta2-adrenoceptor polymorphism.

Martínez JA[1], Corbalán MS, Sánchez-Villegas A, Forga L, Marti A, Martínez-González MA.

Sense of hunger

GENES	SNPs	MODEL	Mutated variants
FTO Fat mass- and obesity-associated gene	rs9939609 (g.53820527 T>A)	Dominant	TA/AA
LEPR Leptin Receptor gene	rs1137101 (c.668 A>G; Gln223Arg)	Dominant	AG/GG
DNMT3B DNA MethylTransferase 3B	rs992472 (g.31385269 A>C)	Recessive	CC

FTO



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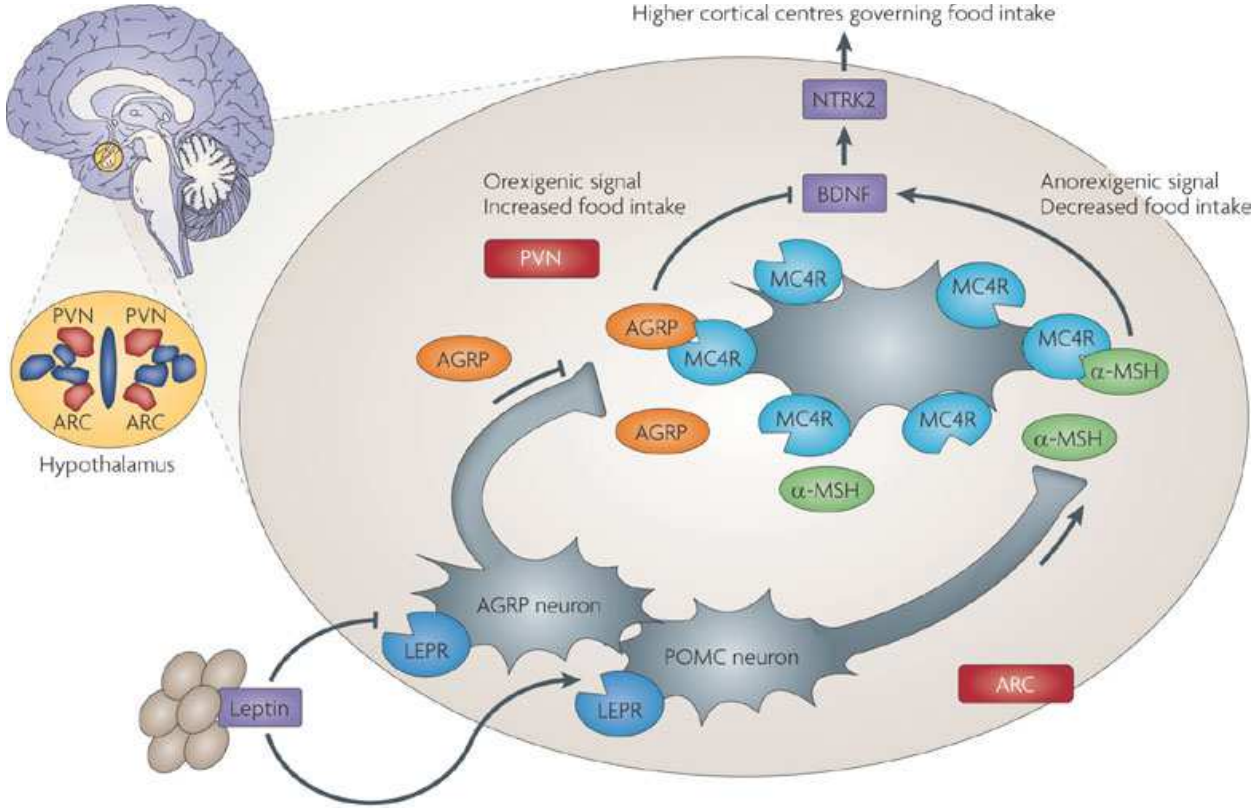
LEPR



