



The effect of Nutrition and Physical activity on the Biochemical metabolic functions

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Emer Professor of Biochemistry

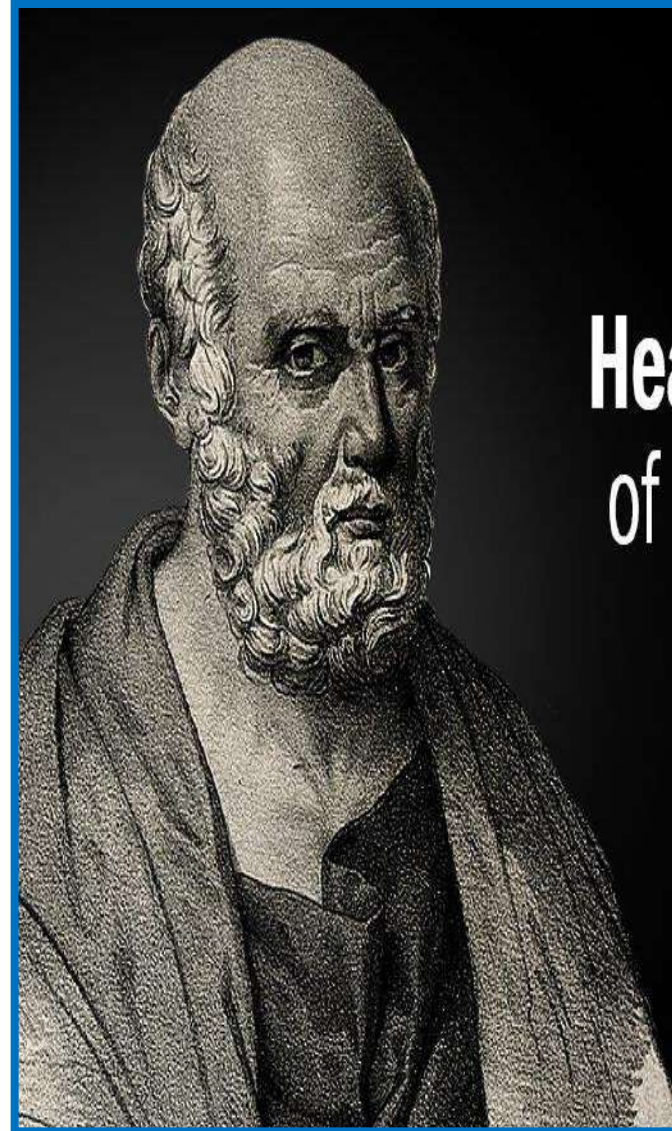
National and Kapodistrian University of Athens

Sitia 27-9-23



Αν μπορούσαμε να δώσουμε σε κάθε άτομο την σωστή δόση διατροφής και άσκησης – ούτε πολύ λιγότερη, ούτε πολύ περισσότερη – τότε θα είχαμε βρει τον ασφαλέστερο δρόμο για την Υγεία.”

If we could give each person the right dose of Diet and exercise not too much less and not to much more then we would have fount the safest path to health



**Health is the greatest
of human blessings.**

– Hippocrates



ΦΥΣΙΟΛΟΓΙΑ: “Ο περί φύσεως λόγος”

Το φαινόμενο της ζωής

αρχή

τέλος

Τα γηρατειά είναι
“φυσιολογική” διαδικασία

Τα γηρατειά είναι
“παθολογική” διαδικασία

“Μια αστραπή είναι η ζωή... αλλά προλαβαίνουμε”
Νίκος Καζαντζάκης

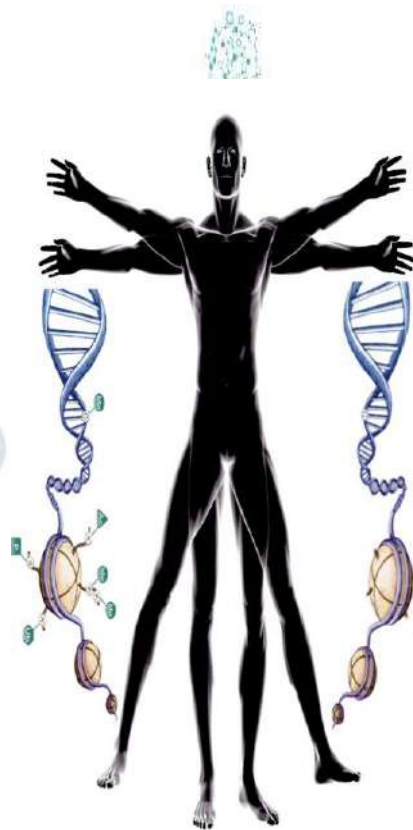


IATRIKH EPEYNA



GENOMICS

Our genes can suggest what diseases we *might* be predisposed to, but it's an incomplete picture of human health.



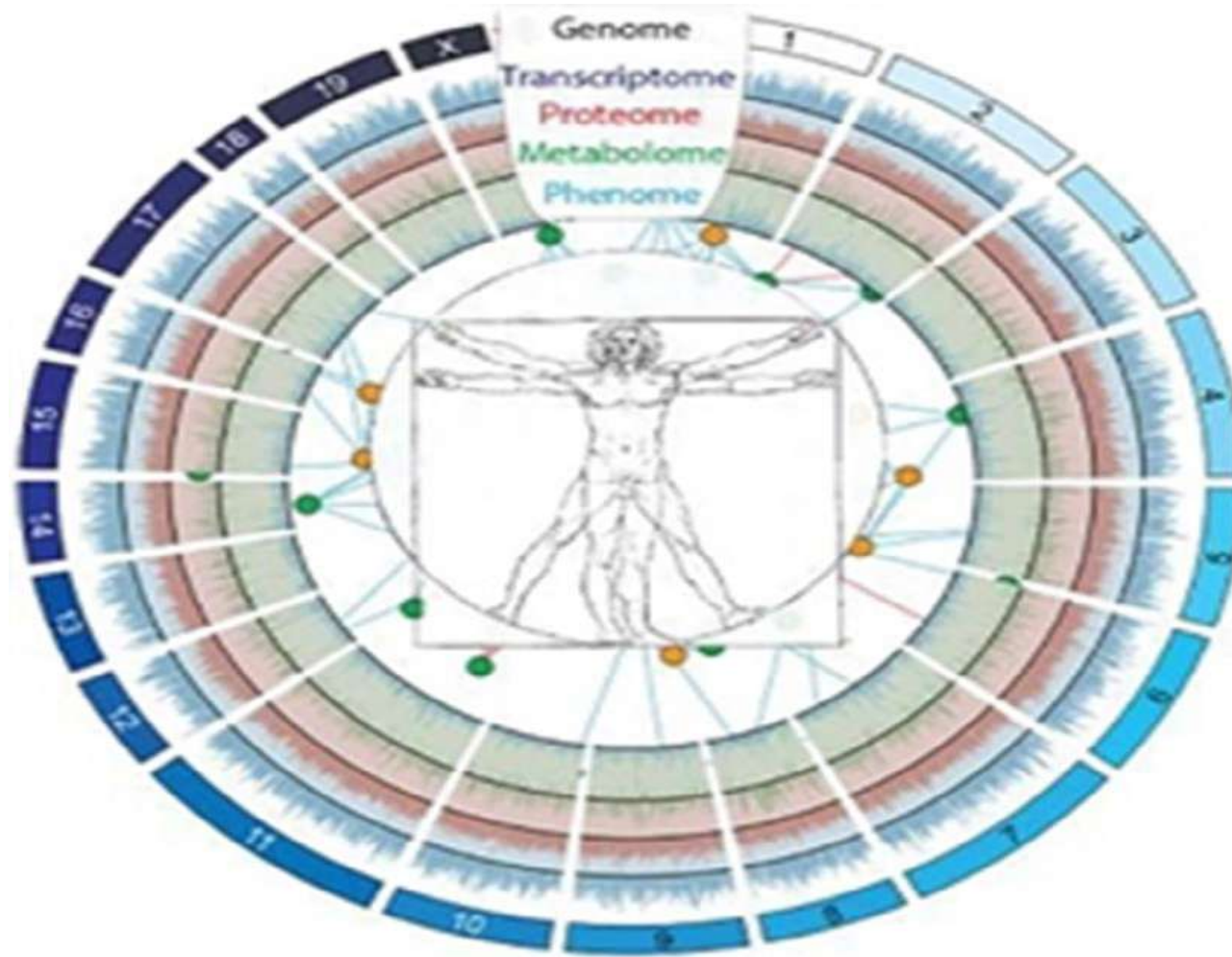
PHENOTYPE

A snapshot of the current state of health that can be used to prevent, diagnose and treat disease or improve health.



LIFESTYLE/ENVIRONMENT

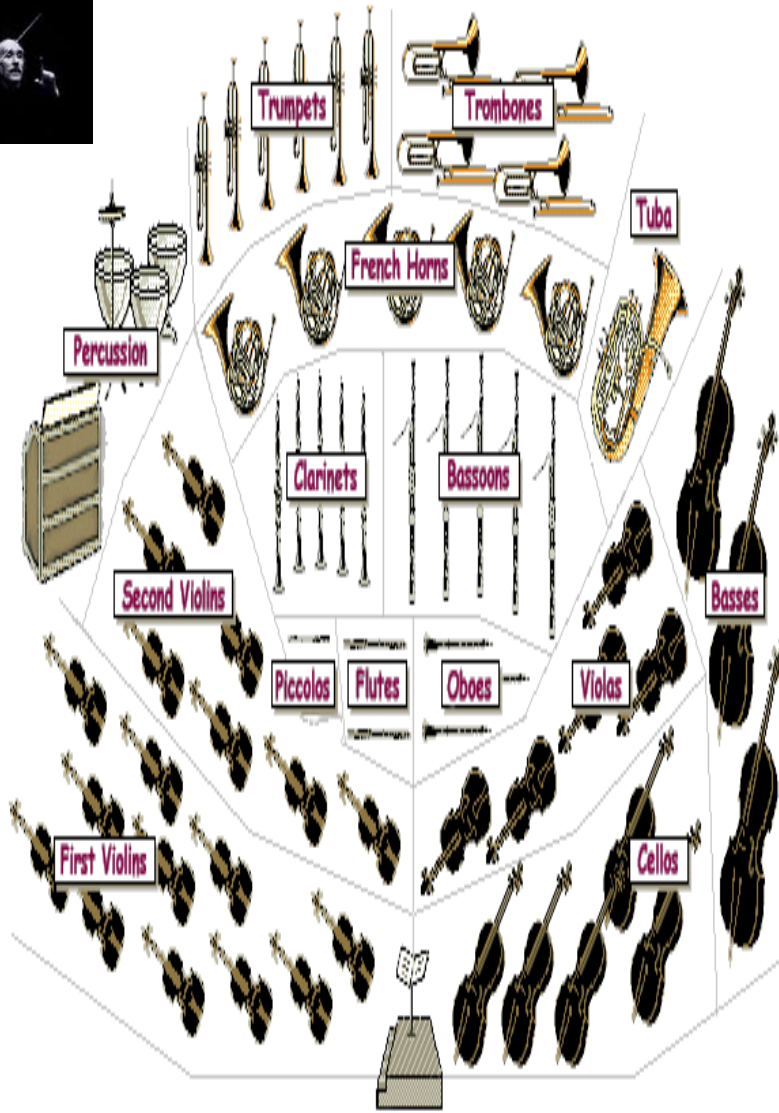
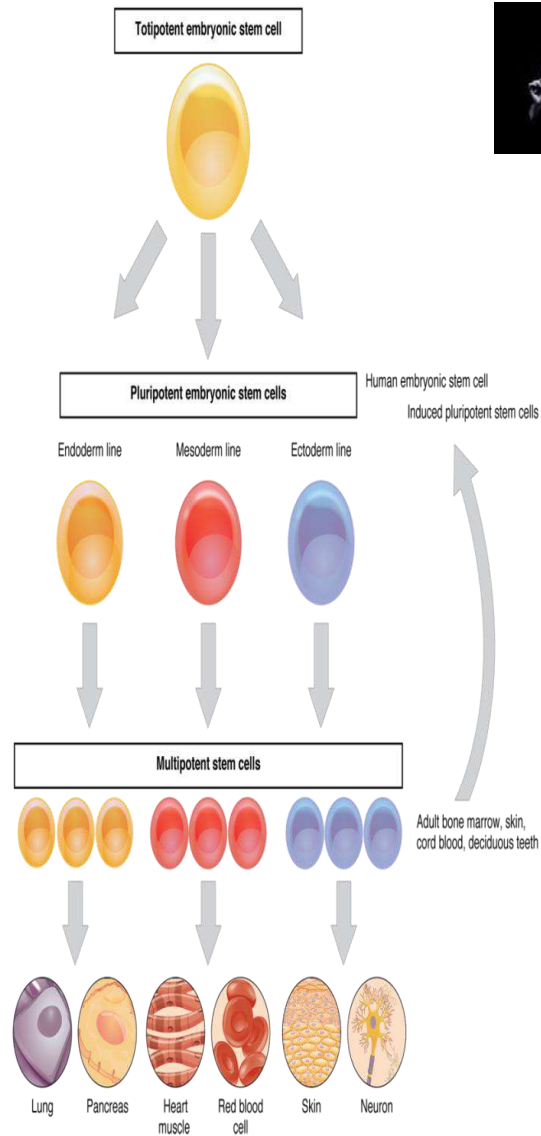
External factors like diet, exercise, medications, microbiota and even where we live influence our metabolic state.





