The Importance Of Molecular Biology In Life Aspects

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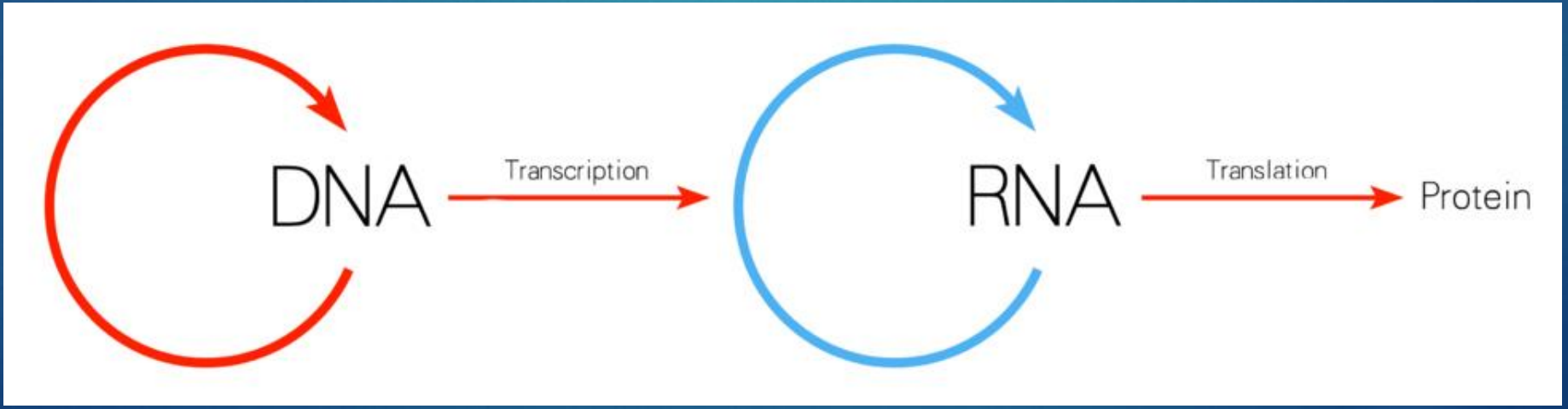
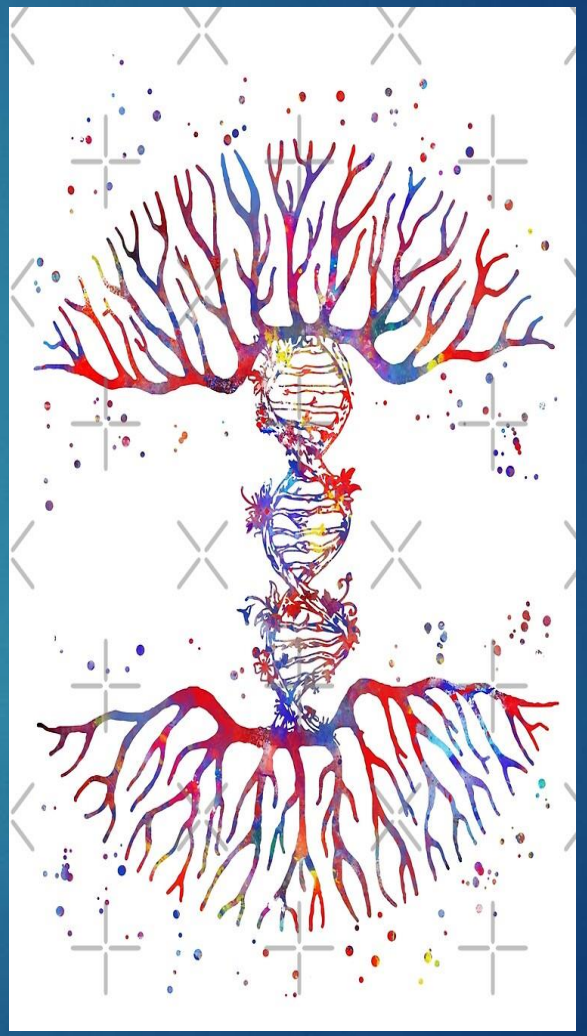
What is molecular Biology?