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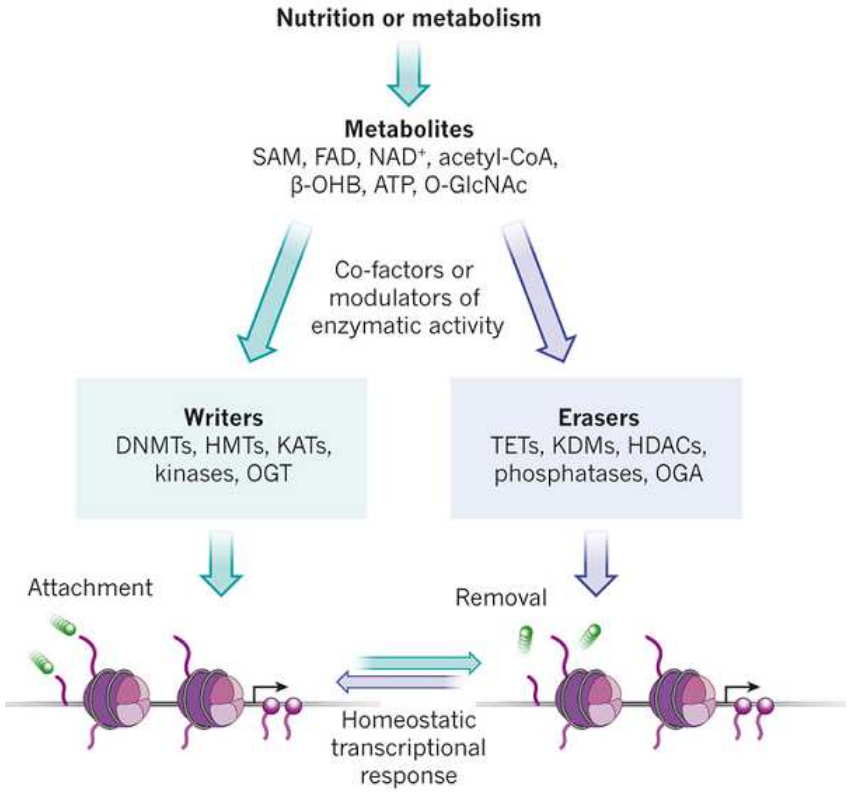
DNMT3B



Sense of hunger

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DNMT3B DNA MethylTransferase 3B	rs992472 (g.31385269 A>C)	Recessive	CC

Polymorphisms of these 3 genes have a synergistic action

The subjects carrying the mutated variants:

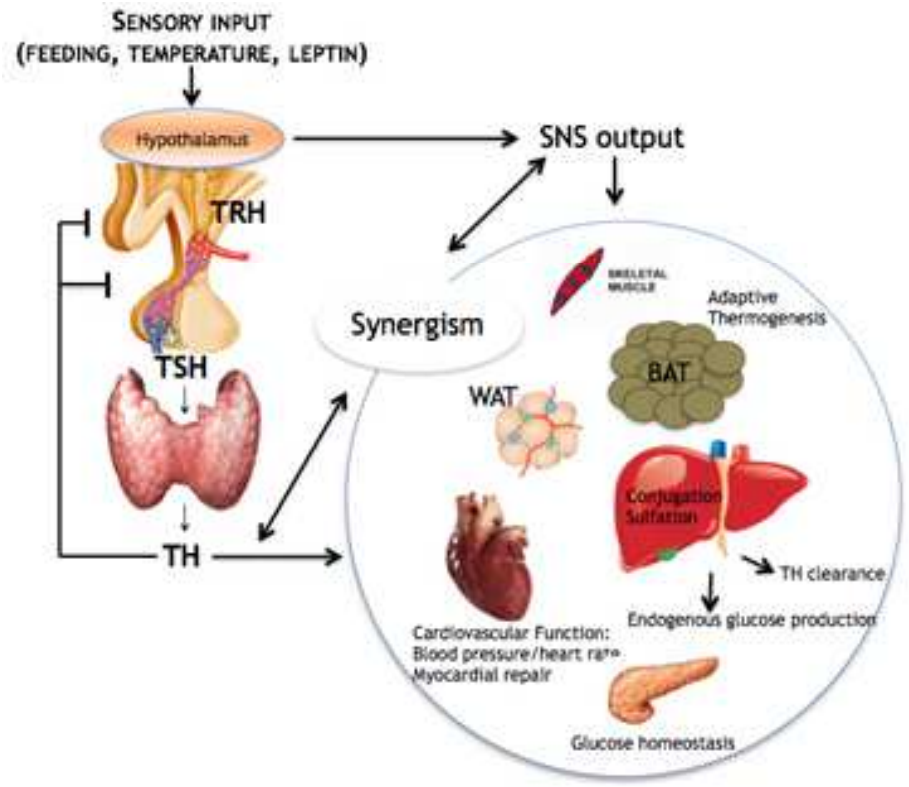
- have a more accentuated sense of hunger
- are less sensitive to sense of postprandial satiety
- consume more willingly biscuits, pastries, fruit, cereals, fatty meats, ice cream and cheese
- tend to eat between meals

All this leads to the early onset of obesity:
risk increased 6-8 times in the homozygous mutant of the 3 variants.

