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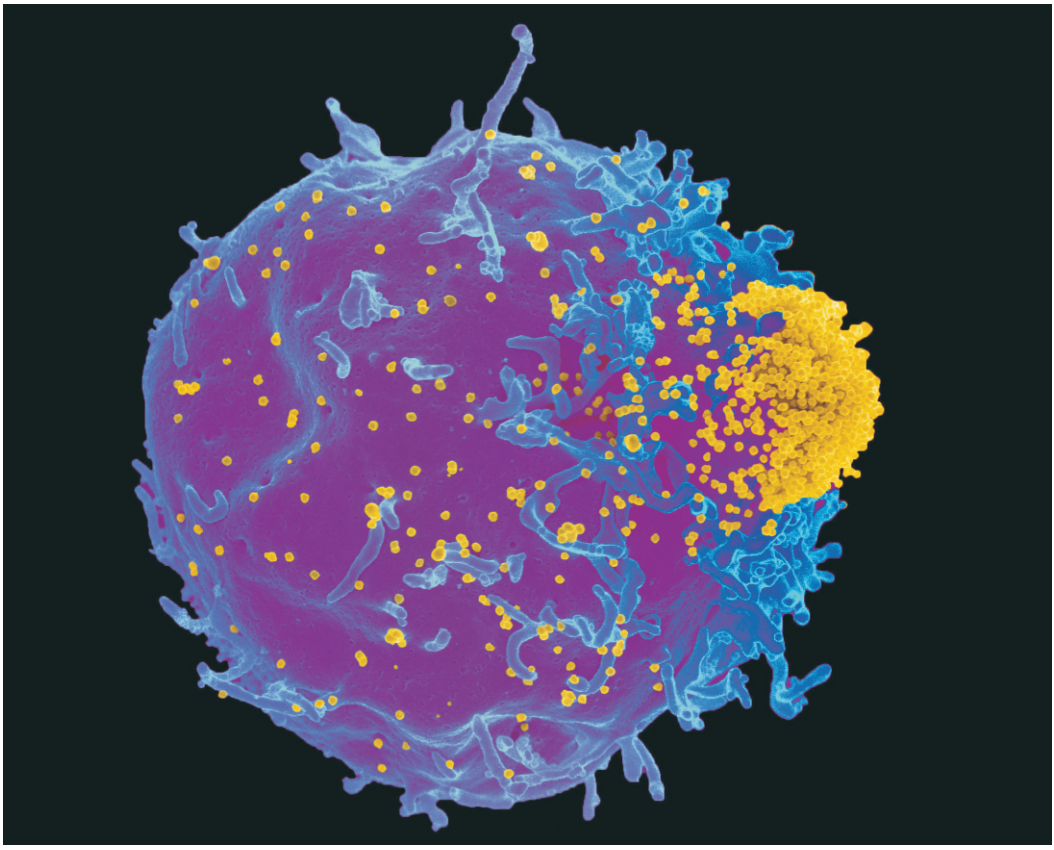

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ISBN: 978-1-946898-11-1

Published in 2017 by Open Science Publishers

228 Park Ave., S#45956, New York, NY 10003, U.S.A.

http://www.openscienceonline.com

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The Endosymbiotic Archaea, Fructose Disease, Autoimmunity and Global Warming

Global warming induces endosymbiotic archaeal and RNA viroidal growth. The porphyrins form a template for the formation of RNA viroids, DNA viroids, prions, isoprenoids and polysaccharides. They can symbiose together to form primitive archaea. The archaea can further induce HIF alpha, aldose reductose and fructolysis resulting in further porphyrinogenesis and archaeal self replication. The primitive archaeal DNA is integrated along with RNA viroids which are converted to their corresponding DNA by the action of redox stress induced HERV reverse transcriptase into the human genome by the redox stress induced HERV integrase. The archaeal DNA sequences that are integrated into the human genome forms endogenous archaeal human genomic sequences akin to HERV sequences and can function as jumping genes regulating genomic DNA flexibility. The integrated endogenous genomic archaeal sequences can get expressed in the presence of redox stress forming endosymbiotic archaeal particles which can function as a new organelle called the archaeaons. The archaeaon can express the fructolytic pathway constituting an organelle called the fructosome, cholesterol catabolic pathway and digoxin synthetic forming an organelle called the steroidelle, the shikimic acid pathway forming an organelle called the neurotransminoid, antioxidant vitamin E and vitamin C synthetic organelle called the vitaminocyte as well as the glycosaminoglycan synthetic organelle called glycosaminoglycoid. The archaea can secrete capsulated RNA viroidal particles which can function as blocking RNAs modulating cell metabolism and such archaeaon organelle are called viroidelle. The archaea suppresses pyruvate dehydrogenase and promotes fructolysis resulting in accumulation of pyruvate which enters the GABA shunt pathway producing succinyl CoA and glycine, the substrates for porphyrin synthesis. Porphyrin forms a template for the formation of RNA viroids, DNA viroids, prions and isoprenoids which can symbiose together to form an archaea. Thus endosymbiotic archaea have an abiogenic replication. The archaeaon concerned

with GABA shunt pathway and porphyrinogenesis are called porphyrinoids. The archaeaon colony forms a network with different areas showing differential specialization of function - fructosoids, steroidelle, vitaminocyte, viroidelle, neurotransminoid, porphyrinoids and glycosaminoglycoids. This forms a living organized structure within human cells and tissues regulating their function and reducing the human body to zombie working under the directions of the organized archaeal colony. The organized archaeal colony has abiogenetic replication and is eternal.

Global warming can lead to osmotic stress consequent to dehydration. The increase in actinidic archaeal growth leads to cholesterol catabolism and digoxin synthesis. Digoxin produces membrane sodium potassium ATPase inhibition and increase in intracellular calcium producing mitochondrial dysfunction. This results in oxidative stress. The oxidative stress and osmotic stress can induce the enzyme aldose reductase which converts glucose to fructose. Fructose has got a low km value for ketokinase as compared to glucose. Therefore fructose gets phosphorylated more to fructose phosphate and the cell is depleted of ATP. The cell depletion of ATP leads to oxidative stress and chronic inflammation consequent to induction of NFKB. The fructose phosphate can enter the pentose phosphate pathway synthesizing ribose and nucleic acid. The depletion of cellular ATP results in generation of AMP and ADP which are acted upon by deaminases causing hyperuricemia. Uric acid can also produce mitochondrial dysfunction. The fructose phosphate can enter the glucosamine pathway synthesizing GAG and producing mucopolysaccharide accumulation. Fructose can fructosylate proteins making them antigenic and producing an autoimmune response. This can lead to global warming related autoimmune disease.

The endosymbiotic actinidic archaea forms the basis of life and can be considered as the third element in the cell. It regulates the cell, the neuro-immune-endocrine system and the conscious / unconscious brain. The

endosymbiotic actinidic archaea can be called as the elixir of life. A definite population of endosymbiotic actinidic archaea is required for the existence and survival of life. A higher density of endosymbiotic actinidic archaeal population can lead to human disease. Thus actinidic archaea are important for survival of human life and can be considered as crucial to it. Symbiosis by actinidic archaea is the basis of evolution of humans and primates. The increase in endosymbiotic archaeal growth can lead to the induction of homo neanderthalis. This endosymbiotic archaea induced neanderthalisation of the species leads to human disease like metabolic syndrome X, neurodegenerations, schizophrenia and autism, autoimmune disease and cancer. The reduction in endosymbiotic archaeal growth by a high fibre, high medium chain triglyceride and legume protein ketogenic diet, antibiotics from higher plants like Curcuma longa, Emblica officianalis, Allium sativum, Withania somnifera, Moringa pterygosperma and Zingeber officianalis and transplantation of colonic microflora from normal homo sapien population can lead to deneanderthalisation of species and treatment of the above mentioned diseased states. The colonic microflora of neanderthalised diseased states like metabolic syndrome X, neurodegenerations, schizophrenia and autism, autoimmune disease and cancer when transferred to the normal homo sapien species leads to generation and induction of homo neanderthalis. Thus primate and human evolution is symbiotic event which can be induced the modulating symbiotic archaeal growth. Human populations can be divided into matrilineal Neanderthal population in South Indian Dravidians, Celts, Basques, Jews and Berbers and the Cro-Magnon population seen in Africa and Europe. The symbiotic archaeal colonization decides which species - Neanderthal or Cro-Magnon to which the society belongs to. It is tempting to postulate symbiotic microflora and archaea determining the family behavior and traits as well as societal and caste behavior and traits. The cell has been postulated by

Margulis to be a symbiotic association of bacteria and viruses. Similarly, the family, the caste, the community, nationalities and the species itself is determined by archaeal and other bacterial symbiosis.