PHYSIOLOGY: THE MUSIC SHEET OF THE “LIFE MELODY”

ΦΥΣΙΟΛΟΓΙΑ: Η ΠΑΡΤΙΤΟΥΡΑ ΤΗΣ “ΜΕΛΩΔΙΑΣ ΤΗΣ ΖΩΗΣ”



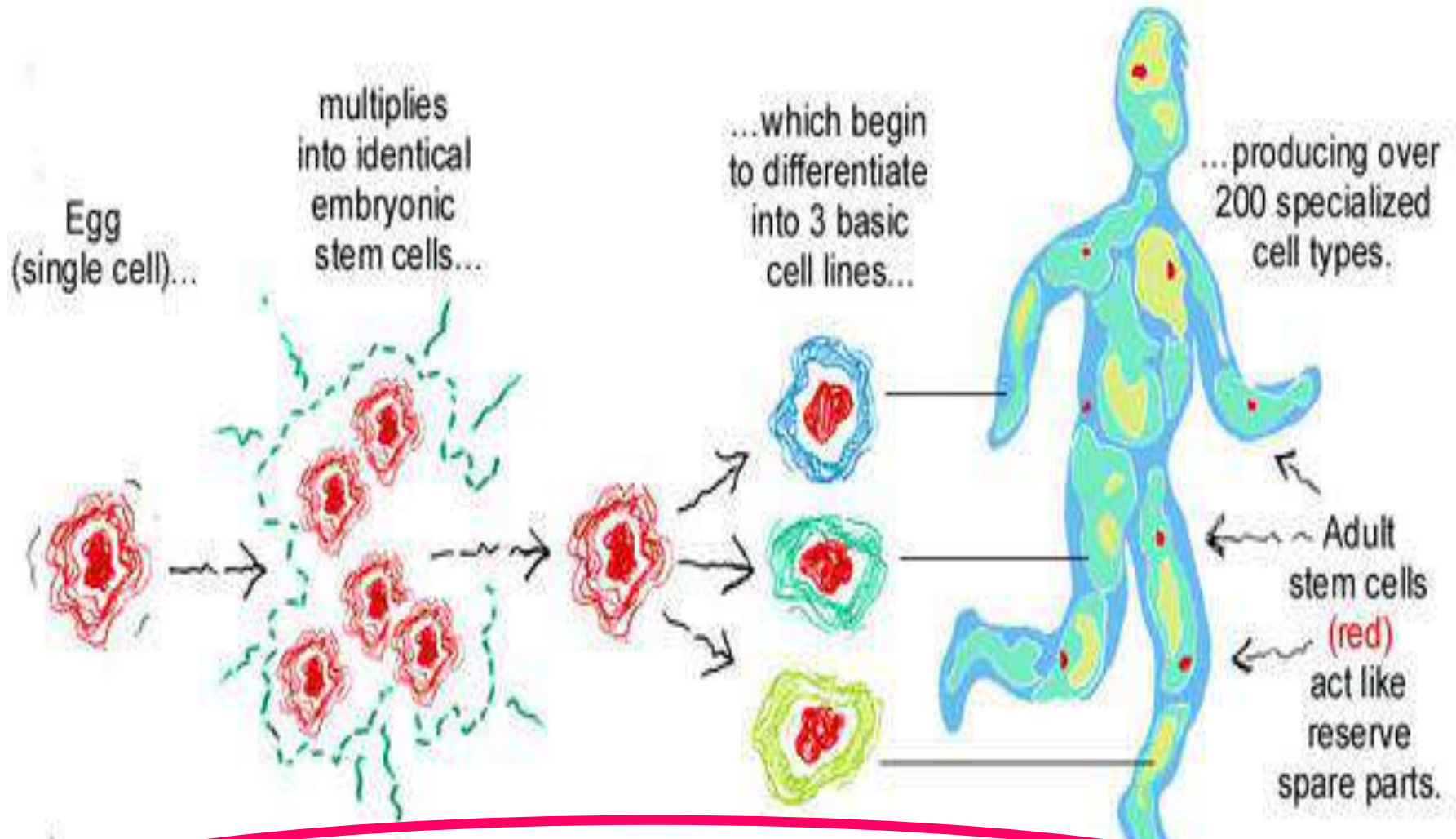
Cellular Physiology

Mitosis/Proliferation
DNA Repair
Differentiation
Programmed Cell Death

apoptosis – autophagy –
senescence



STEM CELLS – ΑΡΧΕΓΟΝΑ ΚΥΤΤΑΡΑ



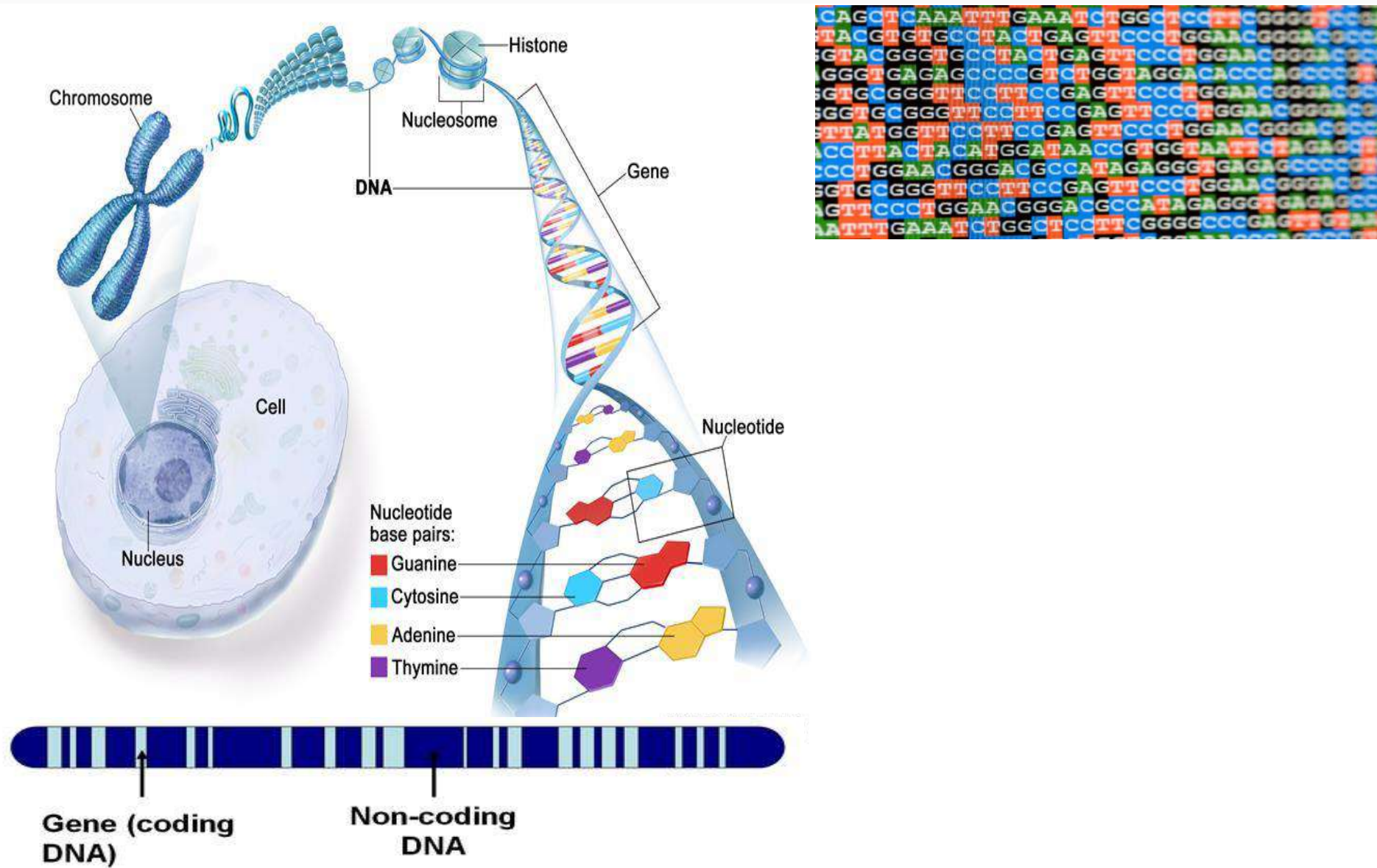
IMMORTAL CELLS
ΑΘΑΝΑΣΙΑ

PROGRAMMED CELL DEATH APOPTOSIS
ΠΡΟΓΡΑΜΜΑΤΙΣΜΕΝΟΣ ΚΥΤΤΑΡΙΚΟΣ ΘΑΝΑΤΟΣ



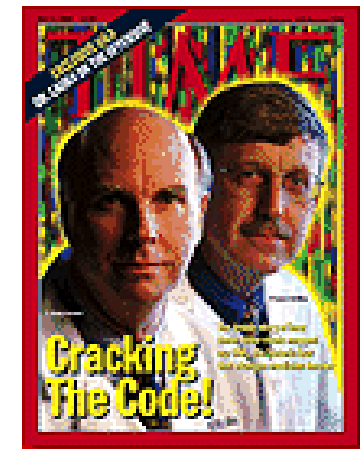
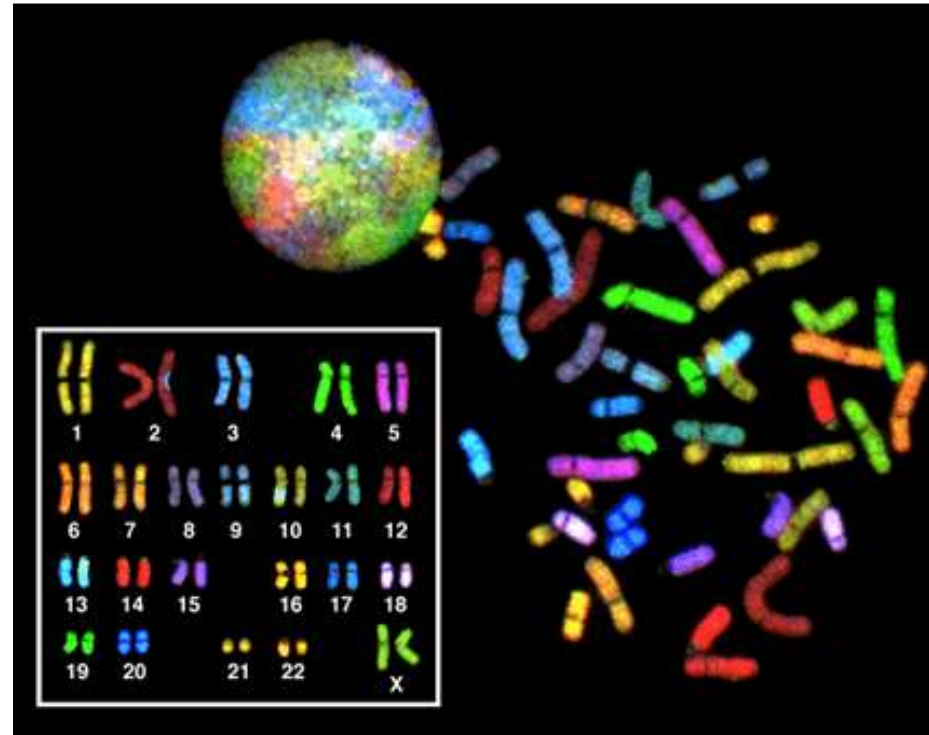
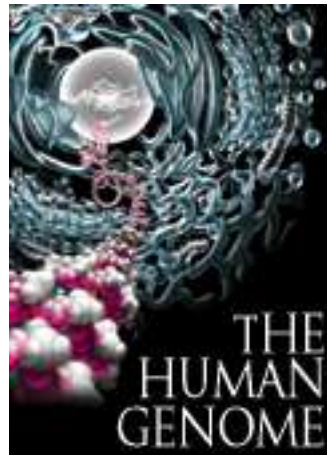
DNA STRUCTURE

ΔΟΜΗ ΤΟΥ DNA



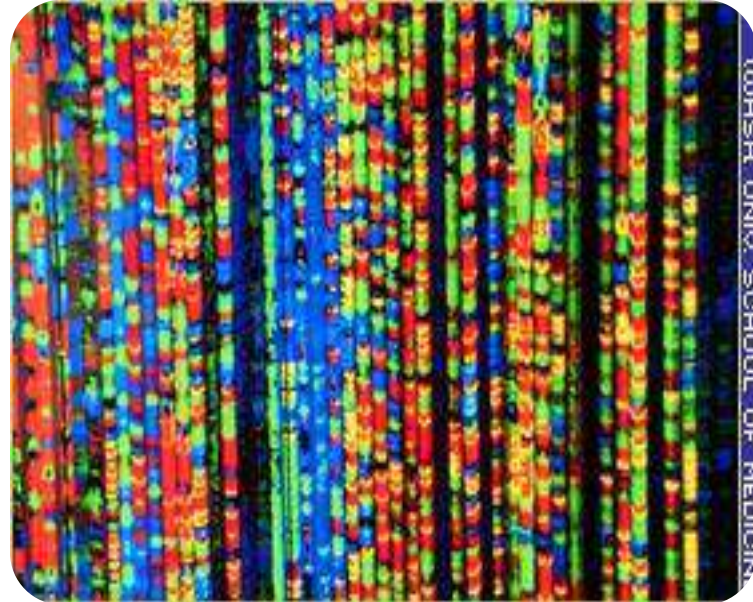


Human Genome Project





The automated sequencing machines use four different colors for the four bases so they can read all four bases simultaneously



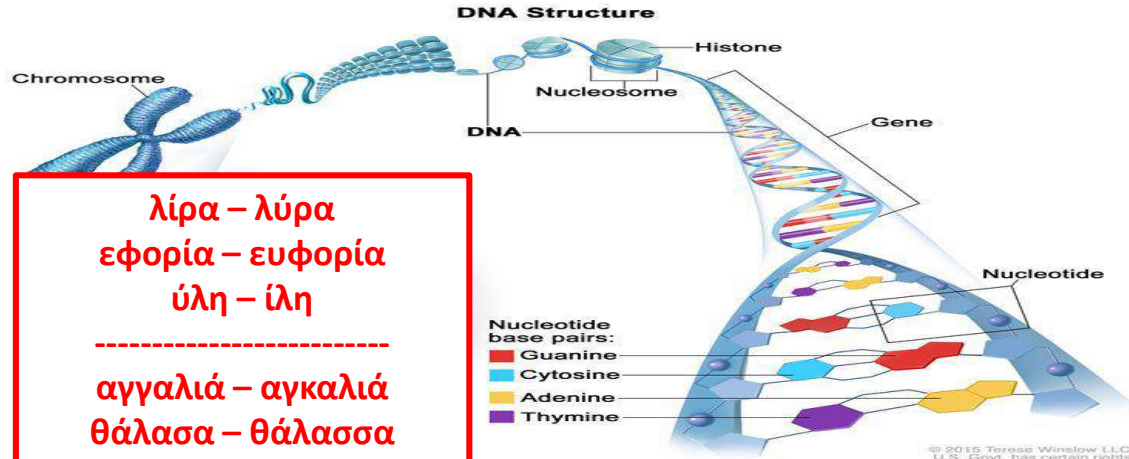


It is now clear that the genome that each person has inherited from their parents very often differ both from each other in terms of individual base changes, and also by the genome of other person

During the twentieth century only a few thousands of the so called single nucleotide polymorphism were identified
But in the century that we are now passing through, the revelation of such polymorphism is becomes more and more impressive .Only in the first year of the new century the number increased by 1000 times