- Molecular biology is the study of living things at the level of the molecules.
- Of particular importance to molecular biology are the nucleic acids (DNA and RNA) and the proteins.



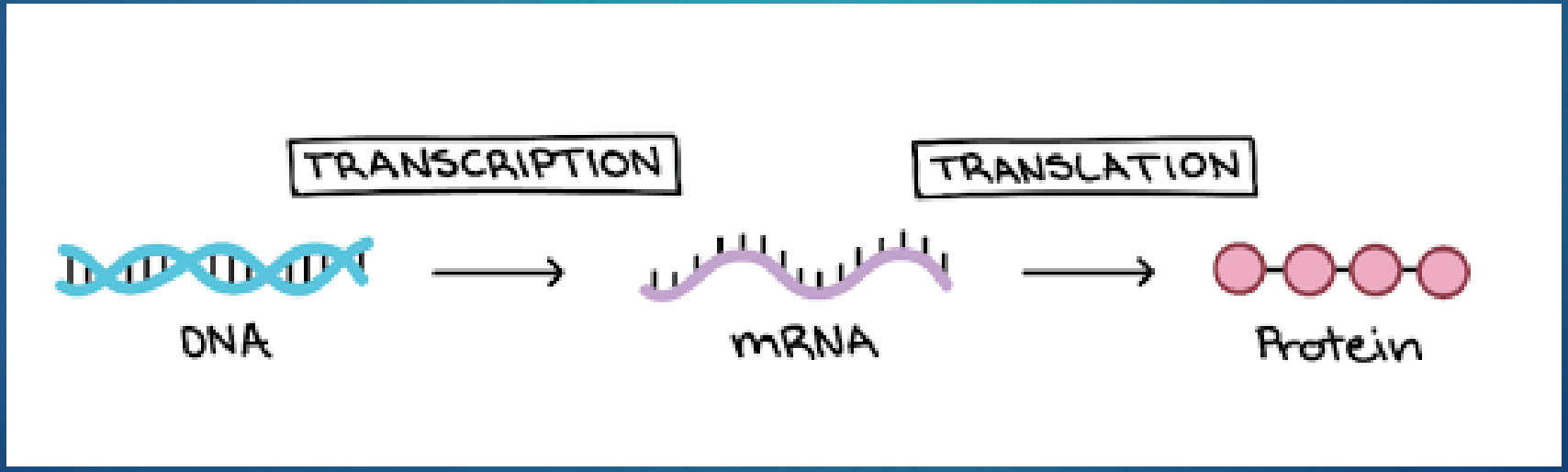
DNA: the molecule of life (The Code)

- DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. Nearly every cell in a person's body has the same DNA. The information in DNA is stored as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T).