Symbiosis by microorganisms especially archaea drives the evolution of the species. In such a case symbiosis can be induced by transfer of microflora symbionts and evolution induced. Endosymbiosis by archaea as well as archaeal symbionts in the gut can modulate the genotype, the phenotype, the social class and the racial group of the individual. The symbiotic archaea can have horizontal and vertical transmission. Endosymbiotic archaeal growth leads to neanderthalisation of the species. The neanderthalised species is matrilineal society and includes the Dravidians, the Celts, the Basques and the Berbers. The inhibition of the endosymbiotic archaeal growth leads to evolution of the homo sapiens. This includes the Africans, Aryan invaders of North India and the Aryan derived European population. Symbiosis mediated evolution depends on the gut flora and the diet. This has been demonstrated in the drosophila pseudoobscura. The drosophila mates only with other individuals eating the same diet. When the drosophila gut microflora is altered by feeding antibiotics they mate with other individuals eating different diets. The diet consumed by the drosophila regulates its gut microflora and mating habits. The combination of the human genome and the symbiotic microbial genome is called the hologenome. The hologenome especially its symbiotic microbial component drives human evolution as well as animal evolution. The evolutionary distance between species of wasp depends on the gut microflora. The human gut microflora regulates the endocrine, genetic and neuronal systems. Humans and primate evolution depends on endosymbiotic archaea and gut microflora. The endosymbiotic archaeal growth determines the racial differences between the matrilineal Harappan / Dravidian societies and the patriarchal Aryan society. The matrilineal Harappan / Dravidian society was neanderthalic and had

increased endosymbiotic archaeal growth. Endosymbiotic archaeal growth and neanderthalisation can lead to autoimmune disease, metabolic syndrome X, neurodegeneration, cancer, autism and schizophrenia. The Neanderthal gut flora and endosymbiotic archaea was determined by the non vegetarian ketogenic high fat high protein diet consumed by them in the Eurasian steppes. The homo sapiens including the classical Aryan tribes and African ate a high fibre diet and had lower archaeal growth both endosymbiotic and gut. The dietary fibre intake determines the microbial diversity of the gut. The high fibre intake is associated with increased generation of short chain fatty acids - butyric acid by the gut flora. Butyrate is a HDAC inhibitor and leads to increased generation and incorporation of endogenous retroviral sequences. The high dietary fibre intake related increased HERV sequences leads to increased synaptic connectivity and a dominant frontal cortex as seen in homo sapien species. The neanderthalic species consume a ketogenic non vegetarian high fat high protein low fibre diet. This leads to decreased generation of endogenous HERV sequences and reduced genomic flexibility in neanderthalic species. This produces smaller cerebral cortex and a dominant cerebellar cortex in the neanderthalic brain. The homo neanderthalic species by the low dietary fibre intake starve their microbial self. This leads to increased endosymbiotic and gut archaeal growth. The mucous membrane lining the gut becomes thinned out as the gut bacteria eats up the mucous lining of the gut. This results in leakage of endotoxin and archaea from the gut to the blood breaching the barrier and produces a chronic immunostimulatory inflammatory state which forms the basis of autoimmune disease, metabolic syndrome, neurodegeneration, oncogenic and psychiatric disorders. The Neanderthal species eat a low fibre diet and have a deficiency of microbiota accessed carbohydrate generating short chain fatty acid. There is a deficiency of butyrate generated in the gut from the dietary fibre which can produce suppression of the chronic inflammatory process. The Neanderthals

have got the fermentation by-product deficiency syndrome. The induction of neanderthalic species depends on the low fibre intake induced high archaeal density endosymbiotic and the gut microflora. The homo sapiens species consume a high fibre diet generating large amounts of short chain fatty acid butyrate which inhibits endosymbiotic and gut archaeal growth. The microbial self of the homo sapien species is more diverse than that of the neanderthalic species and the archaeal population density is less. This results in a protection against chronic inflammation and the induction of diseases like autoimmune disease, metabolic syndrome, neurodegeneration, oncogenic and psychiatric disorders. The homo sapien species have a higher intake of dietary fibre contributing to around 40 g/day and a diverse microbial gut flora with less of archaeal population density. The butyrate generated from dietary fibre produces an immunosuppressive state. Thus the symbiotic microflora with less of archaeal density induces a homo sapien species. This can be demonstrated by experimental induction of evolution. A high fibre high MCT diet as well as antibiotics derived from higher plants and fecal microbiota transfer from sapien species can inhibit the Neanderthal metabolonomics and phenotype and induce the evolution of homo sapiens. A low fibre high fat high protein diet as well as fecal microbiota transfer from the Neanderthal species can produce Neanderthal metabolonomics and phenotype inducing the evolution of homo neanderthalis. Transfer of colonic microflora predominantly archaea and modulation of endosymbiotic archaea by a paleo diet and antibiotics from higher plants can lead to interconversion of human species between homo neanderthalis and homo sapiens. The hologenome especially the microbial flora endosymbiotic/gut drives human and animal evolution and can be experimentally induced. Symbiotic microflora drives evolution. Every animal, every human species, different communities, different races and different caste

have their signature endosymbiotic and gut microflora which can be transmitted vertically and horizontally. Thus symbiosis drives human and animal evolution.

This can be interpreted on the basis of Villarreal hypothesis of group identity and cooperativity of RNA collectives. Archaeal symbiosis in the gut and in the tissue spaces determines speciation of human beings as homo sapiens and homo neanderthalis. The endosymbiotic archaea can secrete RNA viroids and viruses and there is a viroid-archaeal host relationship between the two. A dynamic state of virus lysis and persistence can occur in archaea suggesting that viral addiction can occur in archaea. The RNA viroids in the archaea coordinate their behavior by information exchange, modulation and innovation generating new sequence based content. This occurs due to a phenomenon of symbiosis in contrast to the concept of survival of the fittest. The generation of new RNA viroidal sequences is a result of practical competence of living agents to generate new sequences by symbiosis and sharing. This represents highly productive RNA viroidal quasi-species consortia for the evolution, conservation and plasticity of genomic environments. The behavioural motives of the RNA are single stem loop structures. They have self folding and group building capabilities depending upon functional needs. The evolution process depends upon what Villareal calls RNA stem loop consortia. The whole entity can function only if participatory groups of RNA viroids can get their function coordinated. There is competent denovo generation of new sequences by cooperative action and not by competition. These RNA viroidal group consortia can contribute to the host identity, group identity and group immunity. The term used for this is RNA viroidal sociological behavior. The RNA viroids can build groups that invade the archaea and compete as a group for limited resources such host genomes. A key behavioural motif is able to integrate a persistent life style into the archaeal colony with the addiction module forming competing viroidal groups that are counter balancing each other together with the

archaeal/host immune system. This leads to creation of an identity for the archaeal colony and the homo neanderthalis host. Viroids can kill their host and also colonize their host without disease and protect the host from similar viruses and viroids. Together with lysis and protection we see a viroid colonized host that is both symbiotic and innovative acquiring new competent codes. Thus the viroid-host relationship is a pervasive, ancient force in the origin and evolution of life. Cumulative evolution at the level of RNA viroids is like a ratchet effect used for transmission of cultural memes. This learning accumulates so that every new generation must not repeat all innovative thoughts and techniques. Quasi-species of RNA viroids are cooperative and exclusive of other quasi-species. They have group recognition differentiating self-groups and non-self-groups allowing for quasi-species to promote the emergence of group identity. With group identity via counter related addiction modules two opposing components must be present and work coherently and define the group as a whole. Biological identity is constituted by dynamic interaction of cooperative groups. Virus addiction module is an essential strategy for existence of life in the virosphere. Viruses are transmissible and can persist in specific host population leading to a form of group immunity / identity since identical but uncolonized host population remains susceptible to a killing action of lytic viruses. In this way we see that viruses are necessary providing opposing functions for addiction (persistence/protection and lytic/killing). Viroids can function as consortia, an essential interacting group and provide a mechanism from which consortial function could emerge in the origin of protobiotic life. Genetic parasites can act as a group (qs-c). But for this group to be coherent they must attain group identity and this is typically via an addiction strategy. Antiviral and proviral system in the archaea will themselves emerge in the host from virus derived information. The archaeal viruses themselves provide the critical function required for antiviral defence. The opposing functions are the

basis of addiction modules. Thus the emergence of group identity becomes an essential and early event in the emergence of life. This is coherent to the basically group behavior of RNA viroids in archaea. This group selection and group identity are needed to create information coherence and network formation and to establish a system of communication - code competent interactions. This identity serves as information also for the ones that do not share this identity. This is the beginning of self/non-self differentiating capability. In this way viroids promote the emergence of group identity in archaeal colonies and host humans. The archaeal colony identity depends upon the colonizing set of RNA viroids producing a coherent network that is inclusive opposing functions and favours the persistence of parasite derived new information. On the basis of population-based functions of RNA DNA can be considered as a habitat for consortia RNA. Thus RNA viroids of the archaea are involved in complex multicellular identity. This is called as the Gangen hypothesis by Villarreal. The Gangen describes the emergence of commonly shared code use, group membership and collective living function of RNA viroids. Communication is a code depended interaction and transmission of infectious code defines the origin of the virosphere. This issue refers to the idea of collective of RNA viroids with inherent toxic and antitoxic features should be able to transmit or communicate these agents and their features to a nearby competing population. It strongly favours the survival of RNA viroidal population with compatible addiction modules that will inhibit agent toxicity and allow persistence of new agents. This is thus the survival of the persistently colonized set which is an inherently symbiotic and consortial process. It also promotes increasing complexity and identity / immunity of the host collective via a new agent colonization, and stable addition. Thus the transmission of RNA agents attains both communication and recognition of group membership. In this way the emergence of the virosphere must had been an early event in the

origin of life and group identity. Viruses and viroids are genetic parasites and the most abundant living entities on earth. The virosphere is a network of infectious genetic agents. Evolution, conservation and plasticity of genetic identities are the result of cooperative consortia of RNA viroids that are competent to communicate. Thus the archaeal viroidal consortia can symbiotically share and communicate producing new sequences and give an identity to the archaeal colony. The low fibre diet and extreme temperatures of the Eurasian steppes leads to archaeal multiplication and induction of the homo neanderthalis species. The archaeal colony's characteristics are determined by the cooperative consortia of RNA viroids in the archaea and the archaeal colony identity determines the homo neanderthalis identity. Thus the archaeal colonies with their quasi-species consortia of RNA viroids determine the homo neanderthalis identity. The new sequence generation by the RNA viroidal consortia's symbiotic sharing character contributes to the diversity in the behavior and creativity of the homo neanderthalis population. The archaeal RNA viruses and viroids and the archaeal colonies themselves protect the homo neanderthalis population from retroviral infections. Thus the homo neanderthalis population is retroviral resistant and the quasi-species consortia of archaea and archaeal viroids gives them a group identity as retroviral resistant. Thus the quasi-species consortia of archaea and RNA viroids give homo neanderthalis colonies their identity and idea of self. The homo neanderthalis is resistant to retroviral infection like the Australian aboriginals and the endogenous retroviral sequences in the Neanderthal genome are limited. This leads to lack of plasticity and dynamicity of the human genome and the cerebral cortex in ill-developed with a dominant impulsive cerebellar cortex in the homo neanderthalis population. This produces the impulsive creative surrealistic spiritual neanderthalic brain. As the extreme of temperature goes off and the ice age ends the archaeal population density also comes down. This also can result