STRUCTURAL CHANGES OF DNA ΔΟΜΙΚΕΣ ΑΛΛΑΓΕΣ ΣΤΟ DNA

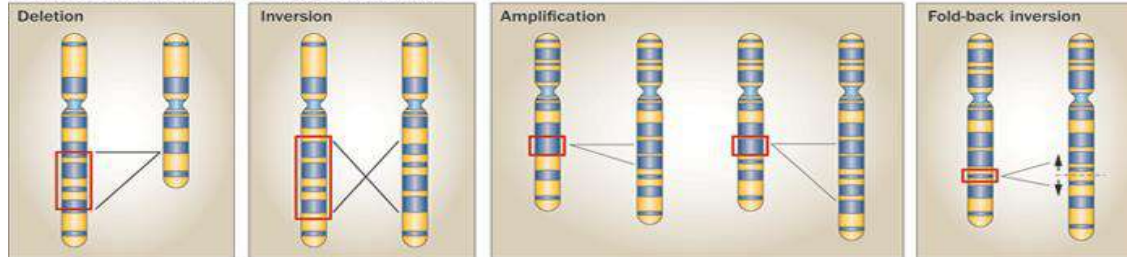


λίρα – λύρα
εφορία – ευφορία
ύλη – ίλη

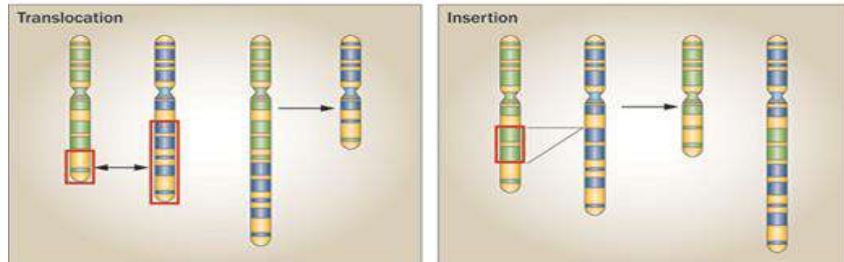
αγγαλιά – αγκαλιά
θάλασσα – θάλασσα



b Chromosomal alterations in a single chromosome

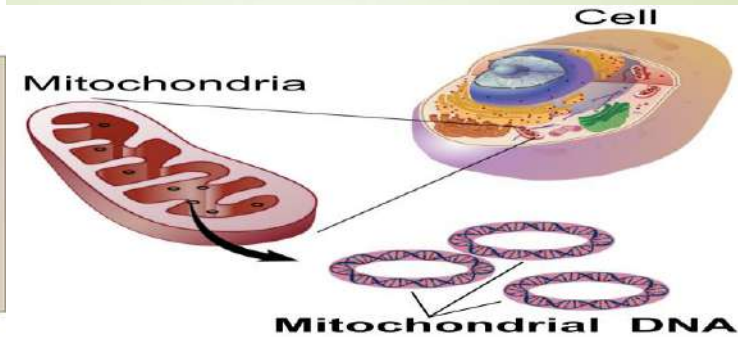


c Chromosomal alterations between two chromosomes



Mitochondrial Disorders

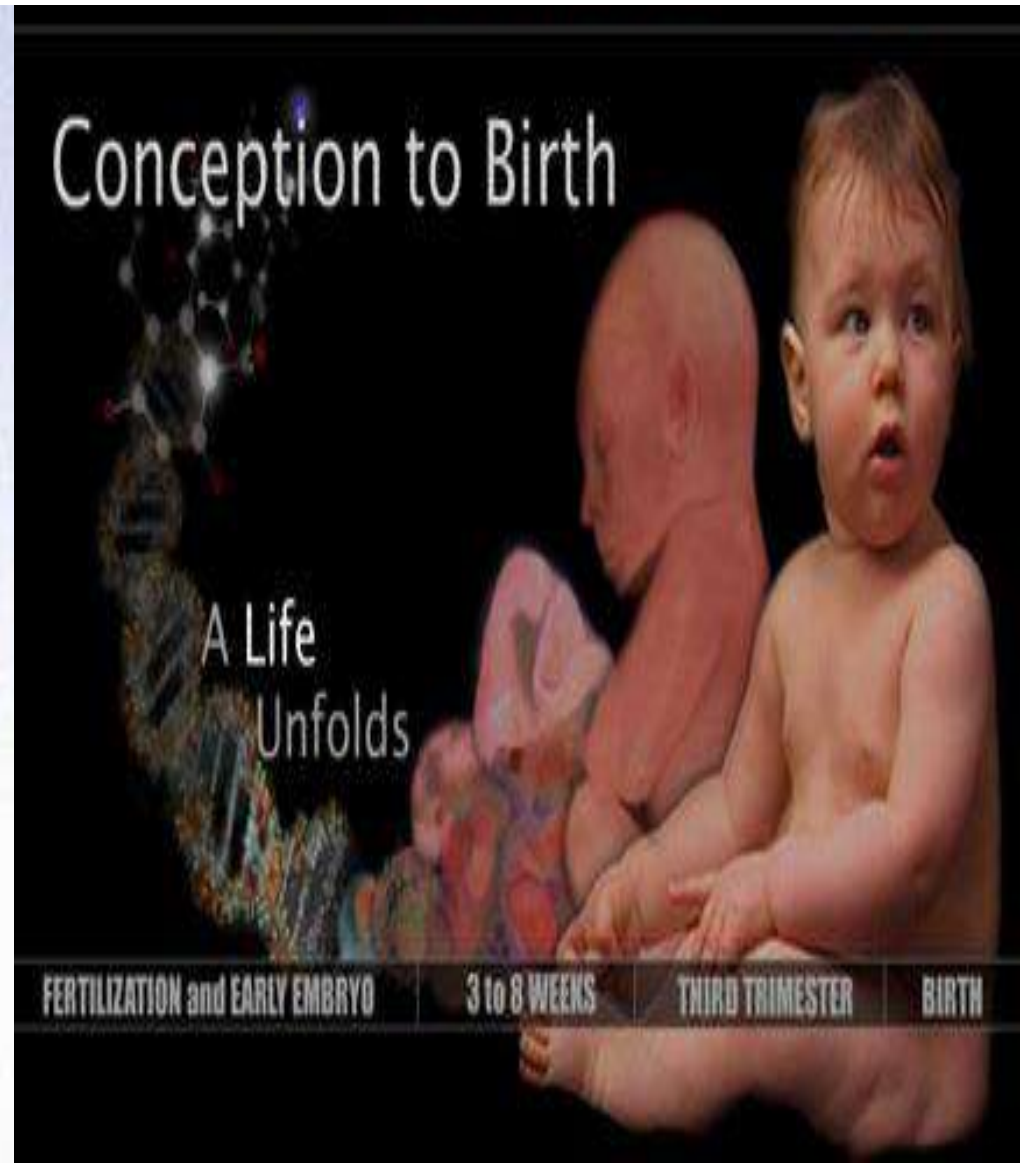
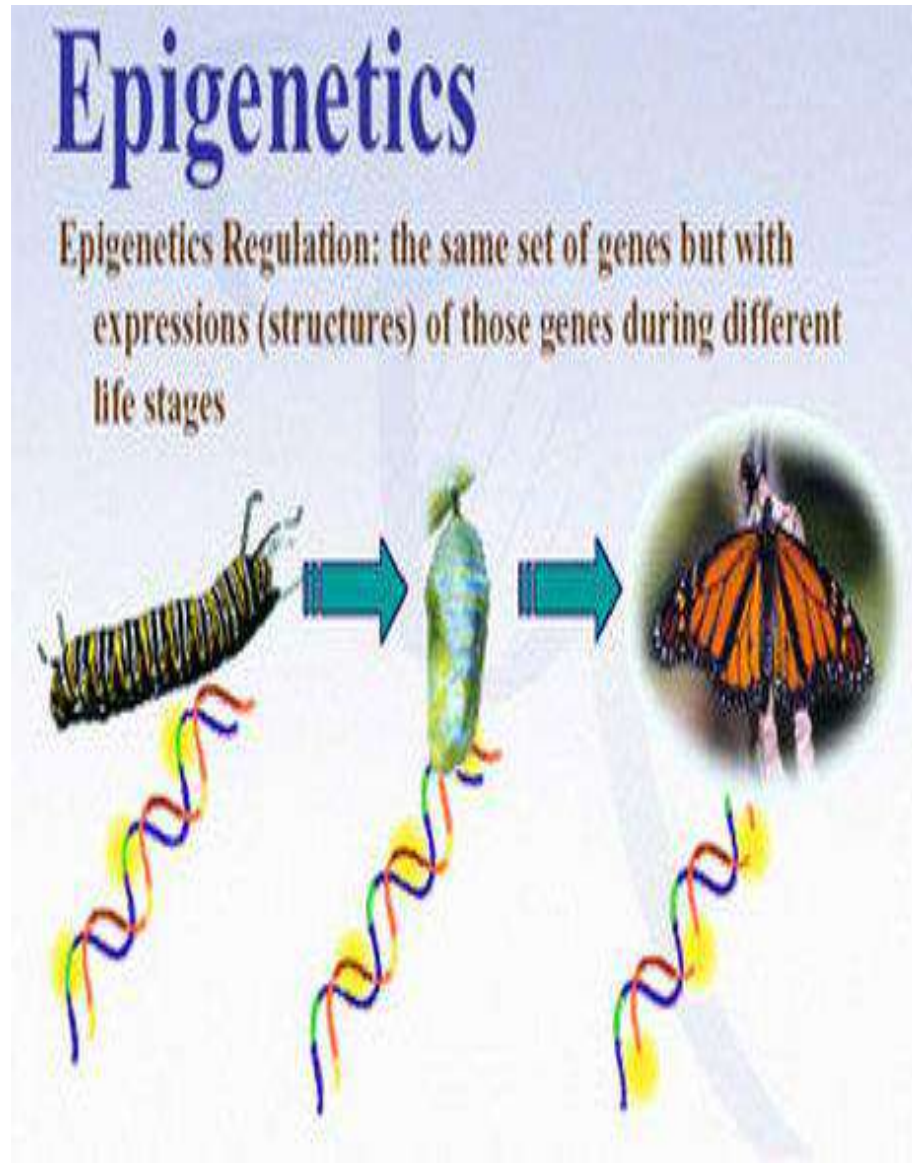
- Mitochondria, the organelles in your cells that convert energy, also contain DNA.
- A mitochondrial disorder, a relatively rare type of genetic disorder is caused by mutations in **nonchromosomal DNA** of mitochondria.
- Mitochondrial DNA is unique in that it is passed solely from mother to child

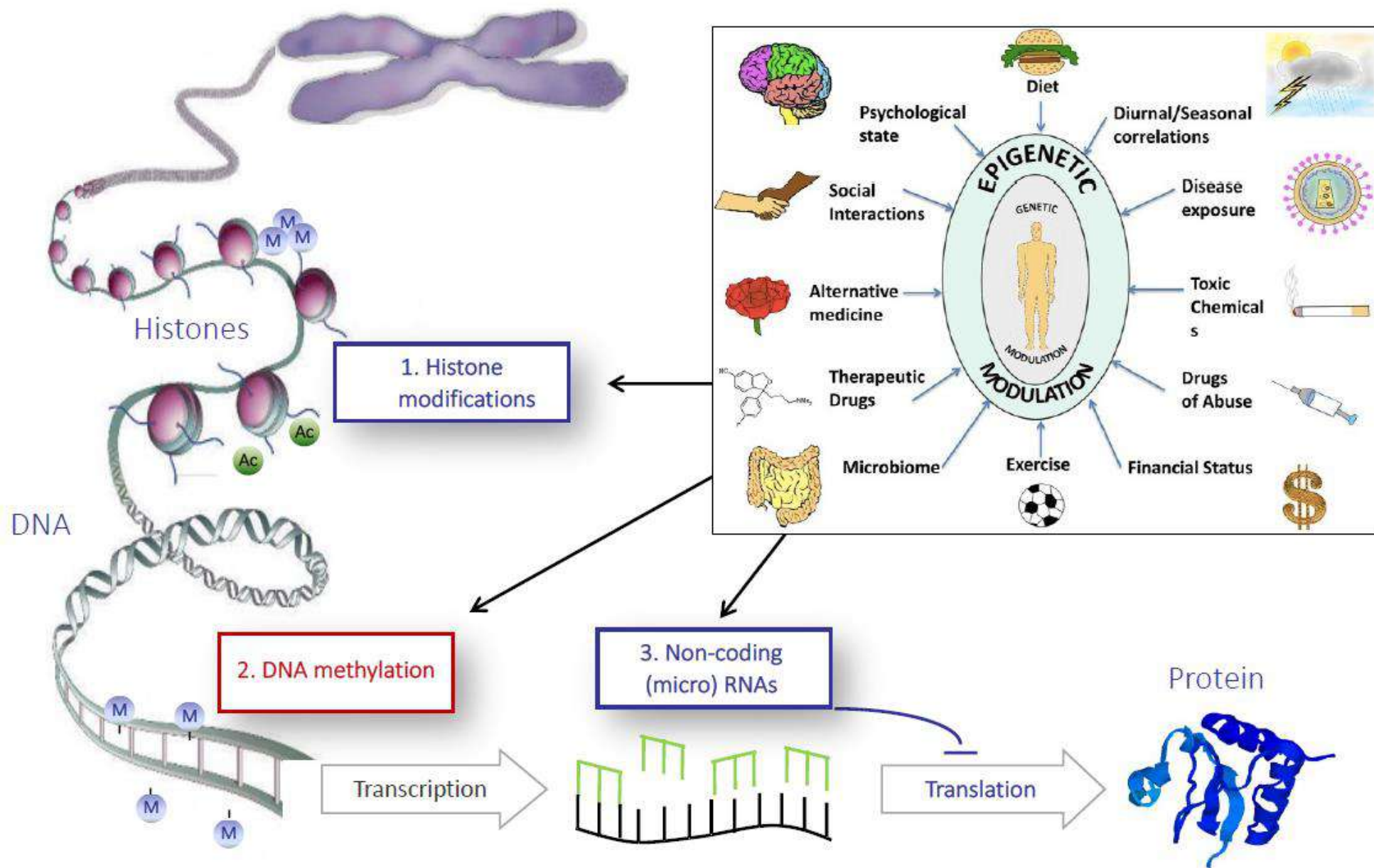


The mitochondrial DNA reflects only the history of the females in a population and so may not represent the history of the population as a whole. This can be partially overcome by the use of paternal genetic sequences (non-recombining region of the Y-chromosome)



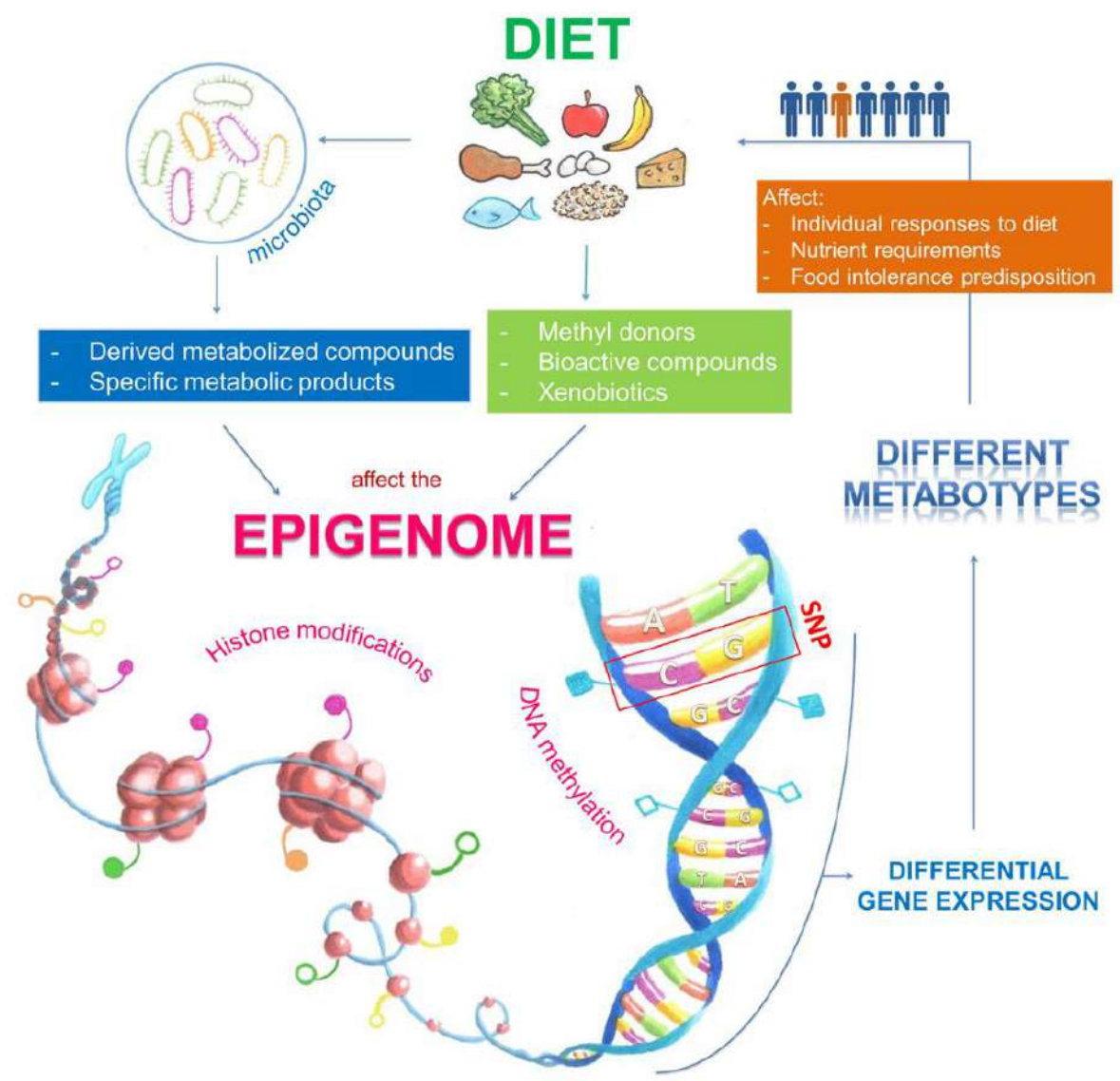
«ήξεις αφήξεις, ουκ εν τω πολέμω θνήξεις»
«ήξεις αφήξεις ουκ, εν τω πολέμω θνήξεις»