RNA The Decoding

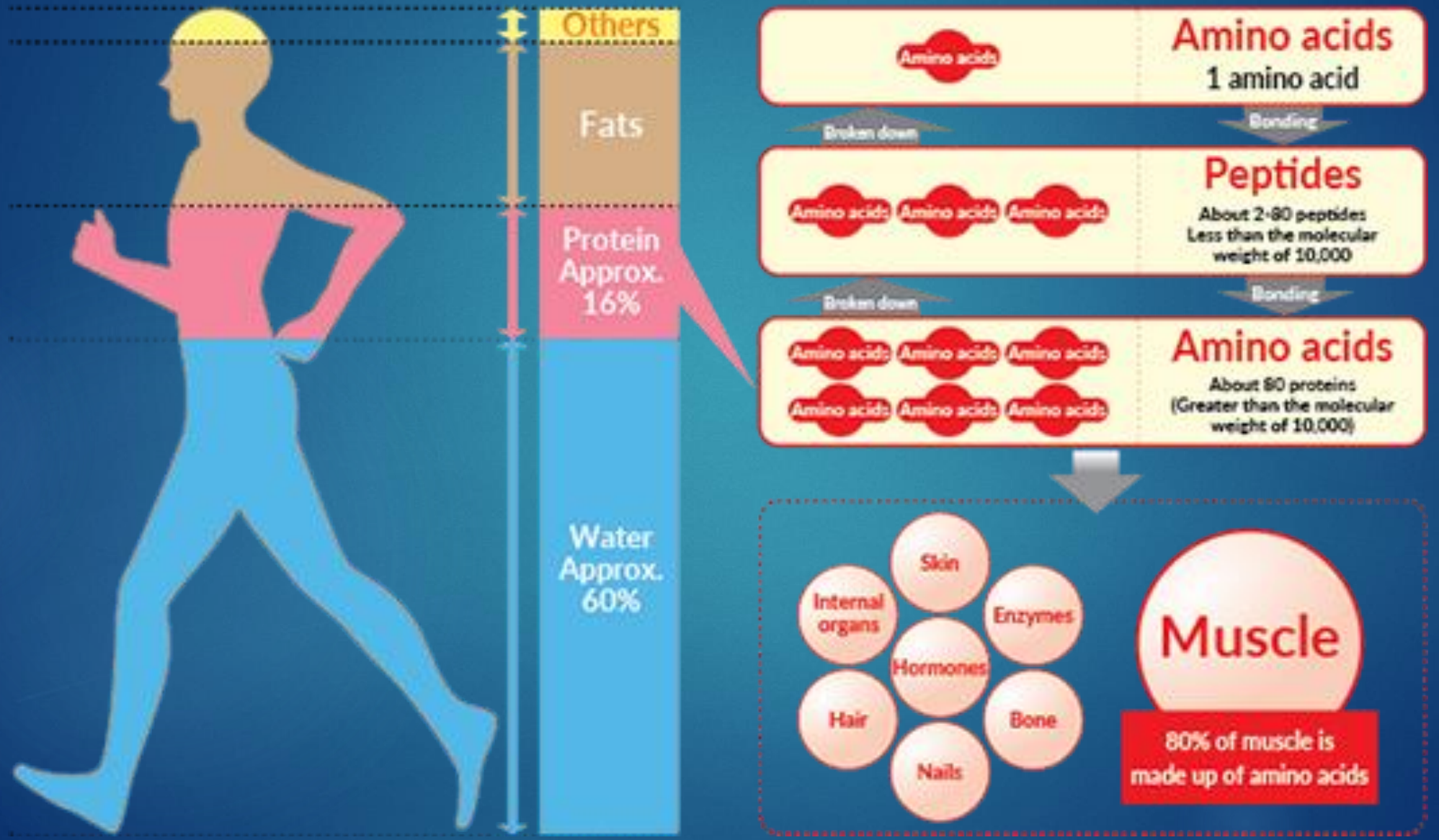
- Ribonucleic acid (RNA) is a polymeric molecule essential in various biological roles in coding, decoding, regulation and expression of genes.