from the consumption of a high fibre diet in the African continent. The high fibre diet digested by clostridial clusters in the colon promotes butyrate synthesis and butyrate will induce HDAC inhibition and expression of retroviral sequences in the primate genome. This leads to increase in endogenous retroviral sequences in the human genome, increasing genomic dynamicity and the evolution of complicated cerebral cortex dominant brain with its complex synaptic connectivity in the homo sapiens. This leads onto a logical, commonsensical, pragmatic and practical homo sapien brain. The homo sapiens due to lack of archaea and the RNA viroids are susceptible retroviral infection. Thus the archaeal colonies and RNA viroidal quasi-species consortia determine the evolution of the human species and the brain networks. Thus extremes of temperature, fibre intake, archaeal colony density, RNA viroidal quasi-species, group identity and retroviral resistance decides on the evolution of homo sapiens and homo neanderthalis as well as the brain networks. The present extremes of temperature and low fibre intake in civilized society can lead to increase in archaeal population densities and quasi-species RNA viroidal networks generating a new homo neanderthalis in a new neanderthalic anthropocene age as opposed to the present homo sapien anthropocene age.

The roots of Western civilisational disease can be related to the starvation of the colonic microflora. The colonic microflora depends upon complex carbohydrates derived from dietary fibre. The processed food of high protein, fat and sugars is digested and absorbed in the stomach and small intestine. A very little of it reaches the colon and widespread use of antibiotics in medicine has produced mass extinction of the colonic microflora. The colonic microflora is extremely diverse and the diversity is lost. There are 100 trillion bacteria in the colon belonging to 1200 species. They regulate the immune system by inducing the T-regulatory cells. A high fibre diet contributes to colonic microbiota diversity. Interaction with farm animals like cows and dogs also

contributes to the colonic microflora diversity. The typical Western diet of high fat, high protein and sugars decreases the colonic microbiota diversity and increase colonic/endosymbiotic archaea producing methanogenesis. The colonic archaea feed upon the mucous lining of the colon and produces leakage of archaea into the blood and tissue system producing endosymbiotic archaea. This results in a chronic inflammatory state. The high fibre diet of Africans, South Americans and Indians produces increased colonic microbiota diversity and increase in clostridial clusters generating SCFA in the gut. High fibre diet is protective against metabolic syndrome and diabetes mellitus. Metabolic syndrome is related to degeneration, cancer, neuropsychiatric illness and autoimmune disease. A high fibre diet of upto 40 g/day can be called as a gut diet. The colonic microflora especially the clostridial cluster digests the fibre generating short chain fatty acids which regulates immunity and metabolism. High fibre diet increases the colonic mucus secretion and the thickness of the mucus lining. A high fibre diet produces increase in clostridial clusters and mucous secretion. This produces a strong gut blood barrier and prevents metabolic endotoxemia which produces a chronic inflammatory response. High dietary fibre intake and the diversity of the colonic microflora with prominent SCFA producing clostridial clusters are interrelated. The clostridial clusters metabolise the complex carbohydrate in dietary fibre to short chain fatty acids butyrate, propionate and acetate. They increase the T-regulatory function. A high fibre diet increases the bacteroides and reduces the firmecutes of the colonic microflora. A high fibre diet is associated with a low body-mass index. A low fibre diet produces increase in colonic archaeal growth as well as endosymbiotic tissue and blood archaea. This produces more of methanogenesis rather than short chain fatty acid synthesis contributing to immune activation. A low fibre diet is associated a high body-mass index and chronic systemic inflammation. Germ-free mice show cardiac, pulmonary and liver atrophy. Gut

microflora is required for the generation of organ systems. The gut microflora is also required for generation of T-regulatory cells. High fibre intake produces more colonic microbiota diversity and increase in clostridial clusters and fermentation by products like butyrate which suppresses inflammation and increases T-regulatory cells. A low fibre diet produces increase in archaeal growth, methanogenesis, destruction of the mucus lining and leakage of the colonic archaea producing endosymbiotic tissue and blood archaea. This produces an immune hyperreactivity contributing to the modern plagues of civilisation - metabolic syndrome, schizophrenia, autism, cancer, autoimmunity and degenerations. The gut microbiota drives human evolution. The humans don't host the gut microbiota but the gut microbiota host us. The human system forms an elaborate culture laboratory for the propagation and survival of the microbiota. The human system is induced by the microbiota for their survival and growth. The human system exists for the microbiota and not the other way round. The same mechanism holds good in plant systems. Plant started the colonized earth as they started symbiosing with bacteria in the roots systems which can derive nutrients from the soil. Human beings form a mobile culture laboratory for the more effective propagation and survival of the microbiota. The microbiota induces the formation of specialized immune cells called innate lymphoid cells. The innate lymphoid cells will direct the lymphocytes not to attack the beneficial bacteria. Thus the endosymbiotic archaea and the gut archaea induce human, primate and animal evolution to generate structures for them to survive and propagate. The source of endosymbiotic archaea, the third element of life is the colonic archaea that leaks into the tissue spaces and blood systems due to breach in the gut blood barrier. The increase in colonic archaea is due to the starvation of the gut microbiota consequent to a low fibre diet. This results in increase in colonic archaeal growth and destruction of clostridial clusters and bacteroides. The increase colonic archaeal growth in the presence

of gut starvation due to low fibre diet eats up the mucus lining and produces breakages in the gut blood barrier. The colonic archaea enters the blood stream and produces endosymbiosis generating endosymbiotic archaea and various new organelle - fructosoids, steroidelle, vitaminocyte, viroidelle, neurotransminoid, porphyrinoids and glycosaminoglycoids.

The increase in endogenous EDLF, a potent inhibitor of membrane Na^+-K^+ ATPase, can decrease this enzyme activity. The results showed increased endogenous EDLF synthesis as evidenced by increased HMG CoA reductase activity, which functions as the rate limiting step of the isoprenoid pathway. Studies in our laboratory have demonstrated that EDLF is synthesized by the isoprenoid pathway. The endosymbiotic archaeal sequences in the human genome get expressed by redox stress and osmotic stress of global warming. This results in induction of HIF alpha which will upregulate fructolysis and glycolysis. In the setting of redox stress all glucose gets converted to fructose by the induction of enzymes aldose reductase and sorbitol dehydrogenase. Aldose reductase converts glucose to sorbitol and sorbitol dehydrogenase converts sorbitol to fructose. Since fructose is preferentially phosphorylated by ketohexokinases the cell is depleted of ATP and glucose phosphorylation comes to a halt. Fructose becomes the dominant sugar that is metabolized by fructolysis in expressed archaeal particles in the cell functioning as organelle called fructosoids. The fructose is phosphorylated to fructose 1-phosphate which is acted upon by aldolase B which converts it into glyceraldehyde 3-phosphate and dihydroxy acetone phosphate. Glyceraldehyde 3-phosphate is converted to D1,3-biphosphoglycerate which is then converted to 3-phosphoglycerate. The 3-phosphglycerate is converted to 2-phosphoglycerate. 2-phosphoglycerate is converted to phosphoenol pyruvate by the enzyme enolase. Phosphoenol pyruvate is converted to pyruvate by the enzyme pyruvic kinase. The archaeaon induces HIF alpha which upregulates fructolysis and

glycolysis but inhibits pyruvate dehydrogenase. The forward metabolism of pyruvate is stopped. The dephosphorylation of phosphoenol pyruvate is inhibited in the setting of pyruvic kinase inhibition. Phosphoenol pyruvate enters the shikimic acid pathway where it is converted to chorismate. The shikimic acid is synthesized by a pathway starting from glyceraldehyde 3-phosphate. Glyceraldehyde 3-phosphate combines with the pentose phosphate pathway metabolite sedoheptulose 7-phosphate which is converted to erythrose 4-phosphate. The pentose phosphate pathway is upregulated in the presence of the suppression of glycolytic pathway. Erythrose 4-phosphate combines with phosphoenol pyruvate to generate shikimic acid. Shikimic acid combines with another molecule of phosphoenol pyruvate to generate chorismate. The chorismate is converted to prephenic acid and then to parahydroxy phenyl pyruvic acid. Parahydroxy phenyl pyruvic acid is converted to tyrosine and tryptophan as well as neuroactive alkaloids. The shikimic acid pathway is structured in expressed archaeaon organelle called the neurotransminoid. The fructolytic intermediates glyceraldehydes 3-phosphate and pyruvate are the starting points of the DXP pathway of cholesterol synthesis. Glyceraldehyde 3-phosphate combines with pyruvate to form 1-deoxy D-xylulose phosphate (DOXP) which is then converted to 2C methyl erythritol phosphate. 2C methyl erythritol phosphate can be synthesized from erythrose 4-phosphate a metabolite of the shikimic acid pathway. DXP combines with MEP to form isopentenyl pyrophosphate which is converted to cholesterol. Cholesterol is catabolised by archaeal cholesterol oxidases to generate digoxin. The digoxin sugars digitoxose and rhamnose are synthesized by the upregulated pentose phosphate pathway. Glycolytic suppression leads to upregulation of the pentose phosphate pathway. The expressed archaeaon organelle concerned with cholesterol catabolism and digoxin synthesis is called the steroidelle. The suppression of glycolysis and stimulation of fructolysis results in upregulation