Saturated fatty acids metabolism

GENES	SNPs	MODEL	Mutated variants
THRA Thyroid Hormone Receptor, Alpha	rs1568400 (g.38221108; - 635 A>G)	Recessive	GG

THRA

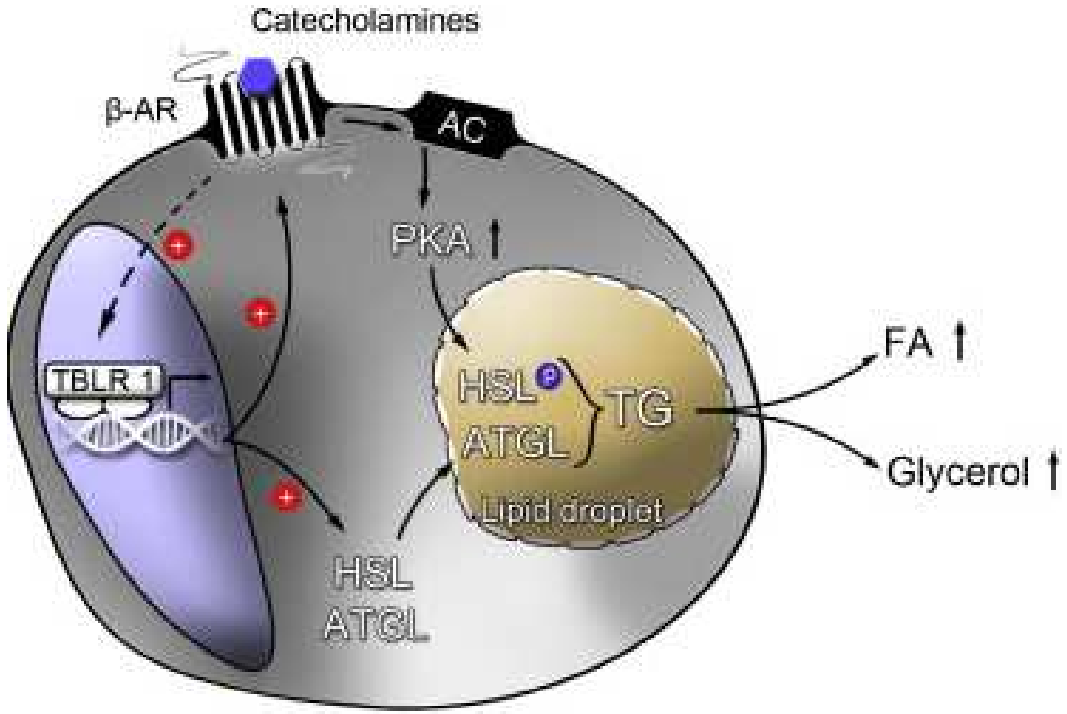


The subjects with the mutated variant and an high intake of saturated fat have a **threefold increased risk of developing obesity**.

Physical activity

GENES	SNPs	MODEL	Mutated variants
ADRB2 Beta-2-Adrenergic Receptor	rs1042714 (c.79 C>G; Gln27Glu)	Dominant	CG/GG

ADRB2



Physical activity

GENES	SNPs	MODEL	Mutated variants
ADRB2 Beta-2-Adrenergic Receptor	rs1042714 (c.79 C>G; Gln27Glu)	Dominant	CG/GG

The subjects carrying the mutated variant have a reduced weight loss after aerobic physical activity and are less able to use fat stores as a source of fuel after intense exercise.

Sport of toning and prolonged exercise

If the subjects do not perform regular physical activity, the diet will account the reduced ability to use fat stores.