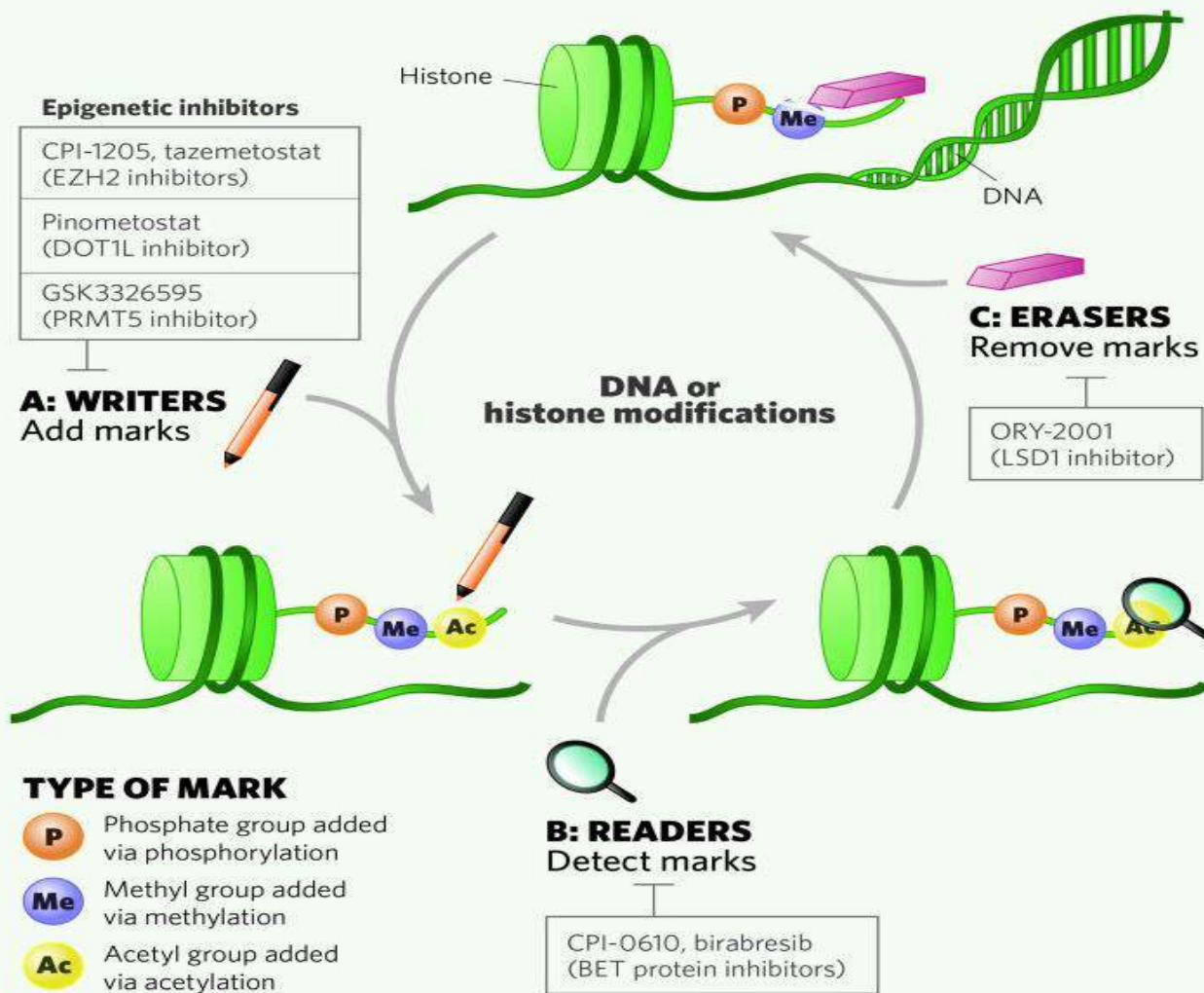
NUTRIGENOMICS



NUTRIGENETICS



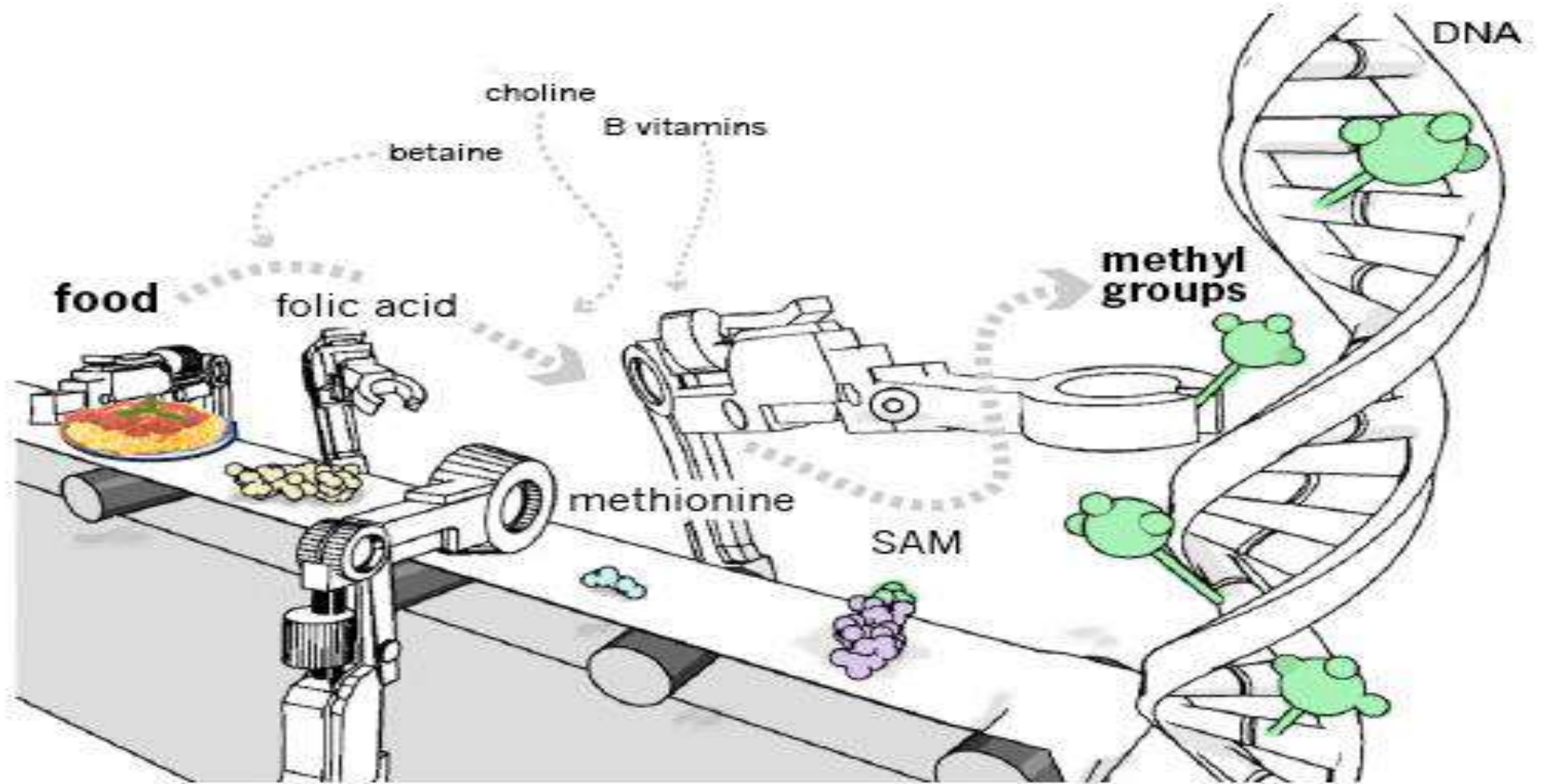
THE EPIGENETIC LANDSCAPE



Epigenetic regulators control protein function and stability as well as gene transcription, DNA replication and DNA repair.

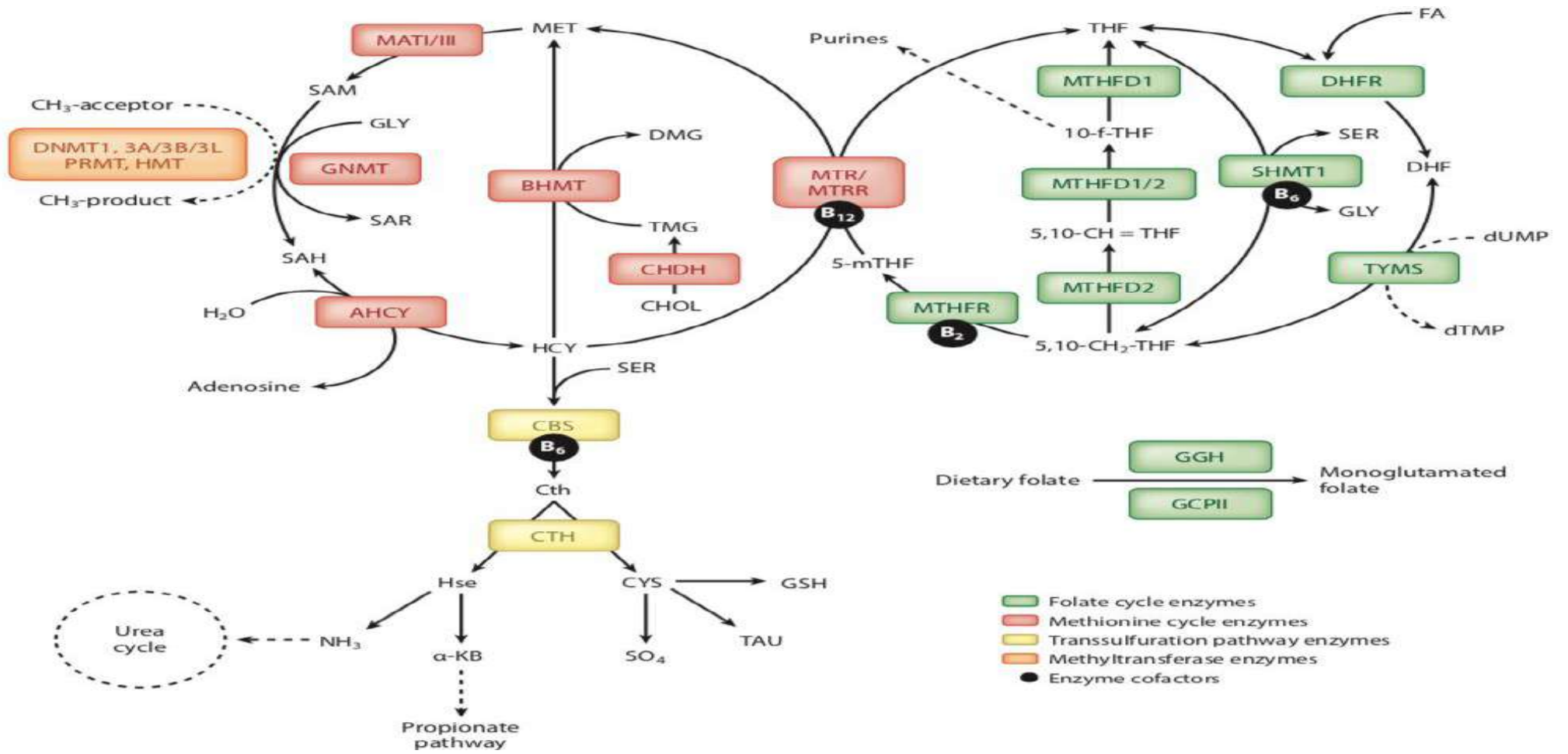


What is necessary to guarantee the functional groups required for epigenetic modulation



