

## RESEARCH ARTICLE

### AMBIENT, ECOLOGICAL, CYTOPLASMIC, HUMORAL METABOLIC, ENDOCRINE AND PSYCHIC FACTORS THAT INFLUENCE MORBIDITY FROM VIRAL, BACTERIAL AND FUNGAL AGENTS

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#### ABSTRACT

Since February of year 2020 AD, alleged COVID-Corona Virus morbidity has promoted hyper-vigilance in the hope of reducing morbidity from an Imagined Epidemic. Rampant confusion abounds despite expert opinions voiced over news media. An evidence based report has been prepared to establish that NON-CHROMOSOMAL FACTORS SUPERCEDE SPECIFIC VIRAL BASE-PAIR NUCLEIC ACID SEQUENCE FOR IMMUNITY.

**Key words:** Immunity, Invention,

#### INTRODUCTION

The various known classes of immune-system modulating cells (such as lymphocytes) display specializations: but these are not easily identified with any medically useful specifics. Factors known to influence immune competence are reviewed here, and these factors apply to ALL vertebrate species: from dogs to horses: not just to hominids and primates.

#### AMBIENT OXYGEN

Dr Otto H. Warburg is reknowned as ardent advocate of oxygen for human health (Warburg, 2010). Crowding in urban areas promotes infectious disease by accumulation of metabolic waste and reduced oxygen from lack of foliage. Poor ventilation, toxic water and air, and atmospheric particulate matter also contribute. Cumulative depletion of oxygen can be quantified by laboratory tests for lactate (McNab, 2002). Risk for severe sepsis, and subsequent morbidity and mortality (Garcia-Alvarez *et al.*, 2014) are rarely ever universal: despite predictions of epidemiology studies based on demographics. Ozone, iodine, fluorine, bromine, and chlorinated compounds are anti-microbial: with various safety limits. Enzymes such as catalase, and regulators of redox chemistry, are known to alter microbial communities (Gerna *et al.* 2020). Supporting aerobic respiration and mitochondria are vital.

#### OXIDATION REGULATORS

Rind, and inner liquid-filled sacs of lime and lemon; and juices of orange, tangerine and grapefruit; along with the green insides and black seeds of the kiwi fruit and its edible hairy skin; as well as the fleshy covering of durable seeds of tamarind protected by outer pod sheath, are natural sources of Vitamin C (ascorbate; ascorbic acid). Synthetic vitamin C should be ingested alongside natural fruit such as apricot, pear,

blueberry, mulberry, and such, for synergy with bioflavonoids: perhaps reducing adverse effects (Aggarwala, Gupta and Lane 1998; Lane, Aggarwala and Gupta 1998; Moon, 1999). Laboratory tests for determining ascorbic acid in animal fluids and cell assemblies (Omaye, Turnbull and Sauberlich, 1979) are hardly ever requested by medical doctors. Other major oxygen regulators include various molecular variants that are regarded as belonging to the tocopherol and tocotrienols of Vitamin E; and favorable non-competing carotenoids and Xanthins. Supplemented Beta carotene and related carotenoid molecules decrease levels of tocopherol (Vitamin E) in blood plasma and liver (Blakely *et al.*, 1990; Woodall *et al.*, 1996).

#### ECOLOGICAL DYNAMICS

Ecology enters human affairs (Brown & Gibson, 1983) at *FIRST STAGE*, as multiple *INPUTS*: ingested milk, egg, fruit, vegetable, and meat; radiation, moisture and ambient noise. At *SECOND STAGE* psychic response and somatic memory produce reactions that influence self and others. Nutrient deployment enables signaling, locomotion, growth, repair, defense, reproduction, creative expression, and longevity. Viral, bacterial, fungal or microbial load in general, by itself, does not determine individual coping ability. Just as every butterfly, wasp, and hummingbird learns its ecological role and finds its niche based on visual and other stimuli, modeling generative ecology such as nectar production as a feedback system is useful but can be limited. Individual cells and assembled tissue can each have ecological dynamics; as we hope humans do, with family units and their extensions.