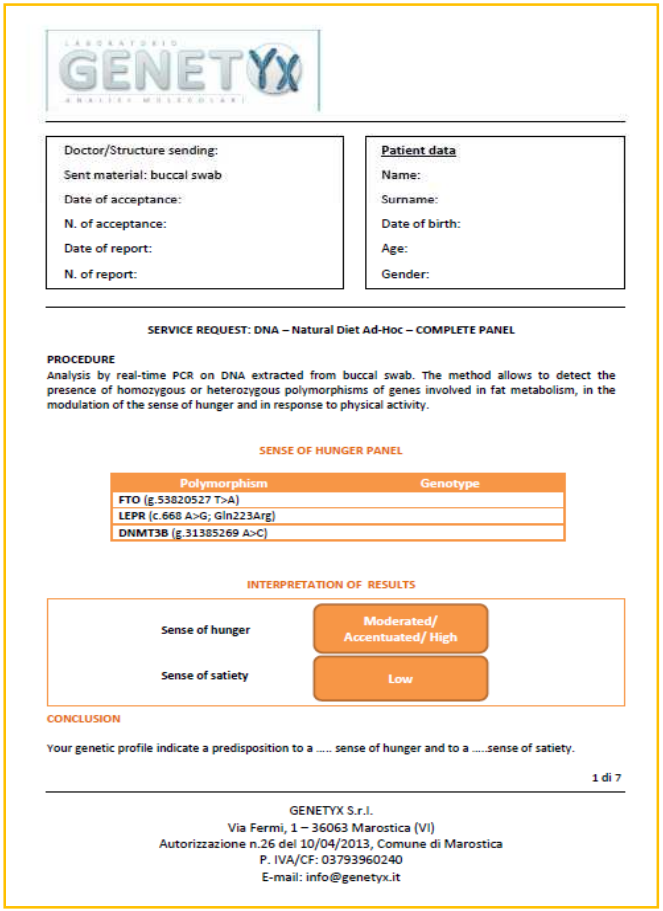
DNA is the Natural Diet Ad-Hoc

SAMPLING AT HOME

TNT

ANALYSIS BY GENOTYPING

SPECIALIST COUNSELING



Doctor/Structure sending:
Sent material: buccal swab
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Patient data
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Date of birth:
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SERVICE REQUEST: DNA – Natural Diet Ad-Hoc – COMPLETE PANEL

PROCEDURE
Analysis by real-time PCR on DNA extracted from buccal swab. The method allows to detect the presence of homozygous or heterozygous polymorphisms of genes involved in fat metabolism, in the modulation of the sense of hunger and in response to physical activity.

SENSE OF HUNGER PANEL

Polymorphism	Genotype
FTO (g.53820527 T>A)	
LEPR (c.668 A>G; Gln223Arg)	
DNMT3B (g.31385269 A>C)	

INTERPRETATION OF RESULTS

Sense of hunger	Moderated/ Accentuated/ High
Sense of satiety	Low

CONCLUSION

Your genetic profile indicate a predisposition to a ..... sense of hunger and to a .....sense of satiety.

1 di 7

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Report

Dieta Naturale Ad-hoc

Doctor/Structure sending:	**Patient data**
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SENSE OF HUNGER PANEL

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FTO (g.53820527 T>A)	
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DNMT3B (g.31385269 A>C)	

INTERPRETATION OF RESULTS

Sense of hunger	Moderated/ Accentuated/ High
Sense of satiety	Low

CONCLUSION

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NUTRITIONAL ADVICE

Subjects carrying the mutated variants (FTO: A allele carri genotype) have a more pronounced sense of hunger and a These individuals consume more willingly biscuits, pastries, cheese. They also tend to eat between meals. All this leads times increased risk of developing obesity in the ho These people should be subjected to a diet that takes into ac meals throughout the day with increased protein concentrati

NOTES ABOUT THE SENSE OF HU

The ways in which we metabolize foods, the modulation of the body to physical activity are regulated by a number o Today it is possible to analyze some of the genes involved information for the proper setting of a diet and a personalized p

In the SENSE OF HUNGER panel are analyzed polymorphisms of

FTO (Fat mass- and obesity-associated gene)

Chromosomal localization: 16q12.2

The FTO gene encodes a protein expressed in the hypotha regulating hunger and in food intake.

LEPR (Leptin Receptor)

Chromosomal localization: 1p31.3

The LEPR gene encodes the leptin receptor, an adipocyte-speci adipose tissue through a direct effect on the hypothalamus, r and energy expenditure of the body.

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DNMT3B (DNA Methyltransferase 3B)

Chromosomal localization: 20q11.21

DNMT3B The gene encodes a protein present in many bodily tissues that modulates the status of DNA methylation, important for the regulation of food intake.

The polymorphisms of these three genes have a synergistic and play an important role in the sense of hunger and satiety.