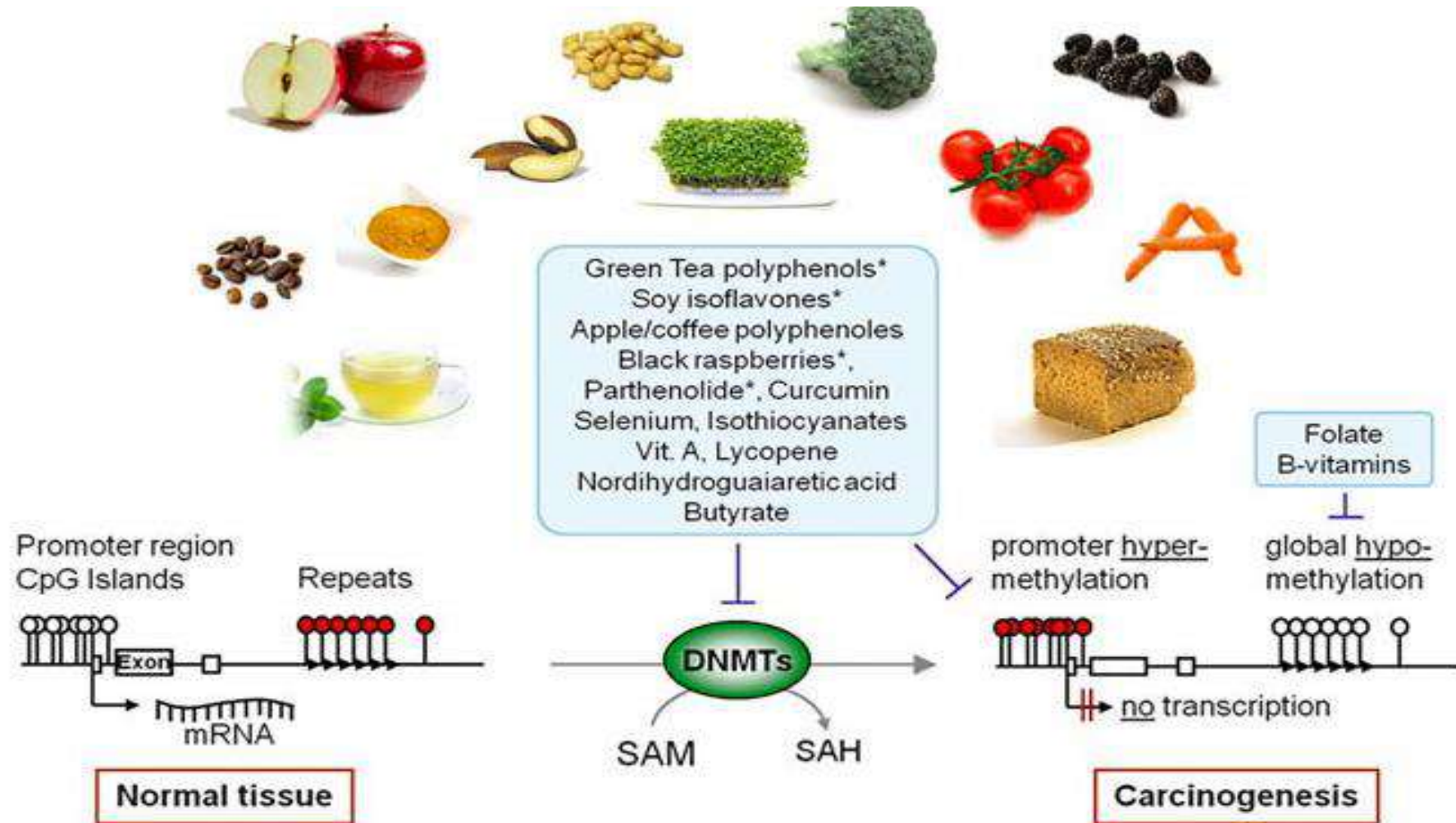


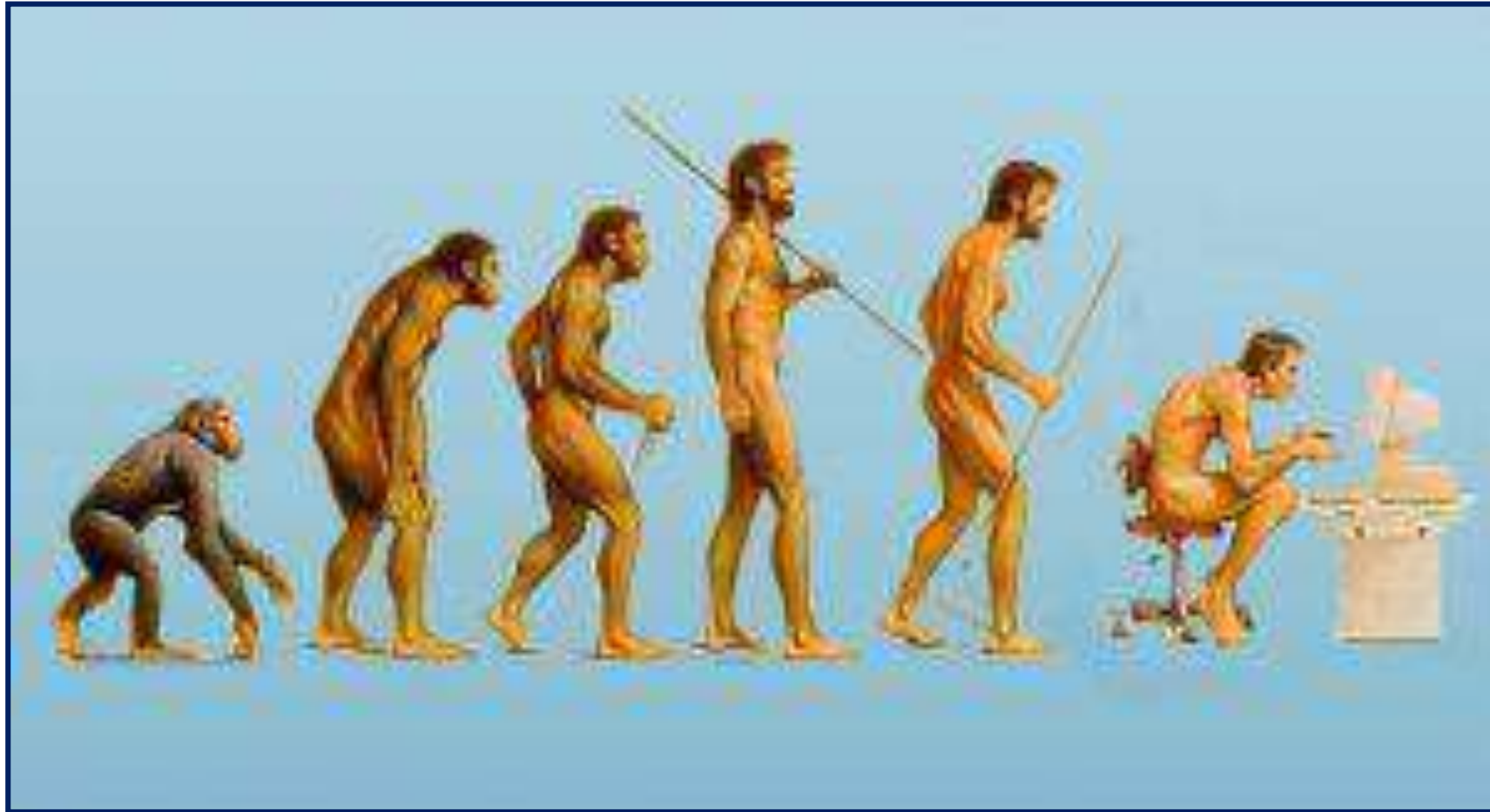
What we need to synthesize methyl groups





What happens if we lost the correct DNA methylation?