**CYTOPLASM ENTRY:** Disruption of prokaryote and eukaryote cell membrane by enzymatic acceleration of viral substrate-binding can rapidly enable entry (March & Helenius, 2006) of viral RNA into the host cell, leading to disarray of regulatory processes that enable the cell to utilize local chemical, osmotic, and temperature cues for growth, mobility, and survival. Factors that influence virus entry past host cell barrier for the Human Immunodeficiency Virus (HIV) being well documented after decades of scientific rigor, and billions

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in financial allocation (Wilén *et al.* 2012), are more than likely, applicable to all species of virus, regardless of individual genetic sequences. Viral adhesion and host cytoplasm entry occurs by a pH dependent process: Acidic environments tend to promote conformational changes in host cell membrane, encouraging viral envelope fusion, followed by protein molecule transfer across host cell membrane. The role of alkaline forming foods and potable natural spring water of pH acid-base balance close to 8.5 or higher is documented.

**HUMORAL IMMUNITY:** Lymph-related cellular systems (Th1-like cells), despite their astounding complexity, are derived from circulating blood and lymph-- and are subject to alteration over durations ranging from 15 minutes (such as reversal of itching after topical eye-drop: see Abelson *et al.* 2009) to about 3 months (such as reversal of HbA1c elevation): see Preuss & Anderson, 1998). Evolutionary paths determined by symbiotic cooperation (See Lynne Margulis: book, *Microcosmos*) do not exclude a vital role for viral infection. Salivary immunoglobulins are altered in minutes after inducement of a relaxation response (Green and Green 1987).

**BARRIER TISSUE INTEGRITY, DEFENSE, REPAIR:** Integrity of epithelial and connective tissue, strongly impact permeation of toxins and extra-cellular fluid (Huang *et al.* 1991): with potential applications for prevention of sepsis. Reversal of cellular anomalies (such as recovery from a skin abrasion) requires enzymes and cofactors for utilization of dietary and intravenous nutrient inputs (Garrett and Grisham, 2010). Neurological and endocrine factors can enhance immune defense to prevent malaise, dysfunction, and morbidity. Professional guidance, cooperation from community and government can improve public health. Molecular structures of phospholipid membranes, with ionic channels, tight junctions and diffusion coefficients, are variously permeable (Lane and Aggarwala, 1999a). Remodeling of blood-brain barriers requires adequate pyridoxine (Vitamin B-6; Pyridoxal) which is entirely lost by cooking near the boiling point of water for a duration exceeding 15 minutes.

**VACCINE EFFECTS:** Influencing immune effects by way of secreted protein moiety is a traditional approach. Peptides secreted by microbes are so multifarious (Bugalhao and Mota, 2019) that uniquely encoded vaccinations may have limited utility. For the case of influenza virus, innate immune mechanisms in ducks are known to prevent disease onset (Fleming-Canepa *et al.* 2019). Vaccines for immune system regulation have had a history peppered with huge successes and equal failures. In Australia, among other regions, high rates of pertussis vaccination have not prevented an emergence of epidemics every 3 to 5 years since 1991: 39,000 cases being recorded at a peak in 2011 (Zheng *et al.* 2019).

## MINERAL TRANSPORT

Nutrient metals, enzymes and cofactors (vitamin, phytochemical) can be stored or circulated, and perform vital roles as part of complex molecules and multi-stage biochemistry (Boik, 2001; Bidlack, Omaye, Meskin & Jahner 1998). Deficiency and impaired transport of the trace mineral copper (Cu) impairs nerves and enzymes, and oxygen use in mitochondria (Dipaolo, Kanfer and Newberne, 1974; Danks, 1988).