protein The Building Blocks of Life

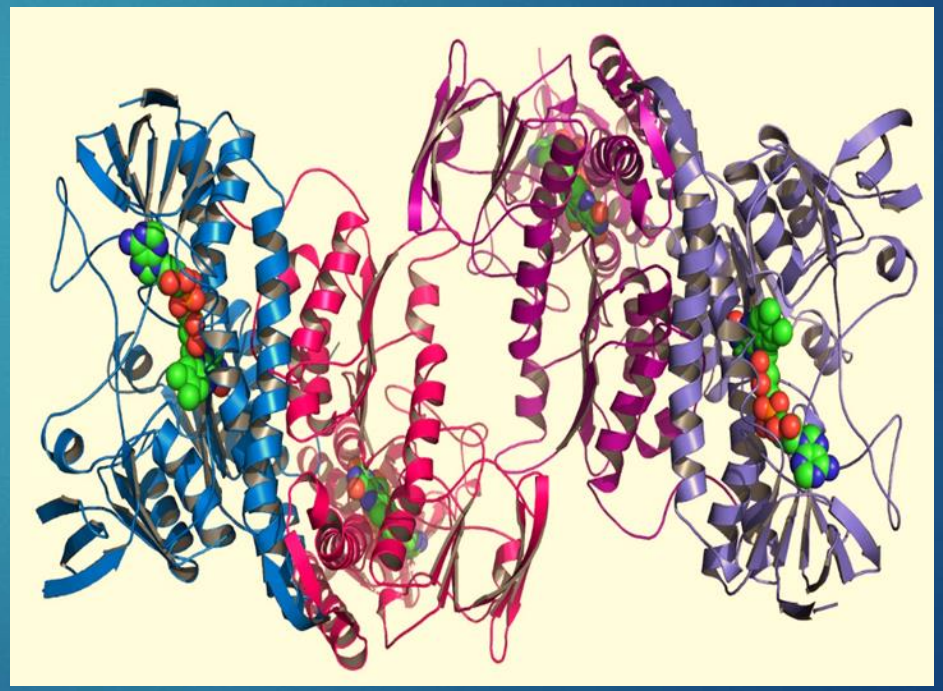
- Proteins are large, complex molecules that play many critical roles in the body. They do most of the work in cells and are required for the structure, function, and regulation of the body's tissues and organs. ... These proteins provide structure and support for cells. On a larger scale, they also allow the body to move.

Body composition



Along with water, protein is the most abundant substance in the body, with most of it located in the muscle tissue. The protein we consume provides the basic **building blocks** of the human body.

- Protein as we know it



- Protein structure!

Molecular genetics

- Molecular genetics is the study of the molecular structure of DNA, its cellular activities (including its replication), and its influence in determining the overall makeup of an organism.

The significance of Molecular genetic & M. Biology

Dawn of the DNA age

- **The Human Genome Project** was an international scientific research project with the goal of determining the base pairs that make up human DNA, and of identifying and mapping all of the genes of the human genome from both a physical and a functional standpoint.
- April 14, 2003: The Human Genome Project was completed.

In Medicine

- Molecular Assessment of genetic Diseases
- Generation of Vaccines
- Diagnosis of Infection, bacterial, viral
- Gene Therapy
- Pharmacogenetics

Diagnosis of Infection, bacterial, viral

COVID-19 testing

- Real-Time RT-PCR Diagnostic Panel is a real-time RT-PCR test intended for the qualitative detection of nucleic acid from the 2019-nCoV in upper and lower respiratory specimens.
- The oligonucleotide primers and probes for detection of 2019-nCoV were selected from regions of the virus nucleocapsid gene.
- RNA isolated from upper and lower respiratory specimens is reverse transcribed to cDNA and subsequently amplified.
- In the process, the probe anneals to a specific target sequence located between the forward and reverse primers. During the extension phase of the PCR cycle, the 5' nuclease activity of Taq polymerase degrades the probe, causing the reporter dye to separate from the quencher dye, generating a fluorescent signal.
- Fluorescence intensity is monitored at each PCR cycle.

civil and criminal law

- Forensic Science, in almost all crimes of violence, murder, rape, or assault, there is usually some type of biological material left at the scene or on the victim. Catastrophes to identify human remains from disaster scenes.
- Establish Paternity.

Biotechnological science

- Edible vaccine
- Transgenic plants & animals
- Recombinant Drug industry
- Environmental Science
- Industry

Other's…

- Agriculture
- Genetic counseling.
- Phylogenetic analysis
- Genealogy

Keep your DNA Safe

Tobacco Smoke

- Scientists have known for decades that smoking cigarettes causes DNA damage, which leads to lung cancer.
- The p53 protein is the most frequently mutated tumor suppressor in cancer, responsible for a range of critical cellular functions that are compromised by the presence of a mutation.

Radiation

- UV radiation causes distortion to the DNA's structure, introducing bends or kinks and thereby impeding transcription and replication.