of the hexosamine pathway. Fructose is converted to fructose 6-phosphate by ketohexokinases. The fructose 6-phosphate is converted to glucosamine 6-phosphate by the action of glutamine fructose 6-phosphate amidotransferase (GFAT). Glucosamine 6-phosphate is converted to UDP N-acetyl glucosamine which is then converted to N-acetyl glucosamine and various amino sugars. UDP glucose is converted to UDP D-glucuronic acid. UDP D-glucuronic acid is converted to glucuronic acid. This forms the uronic acid synthetic pathway. Uronic acids and hexosamines form repeating units of glycosaminoglycans. In the setting of glycolytic suppression and fructolytic metabolism fructolysis leads to increase synthesis of hexosamines and GAG synthesis. The GAG synthesizing archaeaon particles are called the glycosaminoglycoids. The expressed archaeaon particles are capable of synthesizing antioxidant vitamin C and E. The UDP D-glucose is converted to UDP D-glucuronic acid. UDP D-glucuronic acid is converted to D-glucuronic acid. D-glucuronic acid is converted to L-gulonate by enzyme aldoketoreductases. L-gulonate is converted to L-gulonolactone by lactonase. L-gulonolactone is converted to ascorbic acid by the action of archaeal L-gulo oxidase. The vitamin E is synthesized from shikimate which is converted to tyrosine and then to parahydroxy phenyl pyruvic acid. Parahydroxy phenyl pyruvic acid is converted to homogentisate. Homogentisate is converted to 2-methyl 6-phytyl benzoquinone which is converted to alpha tocopherol. 2-methyl 6-phytyl benzoquinone is converted to 2,3-methyl 6-phytyl benzoquinone and gamma tocopherol. Vitamin E can also be synthesized by the DXP pathway. Glyceraldehyde 3-phosphate and pyruvate combined to form 1-deoxy D-xylulose 5-phosphate which is converted to 3-isopentenyl pyrophosphate. 3-isopentenyl pyrophosphate and dimethyl allyl pyrophosphate combined to form 2-methyl 6-phytyl benzoquinone which is converted to tocopherols. The ubiquinone another important membrane antioxidant and part of the mitochondrial electron transport chain is synthesized

by the shikimic acid pathway and DXP pathway. The isoprenoid moiety of ubiquinone is contributed from the DXP pathway and the rest of it by tyrosine catabolism. The tyrosine is generated by the shikimic acid pathway. The archaeaon particles concerned with the synthesis of vitamin C, vitamin E and ubiquinone which are all antioxidants are called the vitaminocyte.

Global warming induces endosymbiotic archaeal and RNA viroidal growth. The endosymbiotic archaea and the generated RNA viroids induce aldose reductase which converts glucose to sorbitol. The archaeal polysaccharides and lipopolysaccharides as well as viroids and viruses can induce aldose reductase. Sorbitol is acted upon by sorbitol dehydrogenase to generate fructose which enters fructolytic pathway. Aldose reductase is also induced by the osmotic stress of global warming and redox stress. Aldose reductase is induced by inflammatory and immune stimulation. Archaeal synthesized endogenous digoxin can produce intracellular redox stress and activate NFKB which produces immune activation. Both redox stress and immune activation can activate aldose reductase which converts glucose to fructose. Hypoxic stress or anerobic conditions induces HIF alpha which activates ketohexokinase C which phosphorylates fructose. Fructose is acted upon by fructokinase which converts fructose to fructose 1-phosphate. Fructose 1-phosphate is converted to dihydroxy acetone phosphate and glyceraldehydes 3-phosphate which is converted to pyruvate, acetyl CoA and citrate. Citrate is used for lipid synthesis. Fat deposition occurs in the visceral organs like the liver, heart and kidney. There is no subcutaneous fat deposit. Fructose metabolism bypasses phosphofructokinase which is inhibited by citrate and ATP. Fructose metabolism is therefore not under the regulatory control of the enzyme phosphofructokinase. Fructose transport and metabolism is not regulated by insulin. Fructose is transported by glut-5 receptor. Fructose does not increase insulin secretion and therefore does not activate lipoprotein lipase. This results

in visceral adipogenesis. Fructose induces ChREBP and SREBP elements. This results in increased hepatic lipogenesis by the induction of the enzyme fatty acid synthase, acetyl CoA carboxylase and steroyl CoA desaturace. This increases fatty acids and cholesterol synthesis. Fructose is a lipophilic carbohydrate. Fructose can be converted to glycerol 3-phosphate and fatty acids involved in triglyceride synthesis. Fructose administration leads to increase in triglycerides and VLDL. Fructose consumption leads to insulin resistance, fat accumulation in visceral organs like liver, heart and kidney, insulin resistance, dyslipidemia with increased triglycerides, VLDL and LDL as well as the metabolic syndrome. The metabolic syndrome X can be considered as a fructolytic syndrome. Fructose will increase lipid storage and promote insulin resistance. Fructose can fructosylate proteins producing dysfunction. Fructose has no effect upon ghrelin and leptin in the brain and can lead to increased feeding behaviour. Glucose decreases ghrelin and increases leptin levels. This leads to suppression of appetite. Thus fructose can modulate eating behaviour leading onto obesity. Fructose results in NFKB activation and TNF alpha secretion. TNF alpha can modulate the insulin receptor producing insulin resistance and metabolic syndrome X. Fructose can also lead to leptin resistance and obesity. There is an epidemic of metabolic syndrome X in relation to global warming.

Fructose can activate the sympathetic nervous system. This leads to hypertension and increase in heart rate. Fructose is involved in left ventricular hypertrophy, increase in left ventricular mass and decrease in left ventricular ejection fraction in hypertension. Fructose suppresses the parasympathetic nervous system. Fructose acts as a key inducer for uncontrolled proliferation and hypertrophy of the cardiac musculature consequent to hypertension. The heart uses beta oxidation of fatty acids to generate energy. In the setting of anerobic glycolysis consequent to myocardial infarction and hypertensive hypertrophy of the heart, there is induction of HIF alpha. This produces increase

in ketohexokinase C in the heart which phosphorylates fructose. Ketohexokinase C is a predominant liver enzyme as fructose metabolism is primarily focused in the liver. In the setting of anerobic glycolysis ketohexokinase C is also produced in the brain and the heart. Ketohexokinase A is the predominant enzyme in the heart and brain. In the setting of anerobic glycolysis ketohexokinase A which preferentially metabolizes glucose is converted to ketohexokinase C metabolizing fructose by the mechanism of RNA splicing. Anerobic conditions can induce HIF alpha which activates the splicing factor SF3B1. Thus HIF alpha induced by glycolysis induces SF3B1 which induces ketohexokinase C producing fructolysis in the heart. The fructose is converted to lipids, glycogen and glycosaminoglycans in the heart producing cardiac hypertrophy. Fructose metabolism is not under regulatory control of the key enzyme phosphofructokinase by citrate and ATP. The fructolytic pathway functions as a rogue pathway not under any regulatory control. Fructose is a key contributor. The sympathetic overactivity and parasympathetic blockade consequent to fructose can produce immune activation. The sympathetic overactivity and parasympathetic blockade can lead to dysregulation of the nervous system.

Fructose can activate NFKB and tumour necrosis factor alpha. The vagal blockade produced by fructose also leads to increase in immune activation. Fructose can inhibit neutrophilic phagocytosis. Increased fructose ingestion can lead to immune activation and respiratory diseases like chronic bronchitis, COPD and bronchial asthma as well as interstitial lung disease. This immune activation induced by fructose is called as fructositis. Fructosylated proteins can serve as autoantigens. Fructosylated proteins can bind to RAGE receptors producing immune activation. Global warming induced fructose disease is the basis of the epidemic of autoimmune disease rising with the global warming.

Fructose increases flux through the pentose phosphate pathway. This increases the availability of hexose sugars like ribose for nucleic acid synthesis.

This increases DNA synthesis. There is also consequent increase in protein synthesis. The tumour cells can slurp up fructose. Tumour cells utilise fructose for proliferation. The fetal cells like tumour cells also utilize fructose for proliferation. Fructose can promote metastatic deposits. The tumour cells use fructose differently from glucose. Cancer cells utilize fructose to support proliferation and metastasis. Fructose increases nucleic acid synthesis. Fructose can help the cancer cells to grow fast by inducing the transketolase enzyme and the pentose phosphate pathway. Fructose administration increases redox stress, DNA damage and cell inflammation all contributing to oncogenesis. Fructose is the most abundant sugar in the fetal tissues and is important in the development of fetus by promoting cell proliferation. Fructose is 20-times more concentrated in the fetal blood than glucose. Sperm cells and ova also use fructose for metabolism and energy. Thus all rapidly proliferating cells - cancer cells, fetal cells and reproductive cells depends upon fructolysis. Fructose is the principal diet of the cancer cells. Global warming and archaeal growth results in HIF alpha induction. HIF alpha induces tumour growth. HIF alpha also increases glycolysis. But archaeal induced HIF alpha also induces aldose reductase which converts glucose to fructose and metabolism proceeds along the fructolytic pathway. Fructosylation of glycolytic enzymes brings glycolysis to a halt. Fructosylation of mitochondrial PT pore hexokinase can result in PT pore dysfunction and cell proliferation. The fructolytic pathway is the principal energetic pathway for rapidly proliferating cancer cells, fetal cells and stem cells. The global warming will induce the Warburg phenotype of the fructolytic variety. This leads to an epidemic of cancer. There is an epidemic of cancer in relation to global warming. The fructolytic pathway can lead to increased DNA synthesis and RNA synthesis due to flux via the pentose phosphate pathway. The fructolytic pathway can be directed to the GABA shunt generating succinyl CoA and glycine. These are substrates for porphyrin templates to form RNA

viroids. The archaeal induced redox stress can induce endogenous HERV expression and reverse transcriptase expression. The RNA viroids are converted by HERV reverse transcriptase to corresponding DNA and integrated into the genome by HERV integrase. The integrated RNA viroid related DNA can function as jumping genes producing genomic plasticity and genomic change.