Trace elements such as selenium and zinc are known to enable key essential enzymes, and their retention is influenced by competing minerals and chelating agents. Present day synthetic formulations, while useful, may not adequately replicate the wisdom of Nature. Seeds of pumpkin, with highly concentrated zinc, provide a range of amino acids and essential fatty acids. Seeds of sunflower have nutrients for building brain levels of phosphatidyl serine: promoting long-term and short term memory; and stable cognition.

## COOPERATIVE AGRICULTURE

Data of soil erosion are so drastically divergent, that no consensus can be attempted. A 1977 survey of 283 farms in eight US states suggested unacceptable soil erosion in 84 percent farms. Another study of year 1980 gave the number as a mere 20 percent (Blanpied, 1984). It may not be reasonable to regard increased soil erosion as a consequence of more land area cultivated from 1969 to 1981 (17 percent). Furthermore, the rapid expansion of biotechnology to enhance crop gene expression left vacant the myriad applications earlier conceived for plant root interactions toward cooperative growth and reduced pestilence. Such errors of omission may be in part consequent upon disparate methodologies for documenting and interpreting field notes (Sanjek, 1990). From a lifetime of recollections, Jane Goodall laments the loss of enchanting forests, fields and mixed pastures of wildflowers inhabited by rabbits and visited by songbirds (Goodall and Hudson, 2014). Clearing of forest may have proceeded at different rates by geography. If the oldest civilization is the Egyptian, settled agriculture could date back to about 6,000B C. Aggressive defence and acquisition of territory appeared after adoption of the Geometry of the Pythagoras Rule or Theorem for land area measurement (about 700 BC). Organized labor was not an invention of Post-Reformation Colonial expansion. Inter-country efforts for cooperative agricultural exchange: such as wheat and cattle between North India and the USA from New Jersey to the Midwest were mutually beneficial (Aggarwala, RK 1979 to 2010). If nutrient uptake tests (using synthetic fertilizer) reveal loss of plant and seed viability, adding volcanic ash, bird and mammal excrement, and decomposing insects such as the dung beetle, may be an option.

## GROWTH, GREED, CAPITAL, INVESTMENT, LABOR, LAW

Significantly increased depletion of soil may have been documented since the Second World War, but the process began from wide application of the tractor introduced by Henry Ford for families owning greater than about 350 acres. The year 1932-33 was desperate witness to near 80 percent decline in the US Gross National Product (GNP), manufacturing decrement near 55 percent, and 75 percent deficit for new infrastructure and building construction. *The hubris of corporate hegemony, clearly manifested in Ford's assembly line retooling from Model T to Model A with sudden pink slips in 1927* for 100,000 workers, was left unpunished by Federal and State administrators. Vicious tear gassing and gunfire upon protestors in Michigan (1932) was tolerated by panels of State and Supreme Court adjudicators who claimed, contrary to evidence, that workers enjoyed freedom to choose in a laissez-faire economy where wages were negotiable (Lichtenstein, 2002).

The closer truth poorly revealed, is that Machiavellian employers advocate for an economy in which worker wages rise only for competitors, and prices do not reflect operational costs with growth and research factored in. Potentially ANY dollar amount could be extracted from the unwary consumer; who compares and cost and safety of alternative solutions in reaching a decision. Our celebrated Bill of Rights was attributed to the more powerful land owning President Jefferson, rather than to the itinerant revolutionary Thomas Paine who died with none at his bedside.

**GOVERNMENT INFORMATION:** Adherence to Government guideline, tabular information, and recommended milligrams may prevent stark deficiency but rarely ensures dosage optimized individually. Regulatory enforcement by the Food and Drug Administration would require recruiting professionals trained in medical, physiological, and psychic attributes of disease management to work full-time as officers of the FDA, under various classifications of the Department of Health and Human Services and the Office of Dietary Supplements. Products crossing State and ational Borders could be approved by the signing of a certified document stating adherence to government requirements at the risk of penalty upon betrayal that results in public health consequence. The Federal Trade Commission may someday require Pyridoxine to be adequately included in protein powder supplements.