- Wear a wide brim hat to shade your face, head, ears, and neck. Wear sunglasses that block both UVA and UVB rays. Use sunscreen with sun protection factor (SPF) 30 or higher, for protection.

Free radicals

- A free radical can be defined as any molecular species that contains an unpaired electron in an atomic orbital. The presence of an unpaired electron results in certain common properties that are shared by most radicals. Many radicals are unstable and highly reactive.

Avoid:

- Fried foods, junk food.
- High glycemic foods, or foods that are rich in refined carbohydrates and sugars. They are more likely to generate free radicals.
- Limit processed meats such as sausages and salami. They contain preservatives, also leads to the production of free radicals.
- Don't reuse cooking fats and oils. Heating fats and oils during cooking oxidizes them, generating free radicals which leak into our foods.

Keep your DNA Safe
Eat Healthy

- **Avoid** junk food because DNA is subject to oxidative damage from byproducts of metabolism, such as free radicals. In fact, it has been estimated that an individual cell can suffer up to one million DNA changes per day.
- **Consume** a diet rich in antioxidants.
- Antioxidants are compounds that inhibit oxidation. Oxidation is a chemical reaction that can produce free radicals, thereby leading to chain reactions that may damage the cells.
- Antioxidants such as ascorbic acid (vitamin C) terminate these chain reactions.

Antioxidants

Induction of natural antioxidants (glutathione, superoxide dismutase, catalase)

- Curcumin, watermelon juice, black grape juice, kukoamine A (tomato & potato).

Free radical scavenging activity

- Carvacrol (oregano essential oil), coenzyme Q10 (Cold water fish, like tuna, salmon) , vitamin E, melatonin and Resveratrol is a plant compound (grapes, and peanuts).
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Decreased DNA damage

- vitamin C, green tea extract, apigenin (parsley, celery, and chamomile), rosmaric acid, Quinic acid (coffee beans) and vitamin E.

Excerpt of the analyses of nuts, legumes and grain products in the Antioxidant Food Table.