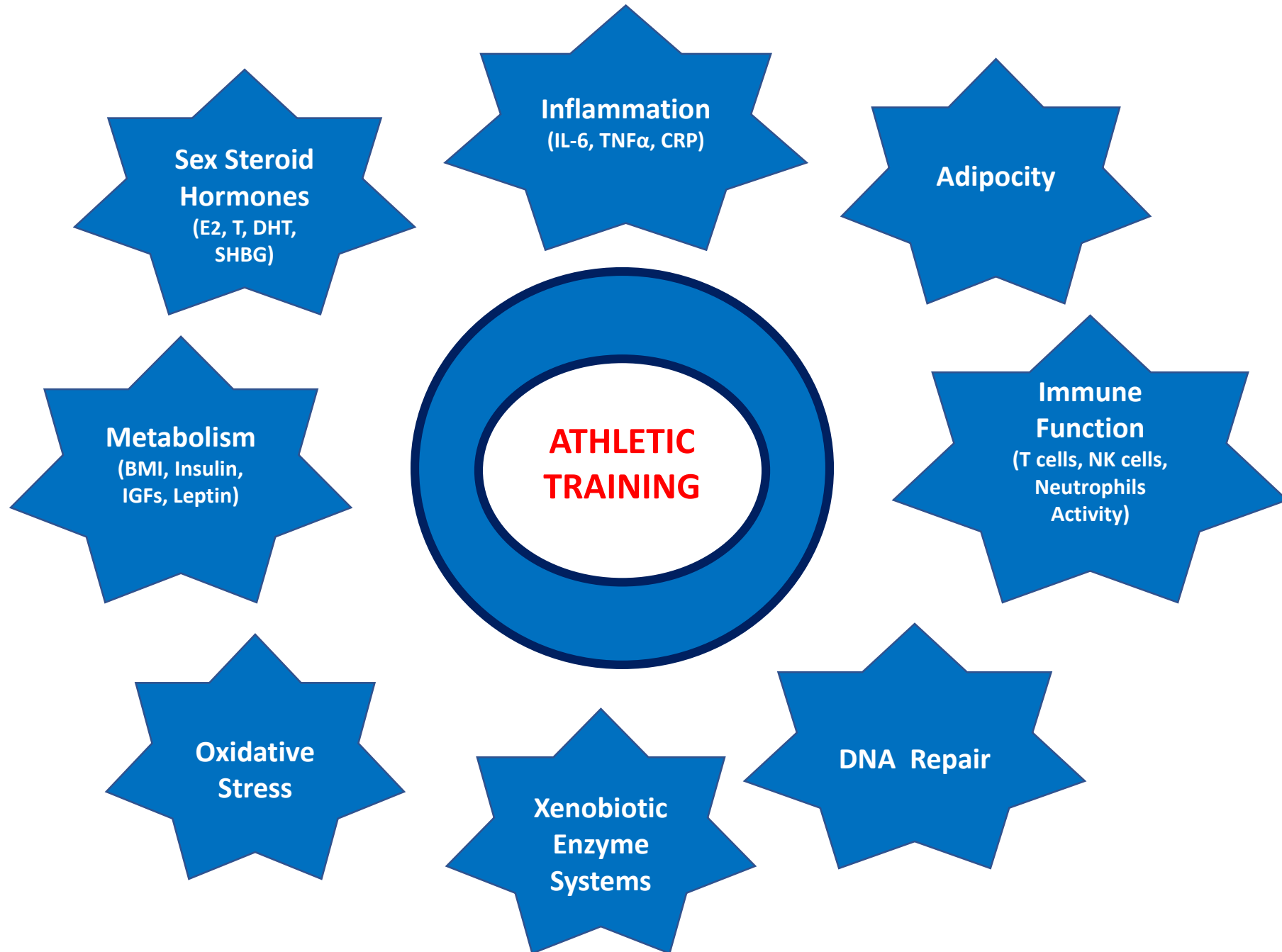
DECREASED PHYSICAL ACTIVITY IN HUMANS

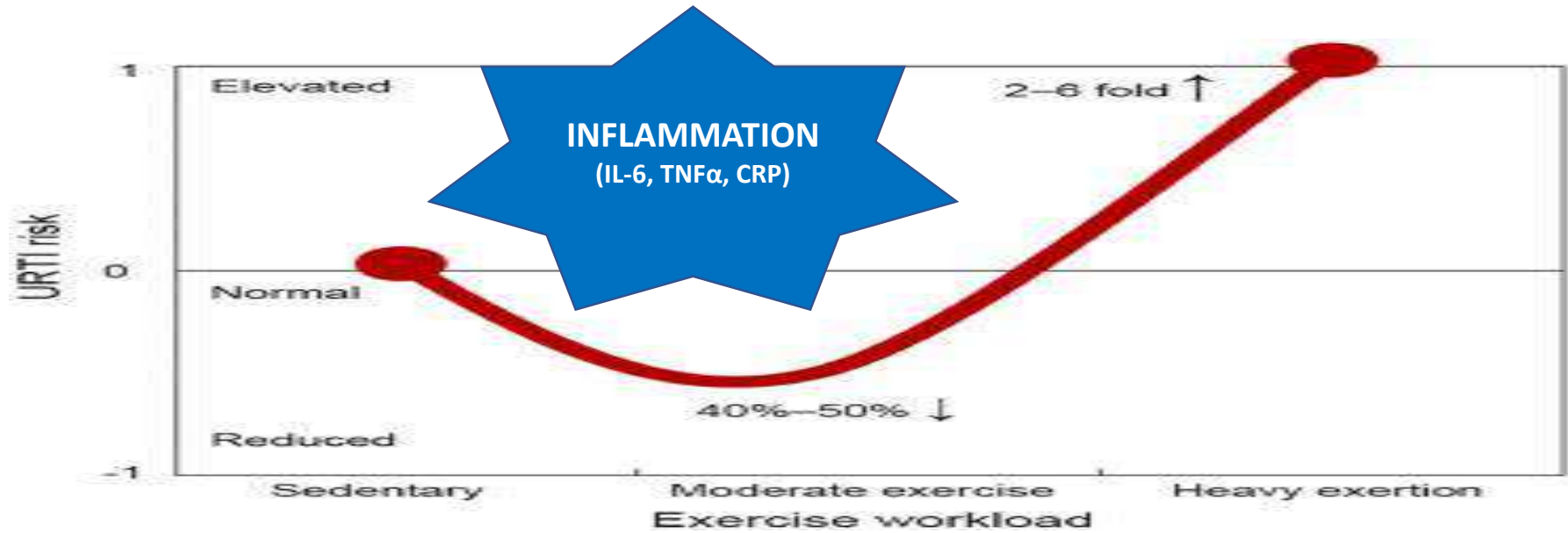
Occupational, House holding, Transport & Recreational