### EMERGENCY PREPARATION

During a crisis, we need to interpret and reconcile motivational drives that result from internal conflict that requires choosing integrity over group loyalty. Recovery from trauma is in greater part a personal journey, to which professionals in clinical psychology and psychiatry merely pay lip service. Reexamination of loyalty to dysfunctional affinities, *being courageous in the face of fear of potential ex-communication from an Elite Club or Clique* is the first step toward resolution of crisis. Finding and adopting a new social ecosystem requires additional steps to channel talent and resources toward an ambitious and attainable planned outcome.

### BIOMEDICAL TESTS

Routine biomedical liver enzyme tests (transaminase) provide a quantitative metabolic indicator (Lane and Aggarwala 1999b) better than B-6 (pyridoxine) levels determined from a phlebotomy. Magnesium and vitamin B-6 appear to work in synergy and deficits make us susceptible to cognitive dysfunction, diabetes, and neuro-muscular spasmodic conditions such as constipation, asthma, recurrent headache (such as cluster or migraine), elevated blood pressure, tachycardia, angina, arrhythmia, irregular gait or related anomalies. Supplemental calcium for increasing bone density can be hazardous for neuro-muscular actions of magnesium; in addition to promoting calcification of soft tissue. Technology innovators may do well to develop biomedical tests that provide quantitative information about nutrients that support synthesis of neurotransmitters, hormones and tissue remodeling. Perhaps some of these new inventions could be based on principles of spectroscopy attributable to original investigators like Witelo, Fraunhofer and Fourier.

**LYMPHATIC EFFECTS:** Immune cells such as lymphocytes routinely conduct surveillance of the fluid-filled cavities of the inter-cellular spaces and circulatory structures in the body in avian and mammalian species. Such intrinsic bodily immune agents include “T” lymphocytes and “NK” cells—both known to help to initiate defense against viral intruders, and maintain a tolerable rate of viral replication. Innate and adaptive immunity is involved in wide range of physiological derangements such as auto-immune conditions and cancer. Tocopherols and tocotrienols (natural forms of Vitamin E), proanthocyanidins, monoterpenes, and fatty acids in foods such as whole fish, ground flaxseed meal, hemp milk, and pecans may increase NK lymphatic cytotoxic effects, in part because components have enhanced immune antigen production in published studies (Boik 2001). Release of histamine from basophils residing in connective tissue (mast cells), and by The Complement System immune proteins of the blood-lymph and extracellular fluid cascade to edema, angiogenesis and vascular leakage: resulting in external and internal wounds that are manifestations of inflammatory process forming the substrate for diverse disorders ranging from psychosis to macular edema.

Protection from inflammation is offered by dietary precursors to prostanoids and leukotriene: and eicosanoid action in various cell assemblies (tissue, organelles) occurs in short time spans over localized regions; regulated by neural stimuli (Kihara 2019); and synaptic interactions in the emotional brain are subject to environmental stressors. Penetration of host cell membrane can be made easier by exposure to chemical agents and by radiation from various sources. The exact dosages of radio-frequency radiation needed to make a pancreatic cell permit viral entry may require additional laboratory investigations for which funding could be forthcoming.

### TOXIC AGENTS

Known offending agents such as arsenic, lead and cadmium; even though poorly regulated by governmental regulatory bodies such as the EPA, are cited in numerous documents as highly toxic. Concern for the neurologically active silvery liquid metal mercury is mostly limited to legislation to for a minimal dose of thimerosal in vaccines; perhaps less conspicuous compared to the 22,000 tonnes of lead mixed automobile manufacture waste (1957 to 1981) dumped in New Jersey. Other than toxic metals there are numerous other known toxic agents that were once endorsed by the FDA (perhaps with convincing evidence, now refuted), there is one that deserves particular mention. The mineral element LITHIUM, with the safety of its pharmaceutical use in psychiatry quite questionable, is also an environmental hazard from rechargeable battery units. Food products that may have passed earlier may today be restricted. Chemical agents like high-fructose corn syrup in confectionary products and beverages, and sulfites in wine bottles have dubious safety records.