Bibliography

- *Dougkas A. et al. The impact of obesity-related SNP on appetite and energy intake. Br J Nutr. 2013 Sep 28;110(6):1151-6.*
- *Den Hoed M. et al. Postprandial responses in hunger and satiety are associated with the rs9939609 single nucleotide polymorphism in FTO. Am J Clin Nutr. 2009 Nov;90(5):1426-32.*
- *Brunkwall L. Genetic variation in the fat mass and obesity-associated gene (FTO) in association with food preferences in healthy adults. Food Nutr Res. 2013 Apr 12;57.*

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SATURATED FAT PANEL

Polymorphism	Genotype
THRA (g.38221108; - 635 A>G)	

INTERPRETATION OF RESULTS

Risk of obesity	**High/Low**

CONCLUSION

Your genetic profile indicates a ..... risk of obesity in the event of a diet rich in saturated fats.

NUTRITIONAL ADVICE

Subjects carrying of the mutated variant (genotype GG) who consume high amounts of foods containing saturated fats (butter, margarine, chocolate, coconut, lamb, etc. ..) have a threefold risk of developing obesity. These people should be subjected to a diet that takes into account these characteristics, and in particular that have a low intake of foods containing saturated fats.

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NOTES ABOUT SATURATED FATS PANEL

The ways in which we metabolize the food, the modulation of the sense of hunger and the response of our body to physical activity are regulated by a number of environmental and genetic factors. Today it is possible to analyze some of the genes involved in these processes and to derive useful information for the proper setting of a diet and a personalized physical activity.

In the saturated fats panel is analyzed the polymorphism of THRA gene.

THRA (Thyroid Hormone Receptor, Alpha-1).
Chromosomal localization: 17q21.1
The gene THRA encodes the receptor for thyroid hormone, which regulates energy metabolism, thermogenesis, glucose and lipid metabolism, food intake and oxidation of fatty acids.

Bibliography

Fernandez-Real JM et al. Thyroid hormone receptor alpha gene variants increase the risk of developing obesity and show gene-diet interactions. Int J Obes (Lond). 2013 Nov;37(11):1499-505.

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PHYSICAL ACTIVITY PANEL

Polimorfism	Genotype
ADRB2 (c.79 C>G; Gln27Glu)	

INTERPRETATION OF RESULTS

Weight loss	Normal/ Low

CONCLUSION

Your genetic profile indicates a predisposition to a normal / reduced weight loss as a result of physical activity such as "cardio".

NUTRITIONAL ADVICE

Subjects carrying of the mutated variant (G allele carriers) lose weight difficultly as a result of physical activity such as "cardio" and are less able to burn fat stores after exercise. These people should be subjected to a fitness program that takes into account these characteristics, focusing in particular on toning exercises and sport with slow and prolonged physical effort.

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NOTES ABOUT PHYSICAL ACTIVITY PANEL

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In the physical activity panel is analyzed the polymorphism of the ADRB2 gene.

ADRB2 (Beta-2-Adrenergic Receptor)
Chromosomal localization: 5q32
The ADRB2 gene encodes for the beta2-adrenergic receptor, involved in the process of lipolysis in the development of obesity and hyperlipidemia, hyperinsulinemia and insulin resistance.

Bibliography

- *Martinez J.A. et al. Obesity risk is associated with carbohydrate intake in women carrying the Gln27Glu β_2-Adrenoreceptor polymorphism. J Nutr. 2003 Aug;133(8):2549-54.*

We recommend genetic counseling for the correct understanding of results.

The results need to be interpreted by professionals (nutritionist, dietician, personal trainer) to be properly used to define an adequate diet and a pattern of personal training.

Biologo analista
Dr.ssa Cristina Patassini

Direttore di Laboratorio
Dr. Antonio Capalbo

Note: Genes involved in the metabolism and in the catabolism of the human body are innumerable, so the partial analysis of some of them can't be considered completely exhaustive.

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Specialist counseling post test

Collaboration with **Webmedicine.it**: the specialist counseling are provided through video-conference from the comfort of home!

Specialist counseling:

- **Nutritionist** to prepare your personalized diet and fitness plan.

  Monthly follow-up.

- **Geneticist** to understand the meaning of your genetic variants.

Preliminary results

Mean age: 41

Mean BMI: **male 26.6** (30%) **overweight**
female 23.6 (70%)

Monthly average weight loss: 3.2 Kg

Compliance: 95% at 6 months

Customer satisfaction: 9.5/10

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www.dnadieta.it

www.webmedicine.it

THANKS FOR YOUR ATTENTION

''Genotype-environment interaction arise when the phenotipic response to lifestyle habits is modulated by the genotype of the individual''