**OBSERVATIONAL EVIDENCE
EPIDEMIOLOGY**



CLINICAL STUDIES

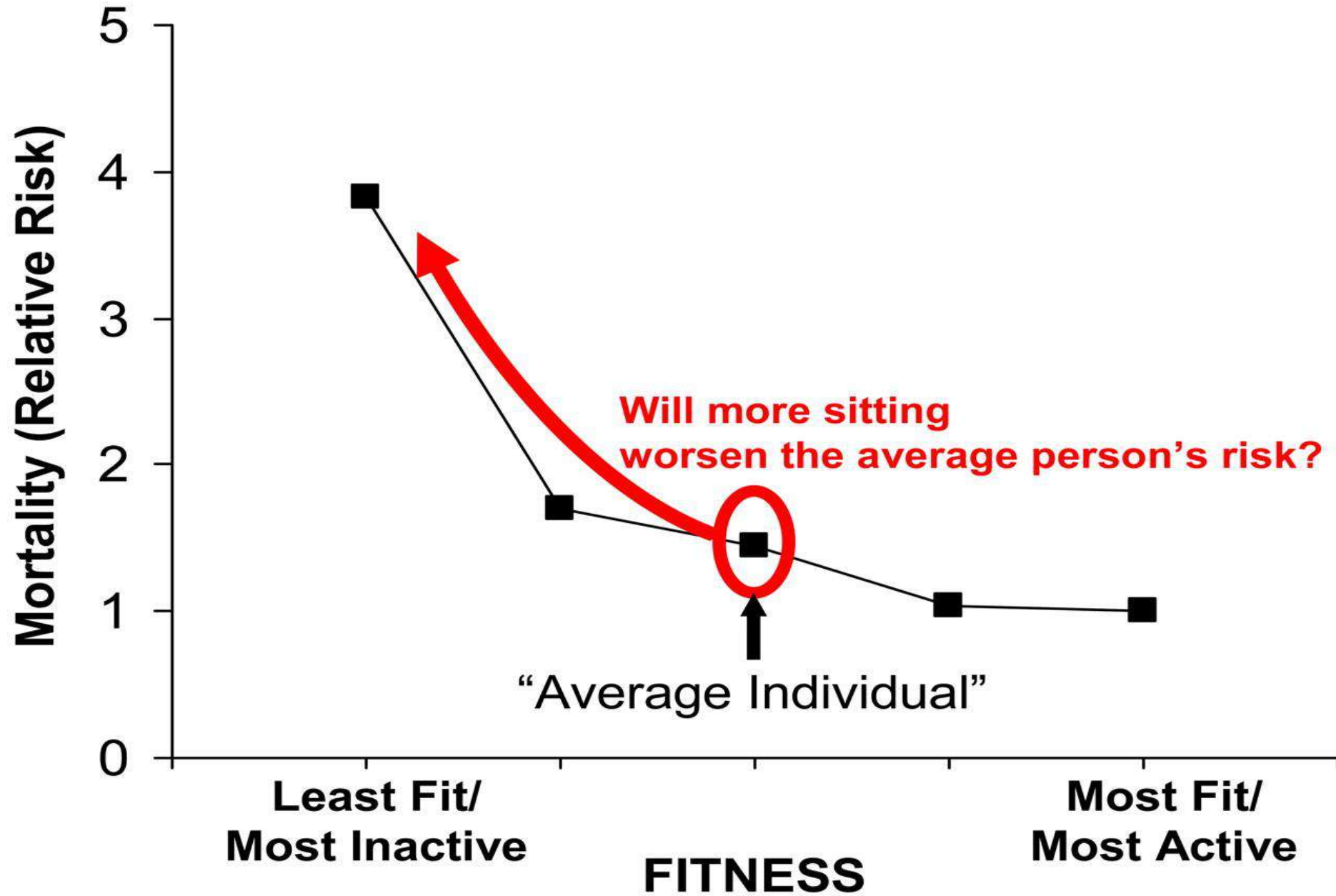


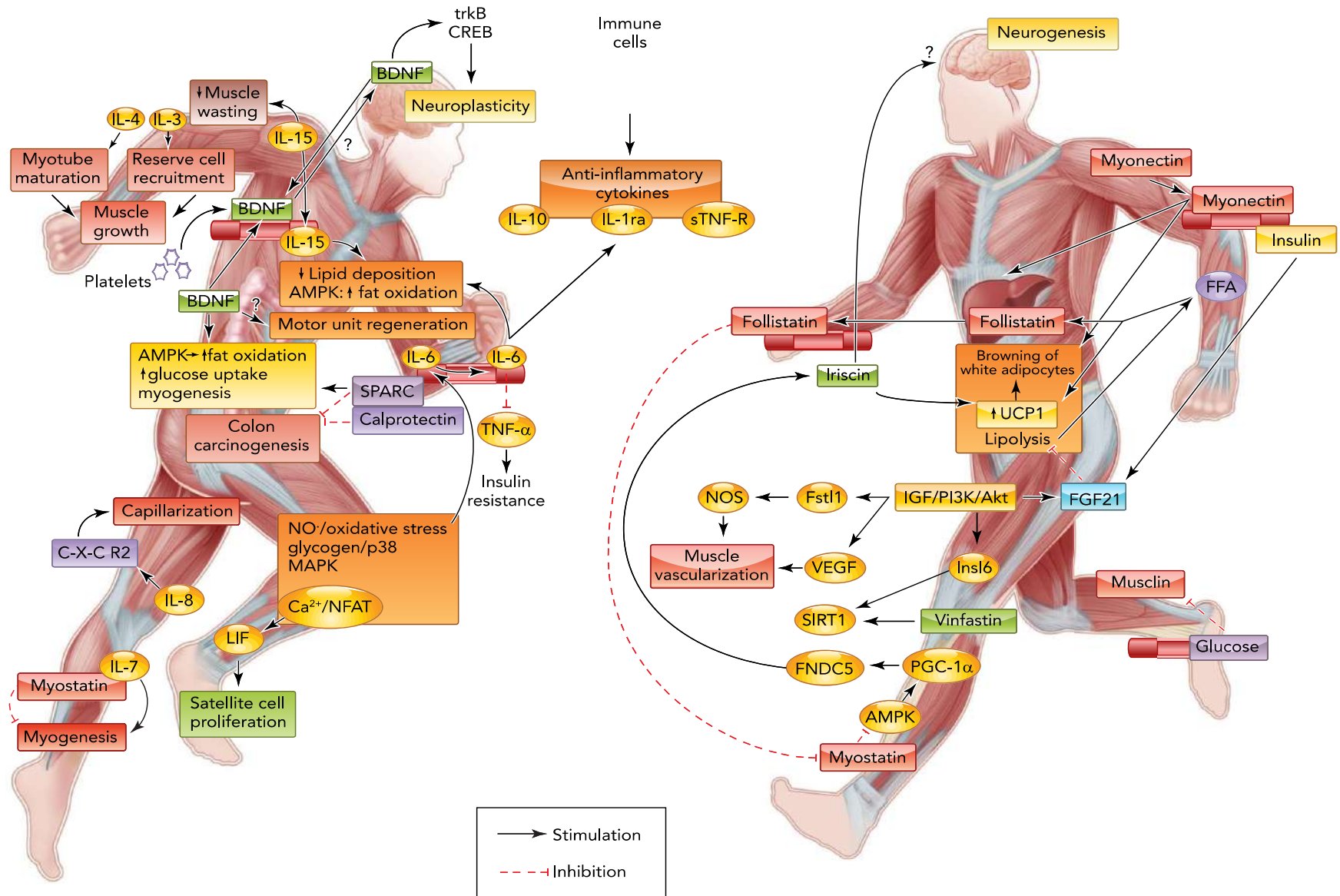


Effect of exercise on immune function


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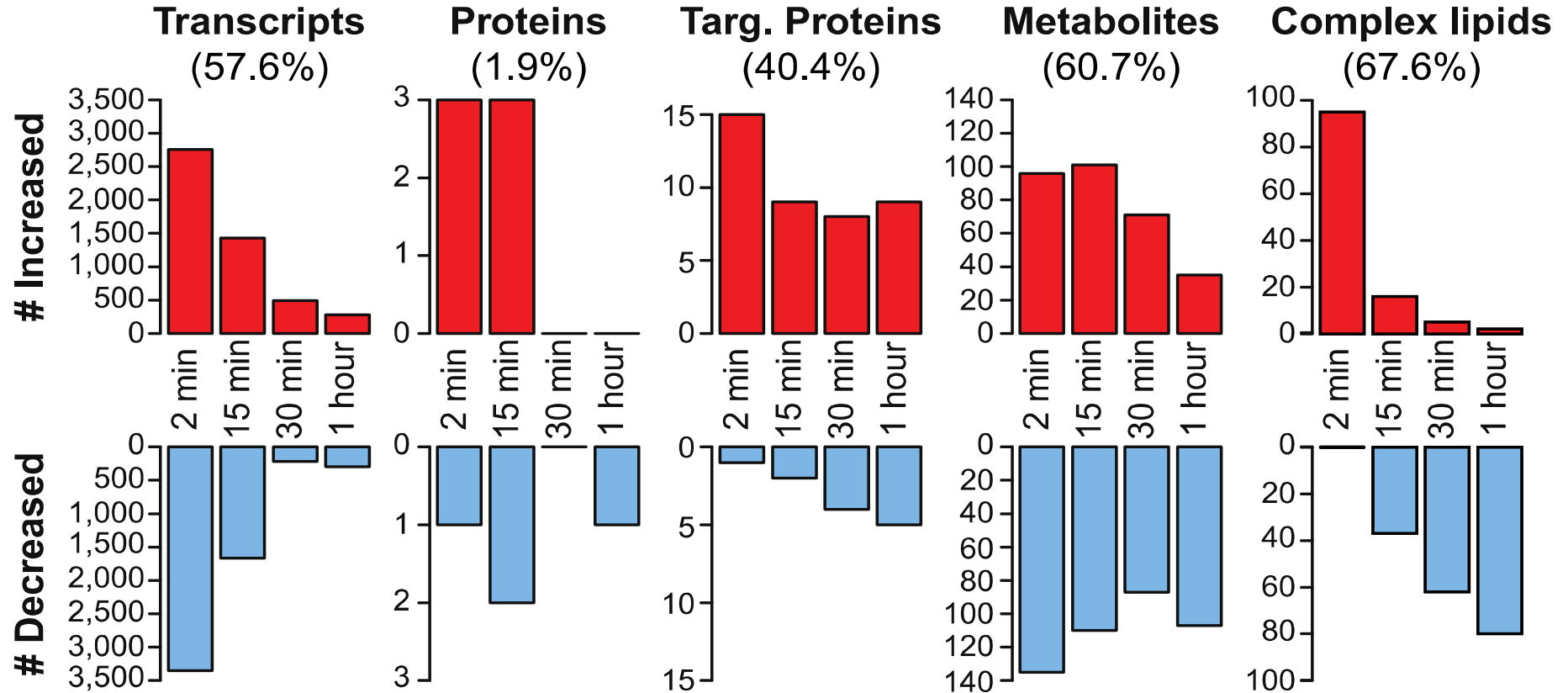


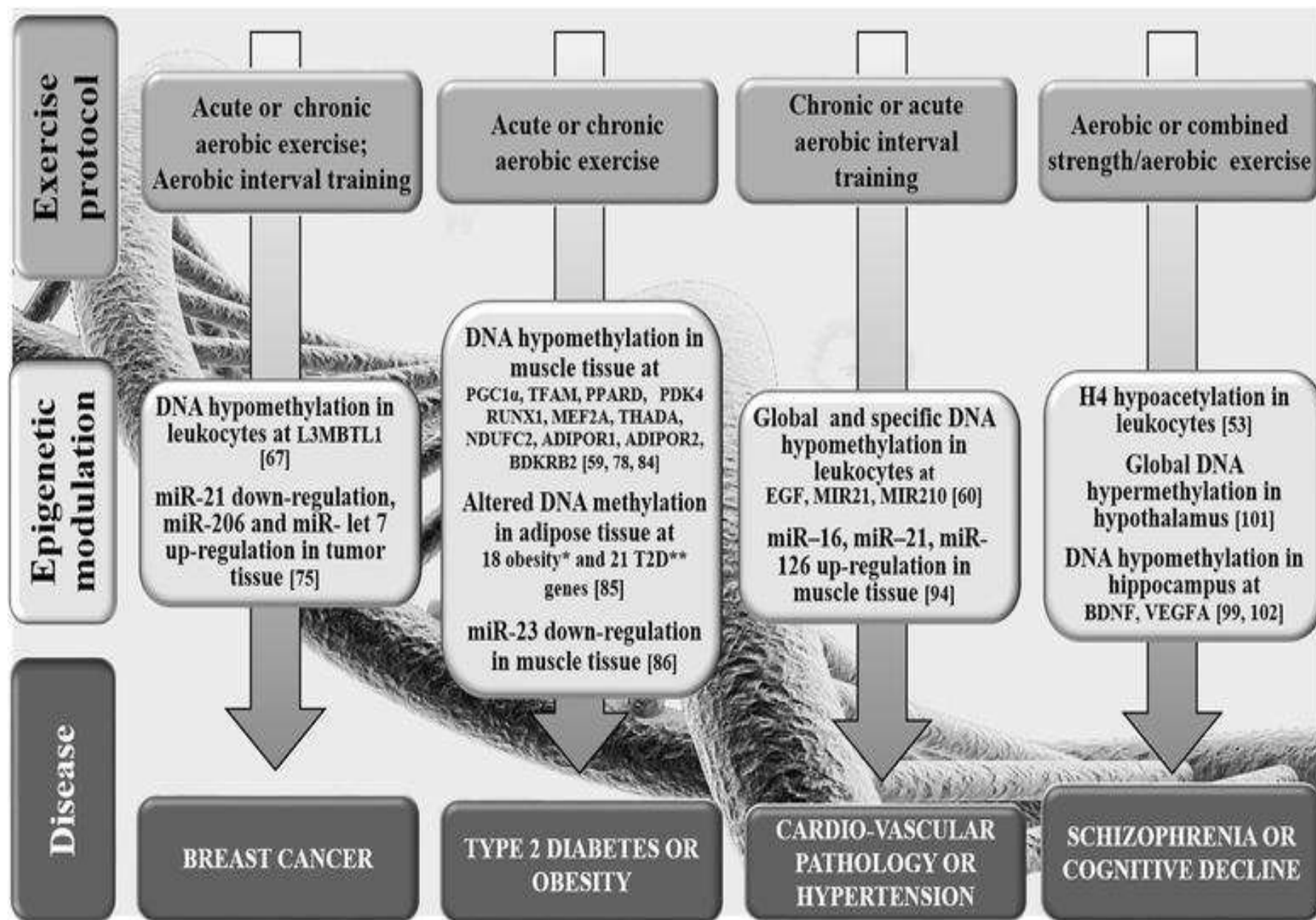






C Multi-omics changes in response to acute exercise





Exercise is effective in the primary prevention of 35 chronic diseases.

- Accelerated biological aging/premature death,
- low cardiorespiratory fitness (VO₂max),
- sarcopenia,
- metabolic syndrome,
- obesity,
- insulin resistance,
- prediabetes,
- type 2 diabetes,
- non-alcoholic fatty liver disease,
- coronary heart disease,
- peripheral artery disease,
- hypertension,
- stroke,
- congestive heart failure,
- endothelial dysfunction,
- arterial dyslipidemia,
- hemostasis,
- deep vein thrombosis,
- cognitive dysfunction,
- depression and anxiety,
- osteoporosis,
- osteoarthritis,
- balance,
- bone fracture/falls,
- rheumatoid arthritis,
- colon cancer,
- breast cancer,
- endometrial cancer,
- gestational diabetes,
- preeclampsia,
- polycystic ovary syndrome,
- erectile dysfunction,
- pain,
- diverticulitis,
- constipation,
- gallbladder diseases



PHYSICAL ACTIVITY IN GREECE

Sport centers Gyms it is part of every day life in Holland (25%) in Germany (19) but not In Greece (2%),in Bulgaria (3%), Hungary (3%), Italy (3%) and Romania (3%).