### PHYTOCHEMICALS

Known since antiquity (Altman, 1994) and confirmed recently by numerous microbiology studies, the active phytochemicals in olive leaf and the flesh of the olive are noticeably immune enhancing (Thea Magrone *et al.* 2018). Active ingredient Oleuropein (OLE) is a secoiridoid unique to *Oleaceae* species, and mediates plant-herbivore interaction.

In a recent study, acting as a signaling molecule, OLE altered gene-expression and re-oriented metabolic pathways, buffered reactive oxygen species accumulation, and facilitated beneficial microbes such as *L. plantarum*, in a reciprocal (Aggarwala, 2020: In Press) cooperative survival strategy (Santamaria *et al.* 2019). Other general immune regulating natural substances have been reviewed (Roxas and Jurenka 2007); and studies on mushroom hypolipidemic, anti-thrombotic, anti-viral, antitumor, and immune potentiating effects (Bidlock, Omaye, Meskin, Jahner 1998) are well documented. A recent commentary on an ancient herbal Ayurveda approach to the COVID-Corona virus has been received (Rajkumar 2020).

## PSYCHIC FACTORS

Attempts to psycho-socially enhance the neural control of immune cells—tend to be most effective in children (Seddon *et al.* 2018) during the “Wonder Years” starting at the age when two-way verbal communication and negotiation ability is established (like 2 to 5 years) till the age at which the child’s sense of delight and wonder at the mystery and bounteous appearance of the natural world diminishes in favor of mundane interpretations (perhaps age 12 to 23 years). The mystical sense of wonderment and delight exhibited by young children observing pollination of a hibiscus or pomegranate by a butterfly, bee, wasp, hummingbird and such may be feasible to cultivated at ANY age especially during private garden encounters, and perhaps even in a large forum.