Fructose as said before induces the thiamine dependent transketolase flux. It increases both the oxidative and non oxidative pentose phosphate pathway. This increases nucleic acids and glycosaminoglycan synthesis. Fructose is converted to fructose 1-phosphate which is acted upon by aldolase B converting it into glyceraldehyde and dihydroxy acetone phosphate. Glyceraldehyde is converted glyceraldehyde 3-phosphate by triokinase. DHAP can be converted to glyceraldehyde 3-phosphate by the enzyme triose phosphate isomerase. Glyceraldehyde 3-phosphate can be converted to pyruvate. This pyruvate can be channeled to gluconeogenesis and glycogen storage by the action of the enzyme pyruvate carboxylase. This results in the conversion of glyceraldehyde 3-phosphate to pyruvate and via pyruvate carboxylase to glucose 1-phosphate. Glucose 1-phosphate is converted to glycogen polymers. Thus fructolysis results in glycogen storage. The pyruvate that is generated by fructolysis is converted to glutamate which can enter the GABA shunt pathway. The GABA shunt pathway generates glycine and succinyl CoA which are substrates for ALA synthesis. Thus fructolysis stimulates porphyrin synthesis. The porphyrins can self organize to form supramolecular arrays called porphyrions. Porphyrions can self replicate by using other porphyrions as templates. Porphyrions can have energetic and ATP synthesis by electron or photon transport. Porphyrions are dipolar molecules and in the setting of digoxin induced membrane sodium potassium ATPase inhibition can generate a pumped phonon system induced quantal state and quantal perception. They can function as quantal computers with information storage. The porphyrions are basic self replicating living structures. The porphyrins can act as

a template for the formation RNA, DNA and proteins. The RNA viroids, the DNA viroids and proteins generated by abiogenesis on porphyrin templates can self organize to form primitive archaea. The archaea are thus capable of abiogenic replication on porphyrin templates. The archaea can induce HIF alpha and further aldose reductase induction promoting fructolysis.

Fructose is an addictive substance. Fructose affects the hedonic centres in the brain concerned with pleasure and reward. In the addiction scale fructose is more addictive then cocaine and cannabis. Fructose decreases BDNF. Low BDNF produces changes in the brain resulting in schizophrenia and depression. Fructose can also produce chronic inflammation involved in schizophrenia. The fructolytic pathway is important in the genesis of psychiatric disorders. The increased fructolysis can lead to fructosylation of lipoproteins especially apoprotein E and apoprotein B. Apo B can undergo lysine fructosylation leading to defective LDL and cholesterol uptake by the brain. This results in autism and schizophrenia. Fructolysis leads to cholesterol depletion of the brain. Cholesterol is required for the formation of synaptic connections and cerebral cortex. This leads to cerebral cortical atrophy and cerebellar dominance in the presence of cholesterol depletion. This can contribute to the genesis of the cerebellar cognitive affective syndrome, the basis of schizophrenia and autism. There is an epidemic of schizophrenia and autism correlating with global warming. Fructosylation of LDL and brain cholesterol depletion can lead to dysfunction in synaptic transport. There is more release of glutamate into the synaptic from the presynaptic neuron consequent to a presynaptic neuron membrane dysfunction as a result of cholesterol depletion. This contributes to glutamate excitotoxicity. Glutame excitotoxicity can contribute to neuronal degeneration. Fructose can also produce zinc deficiency. Increased fructose intake produces zinc depletion leading to defective formation of metallothionines leading to defective heavy metal excretion. This leads to

mercury, cadmium and aluminium toxicity in the brain leading to psychiatric disorders like autism and degenerations like Alzheimer's disease. Zinc deficiency consequent to fructose excess can lead to copper excess. The zinc containing neurons in the cerebral cortex are called the gluzinergic neurons. The cerebral cortex especially the prefrontal cortex will atrophy producing cerebellar and brain stem dominance. Copper is required for the dominance of subcortical cognitive structures. Fructose ingestion can also lead to calcium deficiency which can produce defective calcium signaling. Fructose ingestion leads to fructolysis and the generation of reactive species 3-deoxyglucosone important in mallard reachion and fructosylation of neuronal proteins leading to their defective function. Neuropsychiatric disorders and neurodegenerative disorders can be described as fructose diseases. Topiramate a fructose analogue is used to treat motor neuron disease. Fructose biphosphate aldolase B mutation has been seen in schizophrenia, bipolar disorders and depression. 6-phosphofructo 2-kinase and fructose 2,6-biphosphotase abnormalities have been seen in schizophrenia. Fructose metabolism abnormalities have been noted in schizophrenia, manic depressive psychosis and autism. Fructose inhibits brain plasticity. Fructose inhibits the ability of neurons to communicate with each other. The wiring and re-wiring of neurons is inhibited. Fructose leads to a neuronal disconnection syndrome.

Fructose can increase flux via the pentose phosphate pathway and hexosamine pathway leading to glycosaminoglycan synthesis. Glycosaminoglycan accumulation in the tissues can produce mucopolysaccharidosis and fibrosis. Increased heparan sulphate accumulation in the brain leads to formation of amyloids plaques and Alzheimer's disease. Connective tissue accumulation in the lung leads to interstitial lung disease, in the kidneys it produces tubular atrophy and a chronic renal failure similar to meso-American nephropathy. Connective tissue accumulation in the heart can lead to a restrictive cardiomyopathy.

Accumulation of GAG especially hyaluronic acid in bones and joints leads to osteoarthritis and spondylosis. GAG accumulation in the endocrine organs can produce thyroid dysfunction resulting in MNG and thyroiditis, pancreatic dysfunction producing chronic calcific pancreatitis and adrenal dysfunction producing hypoadrenalism. Accumulation of GAG in the vascular tissues can result in mucoid angiopathy contributing to coronary artery disease and stroke. The accumulation of lipids due to the fructolytic pathway along with glycosaminoglycans can lead to fatty liver. This can later lead onto cirrhosis of the liver. Fructose is the principal culprit for fatty liver and cirrhosis. The glycine synthesized from the fructolytic intermediate phosphoglycerate can play a role inhibiting fatty liver. There is an epidemic of chronic renal failure due to tubular fibrosis, mucoid angiopathic vascular diseases, cardiomyopathy, multiple endocrine failures, cirrhosis of the liver, interstitial lung disease, degenerative bone and joint diseases and degenerative brain disease like Alzheimer's disease and Parkinson's disease as a consequence of global warming.

The increasing growth of archaea results in increased secretion of archaeal RNA viroids. They can interrupt mRNA function and dysregulates cell metabolism. This is by the mechanism of mRNA blockade. The viroidal RNA can combine with proteins generating prion proteins. This produces a protein conformation defect. This produces a prion protein disease. Abnormal protein conformation of beta amyloid, alpha synuclein, ribonuceloproteins, islet associated amyloid polypeptide and tumour suppressor protein can lead to an epidemic of Alzheimer's disease due to beta amyloid accumulation, alpha synuclein accumulation producing Parkinson's disease, prion like ribonucleoproteins producing motor neuron disease, metabolic syndrome X due to defective insulin secretion as a result of IAPP and abnormal prion like tumour suppressor protein producing tumours. These prion diseases induced by archaeal RNA viroids are also transmissible. Thus global warming related fructolysis leads

to archaeal induced RNA viroidal mediated prion disease and amyloidosis. This raises the spectacle of a Cassandra syndrome of human extinction.

Fructose is phosphorylated to fructose 1-phosphate by ketohexokinase C or fructokinase. Fructose 1-phosphate is converted to glyceraldehyde which is then converted to glyceraldehyde 3-phosphate and dihydroxy acetone phosphate (DHAP). Fructose 1-phosphate is cleaved to DHAP and glyceraldehyde 3-phosphate. DHAP can enter the glycolytic pathway or can go to gluconeogenetic pathway. DHAP generated from fructose 1-phosphate by the action of aldolase B is acted upon by triose phosphate isomerase converting it into glyceraldehydes 3-phosphate. Glyceraldehyde 3-phosphate can be fructolysed to pyruvate and acetyl CoA. Acetyl CoA can be used for cholesterol synthesis for storage. The pyruvate generated from glyceraldehydes 3-phosphate can be converted to the citrate which can be used for fatty acid synthesis by the action of enzymes acetyl CoA carboxylase, fatty acid synthase and malonate dehydrogenase. Glyceraldehyde is acted upon by alcohol dehydrogenase which converts it into glycerol. Glycerol is acted upon by glycerolkinase converting it into glycerol phosphate used for phosphoglyceride and triglyceride synthesis. Glyceraldehyde can also be acted upon by triokinase converting it into glyceraldehydes 3-phosphate which is then converted to DHAP by triose phosphate isomerase. Glyceral phosphate and dihydroxy acetone phosphate are interconvertible by the action of the enzyme glycerol phosphate dehydrogenase. Glycerol and fatty acids generated by fructolysis contribute to lipid synthesis and fat is stored. Fructose does not increase insulin secretion and doesn’t need insulin for transport into the cell. Fructose is transported by the fructose transporter GLUT-5. Ketohexokinase C is exclusively seen in the liver which is the principal site of fructose metabolism. In the presence of hypoxia and anerobic states, there is induction of HIF alpha which can induce ketohexokinase C or fructokinase in the liver, kidney,

gastrointestinal tract, brain and heart. Fructose 1-phosphate by-passes the enzyme phosphofructokinase which is the key regulatory enzyme the glycolytic pathway. Phosphofructokinase is inhibited by ATP and citrate. Thus stress induced fructolysis is an unregulated pathway not amenable to metabolic switches. Fructose does not depend upon insulin for its transport and fructolysis. Therefore fructolysis is not under insulin or endocrine control. It is an unregulated pathway.