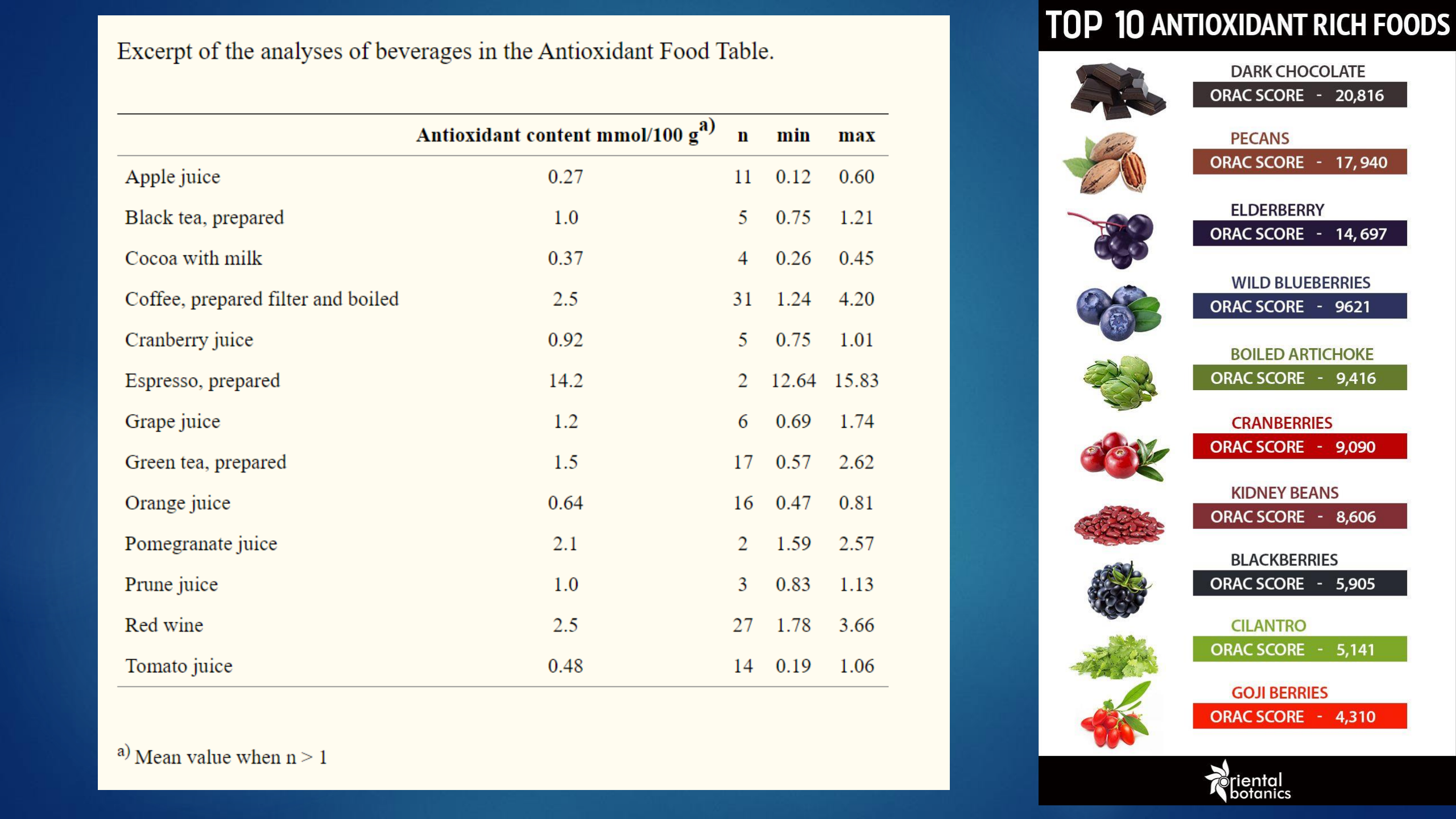
	Antioxidant content mmol/100 g[a)]	n	Min	Max
Barley, pearl and flour	1.0	4	0.74	1.19
Beans	0.8	25	0.11	1.97
Bread, with fiber/whole meal	0.5	3	0.41	0.63
Buckwheat, white flour	1.4	2	1.08	1.73
Buckwheat, whole meal flour	2.0	2	1.83	2.24
Chestnuts, with pellicle	4.7	1	-	-
Crisp bread, brown	1.1	3	0.93	1.13
Maize, white flour	0.6	3	0.32	0.88
Millet	1.3	1	-	-
Peanuts, roasted, with pellicle	2.0	1	-	-
Pecans, with pellicle	8.5	7	6.32	10.62
Pistachios	1.7	7	0.78	4.98
Sunflower seeds	6.4	2	5.39	7.50
Walnuts, with pellicle	21.9	13	13.13	33.29
Wheat bread, toasted	0.6	3	0.52	0.59
Whole wheat bread, toasted	1.0	2	0.93	1.00

mean value when n > 1

Excerpt of the analyses of beverages in the Antioxidant Food Table.

	Antioxidant content mmol/100 g[a)]	n	min	max
Apple juice	0.27	11	0.12	0.60
Black tea, prepared	1.0	5	0.75	1.21
Cocoa with milk	0.37	4	0.26	0.45
Coffee, prepared filter and boiled	2.5	31	1.24	4.20
Cranberry juice	0.92	5	0.75	1.01
Espresso, prepared	14.2	2	12.64	15.83
Grape juice	1.2	6	0.69	1.74
Green tea, prepared	1.5	17	0.57	2.62
Orange juice	0.64	16	0.47	0.81
Pomegranate juice	2.1	2	1.59	2.57
Prune juice	1.0	3	0.83	1.13
Red wine	2.5	27	1.78	3.66
Tomato juice	0.48	14	0.19	1.06

[a)] Mean value when n > 1



Thank you for your attention