## REFERENCES

- Abelson MB, Torkildsen GL, Williams JI, *et al.*, 2009. Time to onset and duration of action of the antihistamine bepotastine besilate ophthalmic solutions 1.0% and 1.5% in allergic conjunctivitis: a phase III, single-center, prospective, randomized, double-masked, placebo-controlled, conjunctival allergen challenge assessment in adults and children. *Clin Ther.* Sep; 31(9): 1908-21.
- Aggarwala KRG (In Press) Ecological thinking and reciprocal altruism may promote world peace, creative collaboration and sustainable development. *International Journal of Information Research and Review*.
- Aggarwala KR, Gupta S, and Lane BC. 1998. Ascorbic acid supplementation prevents uptake of supplemental chromium when taken conjointly. American Public Health Association 126<sup>th</sup> Annual Meeting and Exposition: Public Health and managed Care, November 15-18, Washington DC, Food and Nutrition Session #3111, p 360.
- Aggarwala RK 1979. Twenty one years of personal communications with my father, Raj: referencing exchanges between veterinary medicine and botanical research departments in pre-1947 Pakistan, North India, and the USA: in part directed by his father, Colonel Amin Chand Aggarwala.
- Aldad TS, Geliang G, Gao X-B and Taylor HS, 2012. Fetal Radiofrequency Radiation Exposure From 800-1900 MHz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice. *Sci Rep* 2: 312
- Altman N, 1994. Sacred Trees: Sierra Club Books, San Francisco, pages 49, 100-101.
- Amemiya T 1988. Effects of vitamin E and selenium deficiencies on rat capillaries. *Int J Vit Nutr Res.* 59: 122-126.
- Boik, J, 2001. Natural compounds in cancer therapy. Promising nontoxic antitumor agents from plants and other natural sources.
- Bettger WJ. and O’Dell BL. 1981. A critical physiological role of zinc in the structure and function of biomembranes. *Life Sci* 28: 1425-1438.
- Bidlock WR, Omaye ST, Meskin MS, and Jahner, D. 1998. *Phytochemicals: A New Paradigm.* Technomic Publishing Company: Lancaster, Basel.
- Brown James H & Gibson Arthur C 1983. *Biogeography.* The C. V. Mosby Company. St Louis, Toronto, London.
- Bugalhao JN, Mota LJ, 2019. The multiple functions of the numerous *Chlamydia trachomatis* -secreted proteins: the tip of the iceberg. *Microb Cell.* Aug 21; 6(9): 414-449.
- Chen H, Peng Y, Zhang Y and Corlett RT 2015. Winter cropping in *Ficus tinctoria*: an alternative strategy. *Sci Rep.* Nov 12: 5.
- Danks DM 1988. Copper deficiency in humans. *Annu Rev Nutr*; 8: 235-257.
- Dipaolo RV, Kanfer JN, Newberne PM, 1974. Copper deficiency and the central nervous system: Myelination in the rat: morphological and biochemical studies. *J Neuropathol Exp Neurol* Apr; 33(2):226-36.
- Fleming-Canepa X, Aldridge JR Jr, Canniff L, Kobewka M, Jax E, Webster RG, and Magor KE. 2019. Duck innate immune responses to high and low pathogenicity H5 avian influenza viruses. *Jan.* 228: 101-111.
- Garcia-Alvarez, M, Marik, P, Bellomo, R. 2014. Sepsis associated hyperlactatemia. *Critical Care*; Sept 9: 18(5): 503
- Garrett RH, Grisham CM, 2010. *Biochemistry: Fourth Edition.* Brooks-Cole-Cengage Learning, Boston.
- Gerna D, Roach T, Mitter B, Stoggl W and Kraner I 2020. Hydrogen Peroxide Metabolism in Inter-kingdom Interaction Between Bacteria and Wheat Seeds and Seedlings. *Mol Plant Microbe Interact.* Feb 33(2): 336-348.
- Goodall, J and Hudson, G 2014. *Seeds of Hope. Wisdom and Wonder from the World of Plants.* Grand Central Publishing; New York, Boston.
- Green R, Green M, 1987. Relaxation increases salivary immunoglobulin A. *Psychological Reports* 61, 623-629.
- Hamit HF, David HE, Stevens JC. 1980. Dermatitis due to zinc deficiency associated with prolonged malnutrition and total parenteral nutrition. *World J Surg* 4: 693-698.
- Hardell L, Nyberg R 2020. Appeals that matter or not, on a moratorium on the deployment of the fifth generation: 5G, for microwave radiation. *Mol. Clin. Oncol.* 12(3); 247-257.
- Heimbürger DC, Tamura T, Marks RD (1990) Rapid improvement in dermatitis after zinc supplementation in a patient with Crohn’s disease. *Am J Med.* 88: 71-73.
- Huang AI, Tseng S, and Kenyon KR 1991. Changes in paracellular permeability of ocular surface epithelium by vitamin A deficiency. *Invest Ophthalmol Vis Sci.* 32; 633-639.
- IBrulj S, Haveric S, Haveric A, Durmic-Pasic A, Marjanovic D 2006. Effect of war and post-war genotoxins on micronuclei frequency in Sarajevo Study Group. *Bosn J Basic Med Sci* Nov 6(4), 54-57
- Kihara Y, 2019. Systematic Understanding of Bioactive Lipids in Neuro-Immune Interactions: Lessons from an Animal Model of Multiple Sclerosis. *Adv Exp Med Biol* 1161; 133-148.