Physical activity and exercise in parks and outdoor spaces is surprisingly out of every day life in Greece only 27%.

The rerelationship between physical activity and Ageing ,and the use of exercise as a method for longevity and physical/mental well-being are recognized in Finland (33%),in Sweden (30%) in Denmark (30%) but not in Greece only (7%).

GREECE PHYSICAL ACTIVITY FACTSHEET

This is one of the 28 European Union Member States' factheets on health-enhancing physical activity, developed as a part of a joint initiative between the European Commission (EC) and WHO Regional Office for Europe in the context of the implementation of the Recommendation of the Council of the European Union on promoting health-enhancing physical activity across sectors and the European Intercommunal Co-operation Action Plan 2012-2018.

The Regional Office is grateful to the European Commission (EC) for its financial support for the preparation of this country profile.



World Health
Organization
Europe

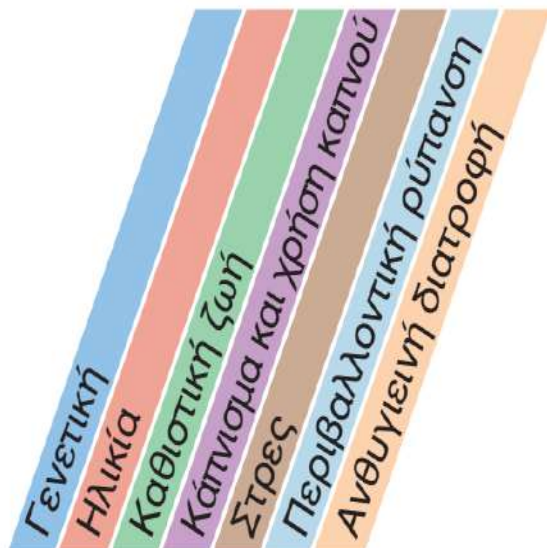


Special Eurobarometer, 2019



Η ΑΛΛΑΓΗ ΤΡΟΠΟΥ ΖΩΗΣ ΣΤΗΝ ΣΥΓΧΡΟΝΗ ΙΑΤΡΙΚΗ

Άλλοι παράγοντες κινδύνου



Χρόνια νοσήματα

Χρόνια νοσήματα	Γενετική	Ηλικία	Καθιστική ζωή	Καπνισμα και χρήση καπνού	Στρες	Περιβαλλοντική ρύπανση	Ανθυγιεινή διατροφή
Καρκίνος	✓	✓	✓	✓	✓	✓	✓
Υπέρταση	✓	✓	✓	✓	✓	✓	✓
Διαβήτης (τύπου 2)	✓	✓	✓	✓	✓	✓	✓
Οστεοπόρωση	✓	✓	✓	✓	✓	✓	✓
Αθηροσκλήρωση	✓	✓	✓	✓	✓	✓	✓
Παχυσαρκία	✓	✓	✓	✓	✓	✓	✓
Εγκεφαλικό επεισόδιο	✓	✓	✓	✓	✓	✓	✓
Μεταβολικό σύνδρομο	✓	✓	✓	✓	✓	✓	✓