The phosphorylation of fructose depletes the cell of ATP. Ketohexokinases preferentially phosphorylate fructose over glucose if it is available. In the presence of redox stress, osmotic stress and archaea/viroids aldose reductase is induced converting all the glucose to fructose. Glycolytic pathway comes to a halt as no ATP is available for phosphorylation of glucose and glucose as such gets converted to fructose. The fructose phosphorylation depletes the cell of ATP. ATP is converted to ADP and AMP which is deaminated to produce uric acid. Fructose increases flux in the pentose phosphate pathway increasing nucleic acid synthesis. Purine degradation results in hyperuricemia. Thus fructolysis results in increase in uric acid accumulation in the body. Uric acid will suppress the mitochondrial oxidative phosphorylation as well as produce endothelial dysfunction. The depletion of ATP by fructose phosphorylation results in membrane sodium potassium ATPase inhibition. This results in reduced energy needs of the cell as 80 percent of the ATP generated by metabolism is used for maintaining the sodium potassium pump. This results in membrane ATPase inhibition generated hibernatory state. The glyceraldehydes 3-phosphate generated by fructolysis can be converted to the pyruvate and acetyl CoA used for cholesterol synthesis. The cholesterol that is synthesized is used for digoxin synthesis. Digoxin also has got aglycone part which contains sugars like digitoxose and rhamnose. Digitoxose and rhamnose are generated by the fructose induced flux and upgradation of the pentose phosphate pathway.

Thus fructolysis results in a hyperdigoxinemic state and membrane sodium potassium ATPase inhibition. This results in cell protection and hibernation.

Fructose produces flux along the pentose phosphate pathway and hexosamine pathway. This results in GAG and nucleic acid synthesis. Fructose is converted to fructose 1-phosphate which is then converted to ribulose 5-phosphate. Ribulose 5-phosphate is acted upon by an isomerase converting it into xylulose 5-phosphate and ribose 5-phosphate. Xylulose 5-phosphate and ribose 5-phosphate interact to produce glyceraldehydes 3-phosphate and sedoheptulose 7-phosphate which is then converted to fructose 6-phosphate and erythrose 4-phosphate. The pentose phosphate pathway generates ribose for nucleic acid synthesis. The pathway also generates hexosamines for GAG synthesis. The pentose phosphate pathway also produces digitoxose and rhamnose for digoxin synthesis.

The global warming results in endosymbiotic archaeal growth. Archaea can induce aldose reductase which converts glucose to fructose. Fructolysis promotes flux along the pentose phosphate pathway generating nucleic acids and glycosaminoglycans. Fructolysis also generates glyceraldehydes 3-phosphate and further pyruvate. The pyruvate can enter the pyruvate carboxylase scheme generating gluconeogenesis and glycogen synthesis. Thus fructolysis can produce glycogen storage. Pyruvate can be converted to citrate for lipid synthesis. Pyruvate can also be converted to acetyl CoA for cholesterol synthesis. The flux along the pentose phosphate pathway generates the digoxin sugars, digitoxose and rhamnose. Cholesterol can be converted to digoxin producing a hyperdigoxinemic state. Digoxin produces membrane sodium potassium ATPase inhibition. The selective phosphorylation of fructose by fructokinase depletes the cell of ATP producing membrane sodium potassium ATPase inhibition. This results in the generation of a hibernatory state. The fructolysis generated pyruvate can get converted to glutamate which can enter

the GABA shunt pathway producing succinyl CoA and glycine for porphyrin synthesis. Porphyrins can form self replicating porphyrions or act as a template for the formation of RNA viroids, DNA viroids and prions which can symbiose to form archaea. Thus the archaea are capable of self replicating on porphyrin templates. The fructolysis thus produces a hibernatory syndrome with fat, glycogen and nucleic acid synthesis and storage. Fructolysis results in the generation of a hibernatory species, the homo neanderthalis. The fructolysis generated membrane sodium potassium ATPase inhibition results in cell hibernation and ATP sparing. The lack of ATP and digoxin induced membrane sodium potassium ATPase inhibition results in cortical inhibition and cerebellar dominance. This produces a somnolent state and a cerebellar cognitive affective disorder. The porphyrions generated by fructolysis produces quantal perception and cerebellar dominance. The storage of glycogen, fat and GAG results in obesity. The cerebellar cognitive affective syndrome results in a hypersexual state. The fructolysis and fructose can activate NFKB producing immune activation. The fructosylation of glycolytic and mitochondrial proteins suppresses the body's normal energetic which depends upon glycolysis and mitochondrial oxidative phosphorylation. Fructosylation of proteins results in blockade of glycolysis and mitochondrial oxidative phosphorylation. The body's energy needs are produced by fructolysis, porphyrin array mediated electron transport chain and ATP synthesis as well as membrane sodium potassium ATPase inhibition relation ATP synthesis. This produces a new species by archaeal symbiosis consequent to global warming - the homo neanderthalis. This can be called as the tropical hibernatory syndrome consequent to global warming.

This can be called also as a fructose disease. Endosymbiotic archaea and viroids induce aldose reductase and converts body glucose to fructose leading to preferential fructose phosphorylation by ketohexokinase C. Fructolysis results

in fructose 1-phosphate being acted upon by aldolase B resulting in the formation of glyceraldehyde and dihydroxy acetone phosphate. Glyceraldehyde can be converted to glyceraldehyde 3-phosphate and this contributes to pyruvate formation. Pyruvate enters the GABA shunt resulting in the formation of succinyl CoA and glycine. They are substrates for porphyrin synthesis and porphyrion formation. The porphyrins form a template for the formation of RNA viroids, DNA viroids, prions, isoprenoids and polysaccharides. They can symbiose together to form primitive archaea. The archaea can further induce HIF alpha, aldose reductose and fructolysis resulting in further porphyrinogenesis and archaeal self replication. The archaea by methanogenesis contributes to global warming which leads to further archaeal growth and a vicious cycle with no regulatory switches. The fructolytic pathway induced by archaea by-passes regulatory enzyme phosphofructokinase and is practically unregulated. Fructolytic pathway contributes to glycogen, lipids, cholesterol, hexose sugars and mucopolysaccharides synthesis and storage. This leads onto a hibernatory state and archaeal symbiosis induced species change resulting in neanderthalisation of the homo sapien species. The digoxin and fructose phosphorylation induced ATP depletion leads to membrane sodium potassium ATPase inhibition, sparing of ATP and tissue hibernation as most of the energy needs of the body are for the working of the sodium potassium pump. The cholesterol that is synthesized by fructolysis is catabolized cholesterol oxidases for archaeal energetics. Archaea also derives its energy from a primitive form of electron transport chain functioning in self replicating porphyrin arrays. The archaeal digoxin induced sodium potassium ATPase inhibition can lead to membrane ATP synthesis. The archaea and the new human species phenotype derive its energy from the above mentioned mechanism. The glycolytic enzymes and the mitochondrial PT pore hexokinase are fructosylated making them dysfunction. The fructosylated glycolytic enzymes lead to generation of

antiglycolytic enzyme antibodies and disease states. The human body's principal method of energetics tissue glycolysis and oxidative phosphorylation comes to a grinding halt. The human body is taken over by the overgrowth of endosymbiotic archaea and assumes hibernatory state with accumulation of glycogen, lipids, mucopolysaccharides and nucleic acids. The catabolic pathways for energy generation related to glucose, glycolysis and oxphos scheme stops. The human body can depend upon ketogenesis from fat and proteins. The upregulated fructolytic pathway generates phosphoglycerate which converted to phosphoserine and glycine. They can be converted to other amino acids and used for ketogenesis. The body assumes a high BMI index and obesity with visceral fat storage and adiposity akin to the Neanderthal metabolic phenotype. Digoxin induced membrane sodium potassium ATPase inhibition results in cortical dysfunction. The brain porphyrins can form a quantal pumped phonon system resulting in quantal perception and low level EMF absorption. This leads to prefrontal cortex atrophy and cerebellar dominance. Fructose itself leads to sympathetic hyperactivity and parasympathetic blockade. This leads onto a functional form of cerebellar cognition and quantal perception resulting in a new brain phenotype. The cerebellar cognitive syndrome leads to a robotic human phenotype. The phenotype is impulsive, has extrasensory perception and has less of speech production. Communication is by symbolic acts. The cerebellar phenotype doesn't have a cortical control and contributes to surrealistic behavior patterns. This produces impulsive behavior and an epidemic of surrealism where the rational prefrontal cortex becomes extinct. This leads to extremes of spirituality, violent and terroristic behavior and hypersexual states contributing to a state of trancedence underlined and reinforced by quantal perception. Cerebellar phenotype owing to its quantal perception behaves as a community and not as an individual. This creates new social and psychological phenotypes. Fructose induces NFKB and immune

activation. This results in an immune activatory phenotype. Cultured T-reg cells on high fructose diet have 62% less IL 40 secretion than controls. This results in a hyperimmune state with fructosylated proteins acting as antigens. The fructolytic pathway can lead to increased DNA synthesis and RNA synthesis due to flux via the pentose phosphate pathway. The fructolytic pathway can be directed to the GABA shunt generating succinyl CoA and glycine. These are substrates for porphyrin templates to form RNA viroids. The archaeal induced redox stress can induce endogenous HERV expression and reverse transcriptase expression. The RNA viroids are converted by HERV reverse transcriptase to corresponding DNA and integrated into the genome by HERV integrase. The integrated RNA viroid related DNA can function as jumping genes producing genomic plasticity and genomic change. This produces a new genotype. Fructosylation of body proteins and enzymes results in a protein processing defect resulting in loss of protein function. The human cell function due to protein fructosylation, protein processing defects and protein conformational defects comes to a grinding halt. Fructolytic pathway generates porphyrin arrays induced ATP production, membrane sodium potassium ATPase inhibition induced ATP synthesis and fructolysis induced ATP generation. This provides energy for porphyrin template induced archaeal replication. The digoxin and fructose phosphorylation induced ATP depletion produces cell membrane sodium potassium ATPase inhibition and a hibernatory state. This leads onto a somnolent sleepy state. The cholesterol catabolism by cholesterol oxidases for archaeal energetics leads to defective sex hormone synthesis. This leads onto an asexual androgynous state. The cerebellar cognitive syndrome due to prefrontal cortical atrophy consequent to porphyrion induced low level EMF perception produces a hypersexual state. This results in male-female equidominance and changes in sexual behavior of the population. Thus the fructose disease consequent to global warming results in a new neuronal, immune, metabolic,