- Lane BC, Aggarwala KR, and Gupta S. 1998. Vitamin C- how much is too much? American Public Health Association, 126th Annual Meeting and Exposition: Public Health and managed Care, November 15-18. Vision Care Session #3155, p386.
- Lane BC. And Aggarwala KR. 1999a. Dietary risk factors associated with exudative maculopathy progression. Vision (19)'99 Abstract Book, [Meeting held at the Waldorf Astoria], p 237.
- Lane BC and Aggarwala KR, 1999b. Elevation of diet-responsive RBC transaminase and excessive intake of denatured protein as risk factors for exudative maculopathy progression. Journal of the American College of Nutrition: 18 (October 5), p548. Abstract #102
- Lichtenstein N 2002. State of the Union: A Century of American Labor. Princeton University Press.
- Marsh M, Helenius A. 2006. Virus entry: Open sesame. Cell 124: 729–740.
- Marjanovic AM, Pavicic I, and Trosic I, 2012. Biological indicators in response to radio frequency microwave exposure. Arch. Hig. Rada Toksikol. 2012; 63:407–416.
- McNab, BK, 2002. The Physiological Ecology of Vertebrates: A view from energetics. Comstock Publishing Associates, Cornell University Press, Ithaca and London.
- Moon, MA 1999. Vitamin C interferes with chromium absorption. *Internal Medicine News*: 32 (2), 24.
- Omaye ST, Turnbull JD and Sauberlich HE, 1979. Selected methods for the determination of ascorbic acid in animal cells, tissues and fluids. *Meths.Enzymol.* 62:p3-11.
- Preuss HG, Anderson, RA, 1998. Chromium update: examining recent literature 1997-1998. *Curr Opin Clin Nutr Metab Care.* Nov 1 (6): 509-12.
- Rajkumar RP, 2020. Ayurveda and COVID-19: where sychoneuroimmunology and the meaning response meet, *Brain, Behavior, and Immunity*: Received April 21.
- Roxas M and Jurenka J, 2007. Colds and influenza: a review of diagnosis and conventional, botanical, and nutritional considerations. *Altern Med Rev* March: 12(1) 25-48.
- Sanjek R, 1990. Fieldnotes: The making s of anthropology. Cornell University Press: Ithaca and London.
- Seddon JA, Chiang S, Esmail H and Coussens AK. 2018. The Wonder Years: What Can Primary School Children Teach Us About Immunity to *Mycobacterium tuberculosis*? *Front Immunol.* Dec 13: 9, 2946.
- Shils ME, Olson JA, Shike M, & Ross C. 1999. Modern nutrition in health and disease. Ninth Edition, Lippincott Williams & Wilkins, Philadelphia.
- Slomanson WR 2007. Fundamental perspectives in International Law, Fifth Edition; Thomson Wadsworth.
- Thea Magrone, Anna Spagnoletta, Rosaria Salvatore, Manrico Magrone, Francesco Dentamaro, Matteo A. Russo, Graziana Difonzo, Carmine Summo, Francesco Caponio and Emilio Jirillo 2018. Olive Leaf Extracts Act as Modulators of the Human Immune Response *Endocrine, Metabolic & Immune Disorders - Drug Targets*, Vol. 18, 85-9.
- Viets M, Khait I, and Obolski U *et al.*, 2019. Flowers respond to pollinator sound within minutes by increasing nectar sugar concentration. *Ecology Letters* 22: 1483–1492.
- Warburg O. H. 2010. The classic: The chemical constitution of respiration ferment. *Clinical orthopaedics and related research*, 468(11), 2833–2839.
- Wilén CB, Tilton JC and Doms RW (2012) HIV: Cell Binding and Entry. University of Pennsylvania, Philadelphia. Cold Spring Harbor Perspectives in Medicine.
- Woodall AA, Britton G, Jackson MJ, 1996. Dietary supplementation with carotenoids: Effects on alpha-tocopherol levels and susceptibility of tissues on oxidative stress. *Br J Nutr* 76; 307-317.
- Zheng Xu, Sophie Octavia, Laurence Don Wai Luu *et al.* 2019. Pertactin-Negative and Filamentous Hemagglutinin-Negative Bordetella pertussis, Australia, 2013–2017. *Emerg Infect Dis.* Jun; 25 (6): 1196-1199.

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