sexual, social phenotype. The human body is converted to a zombie for the global warming related endosymbiotic archaea to thrive. The neuronal, metabolic, sexual and social phenotype creates the necessary environment endosymbiotic archaeal multiplication and the human body is converted to a zombie phenotype. This can be called as a hibernatory zombie syndrome. Due to the new sexual and social phenotype with asexuality and hypersexuality and female-male equidominance the human population falls. The global warming and archaeal induction of HIF alpha resulting in the Warburg phenotype leads to changes in the metabolic scheme of the cells producing body cell transformation to stem cells. The stem cells depend upon glycolysis or fructolysis for energy needs. The Warburg phenotype produces an acidic pH which can result in conversion of body cells to stem cells. The stem cells conversion results in loss of tissue function. The cerebral cortex synaptic connectivity is lost and becomes dysfunction leading to subcortical cerebellar dominance. The immune stem cells proliferate producing an autoimmune disease. The various tissue cells the specialized function like neuron, nephron and muscle cell all because of stem cell conversion becomes dysfunctional. This produces a stem cell syndrome with human somatic cells being converted to stem cells with loss of function and uncontrolled proliferation. The fructosylation of proteins results in protein function defects. The fructosylation of LDL results in defective cholesterol transport to the cells. This results in steroidal hormone synthesis defects. Cholesterol is required for formation of synaptic connectivity and this leads to cerebral cortical dysfunction. The hemoglobin becomes fructosylated and oxygen transport is affected. This leads to hypoxia and anerobic states. The hypoxia and anerobic states induces HIF alpha and the Warburg fructolytic phenotype. The HIF alpha also induces aldose reductase converting glucose to fructose and inducing the fructolytic scheme. The fructolysis induced GABA shunt pathway and porphyrin synthesis results in further archaeal porphyrin

template related replication. This results in further archaeal induced fructolysis and the vicious irreversible cycle proceeds. The uncontrolled growth of archaea leads to still further global warming. The world of endosymbiotic eternal archaea takes over and persists during the extremophilic climatic changes of global warming. The human beings exist as neanderthalic zombies serving archaeal multiplication. The homo sapiens gets converted to a new phenotype, genotype, immunotype, metabolonomic type and brain type. This is called as hibernatory zombie related to global warming - homo neoneanderthalis.

Table 1

	Serum fructose		**Serum fructokinase**		**Aldolase B**		**Total GAG**	
	Mean	**± SD**	**Mean**	**± SD**	**Mean**	**± SD**	**Mean**	**± SD**
Normal	2.50	0.195	8.50	0.405	3.50	1.304	3.50	0.707
RA	29.88	5.150	22.29	1.641	10.87	1.895	23.47	2.878
Lupus	33.11	4.509	20.24	1.639	11.59	0.767	20.62	3.504
ME	33.59	3.938	22.45	2.472	11.30e	0.783	23.50	3.225
F value	17.373		13.973		13.903		21.081	
p value	< 0.01		< 0.01		< 0.01		< 0.01	

Table 2

	Total TG		**Serum ATP levels**		**Uric acid**		**Anti-aldolase**	
	Mean	**± SD**	**Mean**	**± SD**	**Mean**	**± SD**	**Mean**	**± SD**
Normal	124.00	3.688	2.50	0.405	5.70	0.369	7.50	1.704
RA	289.89	23.406	0.74	0.115	9.59	0.783	1.80	0.402
Lupus	294.00	39.903	0.78	0.161	8.34	0.712	1.81	0.691
ME	293.80	31.555	0.72	0.134	9.51	1.059	2.10	0.572
F value	16.378		59.169		14.166		55.173	
p value	< 0.01		< 0.01		< 0.01		< 0.01	

Table 3

	Anti-enolase		**Anti-pyruvatekinase**		**Anti-GAPDH**	
	Mean	**± SD**	**Mean**	**± SD**	**Mean**	**± SD**
Normal	1.50	0.358	50.40	5.960	5.20	0.363
RA	0.39	0.124	18.93	6.447	1.78	0.355
Lupus	0.42	0.116	18.59	3.721	1.48	0.258
ME	0.36	0.177	15.33	3.212	1.72	0.277
F value	14.091		21.073		58.769	
p value	< 0.01		< 0.01		< 0.01	

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2

A Cholesterol and Actinide Dependent Shadow Biosphere of Archaea and Viroids in Systemic Lupus Erythematosis, Multiple Sclerosis and Rheumatoid Arthritis

Introduction

Actinides like rutile, endogenous digoxin as well as organisms like phytoplasmas and viroids have been implicated in the etiology of systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis.[1-4] Endogenous digoxin has been related to the pathogenesis of systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis.[4] The possibility of endogenous digoxin synthesis by actinide based primitive organism like archaea with a mevalonate pathway and cholesterol catabolism was considered.[5-8] An actinide dependent shadow biosphere of archaea and viroids in the above mentioned disease states is described.[7, 9] Metal actinides in beach sands have been postulated to play a role in abiogenesis.[7] A hypothesis of cholesterol as the primal prebiotic molecule synthesized on actinide surfaces with all other biomolecules arising from it and a self replicating cholesterol lipid organism as the initial life form is presented.

Global warming can lead to osmotic stress consequent to dehydration. The increase in actinidic archaeal growth leads to cholesterol catabolism and digoxin synthesis. Digoxin produces membrane sodium potassium ATPase inhibition and increase in intracellular calcium producing mitochondrial dysfunction. This results in oxidative stress. The oxidative stress and osmotic stress can induce the enzyme aldose reductase which converts glucose to fructose. Fructose has got a low km value for ketokinase as compared to glucose. Therefore fructose gets phosphorylated more to fructose phosphate and the cell is depleted of ATP. The cell depletion of ATP leads to oxidative stress and chronic inflammation consequent to induction of NFKB. The fructose phosphate can enter the pentose phosphate pathway synthesizing ribose and nucleic acid. The depletion of cellular ATP results in generation of AMP and ADP which are acted upon by deaminases causing hyperuricemia. Uric acid can also produce mitochondrial

dysfunction. The fructose phosphate can enter the glucosamine pathway synthesizing GAG and producing mucopolysaccharide accumulation. Fructose can fructosylate proteins making them antigenic and producing an autoimmune response. This can lead to global warming related autoimmune disease.

Materials and Methods

The following groups were included in the study:- systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis. There were 10 patients in each group and each patient had an age and sex matched healthy control selected randomly from the general population. The blood samples were drawn in the fasting state before treatment was initiated. Plasma from fasting heparinised blood was used and the experimental protocol was as follows (I) Plasma+phosphate buffered saline, (II) same as I+cholesterol substrate, (III) same as II+rutile 0.1 mg/ml, (IV) same as II+ciprofloxacine and doxycycline each in a concentration of 1 mg/ml. Cholesterol substrate was prepared as described by Richmond.[10] Aliquots were withdrawn at zero time immediately after mixing and after incubation at 37 ℃ for 1 hour. The following estimations were carried out: - Cytochrome F420, free RNA, free DNA, polycyclic aromatic hydrocarbon, hydrogen peroxide, dopamine, serotonin, pyruvate, ammonia, glutamate, cytochrome C, hexokinase, ATP synthase, HMG CoA reductase, digoxin and bile acids.[11-13] Cytochrome F420 was estimated flourimetrically (excitation wavelength 420 nm and emission wavelength 520 nm). Polycyclic aromatic hydrocarbon was estimated by measuring hydrogen peroxide liberated by using glucose reagent. Informed consent of the subjects and the approval of the ethics committee were obtained for the study. The statistical analysis was done by ANOVA.

Results

Plasma of control subjects showed increased levels of the above mentioned parameters with after incubation for 1 hour and addition of cholesterol substrate resulted in still further significant increase in these parameters. The plasma of patients showed similar results but the extent of increase was more. The addition of antibiotics to the control plasma caused a decrease in all the parameters while addition of rutile increased their levels. The addition of antibiotics to the patient's plasma caused a decrease in all the parameters while addition of rutile increased their levels but the extent of change was more in patient's sera as compared to controls. The results are expressed in tables 1-7 as percentage change in the parameters after 1 hour incubation as compared to the values at zero time.

Table 1. *Effect of rutile and antibiotics on cytochrome F420 and PAH.*

Group	CYT F420 % (Increase with Rutile)		CYT F420 % (Decrease with Doxy+Cipro)		PAH % change (Increase with Rutile)		PAH % change (Decrease with Doxy+Cipro)	
	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD
Normal	4.48	0.15	18.24	0.66	4.45	0.14	18.25	0.72
MS	22.12	1.81	61.33	9.82	22.83	1.78	59.84	7.62
SLE	22.06	1.61	57.81	6.04	23.46	1.91	61.56	4.61
RA	22.70	1.87	60.46	8.06	23.73	1.38	65.20	6.20
F value	306.749		130.054		391.318		257.996	
P value	< 0.001		< 0.001		< 0.001		< 0.001	

Table 2. *Effect of rutile and antibiotics on free RNA and DNA.*

Group	DNA % change (Increase with Rutile)		DNA % change (Decrease with Doxy+Cipro)		RNA % change (Increase with Rutile)		RNA % change (Decrease with Doxy+Cipro)	
	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD
Normal	4.37	0.15	18.39	0.38	4.37	0.13	18.38	0.48
MS	22.62	1.38	63.82	5.53	23.29	1.98	67.46	3.96
SLE	23.30	1.42	65.07	4.95	23.11	1.52	66.68	3.97
RA	22.29	2.05	58.70	7.34	22.29	2.05	67.03	5.97
F value	337.577		356.621		427.828		654.453	
P value	< 0.001		< 0.001		< 0.001		< 0.001	

Table 3. *Effect of rutile and antibiotics on HMG CoA reductase and ATP synthase.*

Group	HMG CoA R % change (Increase with Rutile)		HMG CoA R % change (Decrease with Doxy+Cipro)		ATP synthase % (Increase with Rutile)		ATP synthase % (Decrease with Doxy+Cipro)	
	Mean	±SD	Mean	± SD	Mean	± SD	Mean	± SD
Normal	4.30	0.20	18.35	0.35	4.40	0.11	18.78	0.11
MS	23.14	1.85	59.76	4.82	23.52	1.76	67.05	3.00
SLE	22.38	2.38	60.65	5.27	23.00	1.64	66.67	4.21
RA	22.92	1.48	61.91	7.56	23.37	1.31	63.97	3.62
F value	319.332		199.553		449.503		673.081	
P value	< 0.001		< 0.001		< 0.001		< 0.001	

Table 4. *Effect of rutile and antibiotics on digoxin and bile acids.*

Group	Digoxin (ng/ml) (Increase with Rutile)		Digoxin (ng/ml) (Decrease with Doxy+Cipro)		Bile Acids % change (Increase with Rutile)		Bile Acids % change (Decrease with Doxy+Cipro)	
	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD
Normal	0.11	0.00	0.054	0.003	4.29	0.18	18.15	0.58
MS	0.52	0.03	0.214	0.032	21.95	2.11	65.46	5.79
SLE	0.53	0.06	0.212	0.045	23.30	1.88	62.49	7.26
RA	0.51	0.05	0.213	0.033	23.41	1.41	58.70	7.34
F value	135.116		71.706		290.441		203.651	
P value	< 0.001		< 0.001		< 0.001		< 0.001	

Table 5. *Effect of rutile and antibiotics on pyruvate and hexokinase.*

Group	Pyruvate % change (Increase with Rutile)		Pyruvate % change (Decrease with Doxy+Cipro)		Hexokinase % change (Increase with Rutile)		Hexokinase % change (Decrease with Doxy+Cipro)	
	Mean	**±SD**	**Mean**	**±SD**	**Mean**	**± SD**	**Mean**	**± SD**
Normal	4.34	0.21	18.43	0.82	4.21	0.16	18.56	0.76
MS	21.59	1.23	60.28	9.22	22.81	1.91	63.47	5.81
SLE	21.07	1.79	63.90	7.13	22.47	2.17	65.97	4.62
RA	22.29	2.05	62.37	5.05	21.66	1.94	67.03	5.97
F value	321.255		115.242		292.065		317.966	
P value	< 0.001		< 0.001		< 0.001		< 0.001	

Table 6. *Effect of rutile and antibiotics on hydrogen peroxide and delta amino levulinic acid.*

Group	H_2O_2 % (Increase with Rutile)		H_2O_2 % (Decrease with Doxy+Cipro)		ALA % (Increase with Rutile)		ALA % (Decrease with Doxy+Cipro)	
	Mean	**±SD**	**Mean**	**± SD**	**Mean**	**± SD**	**Mean**	**± SD**
Normal	4.43	0.19	18.13	0.63	4.40	0.10	18.48	0.39
MS	21.14	1.20	60.53	4.70	22.38	1.79	67.10	3.82
SLE	23.32	1.71	63.15	7.62	23.45	1.79	66.32	3.63
RA	22.86	1.91	63.66	6.88	23.17	1.88	68.53	2.65
F value	380.721		171.228		372.716		556.411	
P value	< 0.001		< 0.001		< 0.001		< 0.001	

Table 7. *Effect of rutile and antibiotics on dopamine and serotonin.*

Group	DOPAMINE % (Increase with Rutile)		DOPAMINE % (Decrease with Doxy+Cipro)		5 HT % change (Increase with Rutile)		5 HT % change (Decrease with Doxy+Cipro)	
	Mean	**± SD**	**Mean**	**± SD**	**Mean**	**± SD**	**Mean**	**± SD**
Normal	4.41	0.15	18.63	0.12	4.34	0.15	18.24	0.37
MS	22.92	2.14	67.54	3.65	21.93	2.29	63.70	5.63
SLE	23.43	1.57	66.30	3.57	22.98	1.50	65.13	4.87
RA	23.70	1.75	68.06	3.52	23.81	1.49	64.89	6.01
F value	403.394		680.284		348.867		364.999	
P value	< 0.001		< 0.001		< 0.001		< 0.001	

Discussion

Archaeal Cholesterol Catabolism in Relation to Autoimmune Disease

The archaeaon steroidelle DXP pathway and the upregulated pentose phosphate pathway contributes to digoxin synthesis. There was increase in cytochrome F420 indicating archaeal growth. The archaea can synthesize and use cholesterol as a carbon and energy source.[6, 14] The archaeal origin of the enzyme activities was indicated by antibiotic induced suppression. The study indicates the presence of actinide based archaea with an alternate actinide based enzymes or metalloenzymes in the system as indicated by rutile induced increase in enzyme activities.[15] There was also an increase in archaeal HMG CoA reductase activity indicating increased cholesterol synthesis by the archaeal mevalonate pathway. The archaeal beta hydroxyl steroid dehydrogenase activity indicating digoxin synthesis and archaeal cholesterol hydroxylase activity indicating bile acid synthesis were increased.[8] The archaeal cholesterol oxidase activity was increased resulting in generation of pyruvate and hydrogen peroxide.[14] The pyruvate gets converted to glutamate and ammonia by the GABA shunt pathway. The archaeal aromatization of cholesterol generating PAH, serotonin and dopamine was also detected.[16] The archaeal glycolytic hexokinase activity and archaeal extracellular ATP synthase activity were increased. The archaea can undergo magnetite and calcium carbonate mineralization and can exist as calcified nanoforms.[17]

Archaeal-Viroidal Human Genomic Sequences and Autoimmunity

There was an increase in free RNA indicating self replicating RNA viroids and free DNA indicating generation of viroid complementary DNA strands by archaeal reverse transcriptase activity. The actinides modulate RNA folding and catalyse its ribozymal action. Digoxin can cut and paste the viroidal strands by modulating RNA splicing generating RNA viroidal diversity. The viroids are

evolutionarily escaped archaeal group I introns which have retrotransposition and self splicing qualities.[18] Archaeal pyruvate can produce histone deacetylase inhibition resulting in endogenous retroviral (HERV) reverse transcriptase and integrase expression. This can integrate the RNA viroidal complementary DNA into the noncoding region of eukaryotic noncoding DNA using HERV integrase as has been described for borna and ebola viruses.[19] The noncoding DNA is lengthened by integrating RNA viroidal complementary DNA with the integration going on as a continuing event. The archaea genome can also get integrated into human genome using integrase as has been described for trypanosomes.[20] The integrated viroids and archaea can undergo vertical transmission and can exist as genomic parasites.[19, 20] This increases the length and alters the grammar of the noncoding region producing memes or memory of acquired characters as well as eukaryotic speciation and individuality.[21] The viroidal complementary DNA can function as jumping genes producing a dynamic genome important in storage of synaptic information, HLA gene expression and developmental gene expression. The RNA viroids can regulate mRNA function by RNA interference.[18] The phenomena of RNA interference can modulate T-cell and B-cell function, insulin signaling lipid metabolism, cell growth and differentiation, apoptosis, neuronal transmission and euchromatin / heterochromatin expression. This can lead to the pathogenesis of systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis.

Archaeal Digoxin and Autoimmune Disease

NMDA receptors can be modulated by digoxin induced calcium oscillations, PAH increasing NMDA activity and viroid induced RNA interference.[4] The cholesterol ring oxidase generated pyruvate can be converted by the GABA shunt pathway to glutamate. NMDA excitotoxicity can lead to systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis. The dipolar PAH and

archaeal magnetite in the setting of digoxin induced sodium potassium ATPase inhibition can produce a pumped phonon system mediated Frohlich model superconducting state [22] inducing quantal perception with nanoarchaeal sensed gravity producing the orchestrated reduction of the quantal possibilities to the macroscopic world.[4, 22] The perception of low level EMF can lead to systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis.[16] The higher degree of integration of the archaea into the genome produces increased digoxin synthesis producing right hemispheric dominance and lesser degree producing left hemispheric dominance.[4] Right hemispheric dominance can lead to systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis. Archaea and RNA viroid can bind the TLR receptor induce NFKB producing immune activation and cytokine TNF alpha secretion. The archaeal DXP and mevalonate pathway metabolites can bind γδ TCR and digoxin induced calcium signaling can activate NFKB producing chronic immune activation.[4, 23] The archaea and viroid induced chronic immune activation and generation of superantigens can lead on to autoimmune disease. Archaea, viroids and digoxin can induce the host AKT PI3K, AMPK, HIF alpha and NFKB producing the Warburg metabolic phenotype.[24] The increased glycolytic hexokinase activity, decrease in blood ATP, leakage of cytochrome C, increase in serum pyruvate and decrease in acetyl CoA indicates the generation of the Warburg phenotype. There is induction of glycolysis, inhibition of PDH activity and mitochondrial dysfunction resulting in inefficient energetics and insulin resistance. The archaea and viroid generated cytokines can lead to TNF alpha induced insulin resistance. Insulin resistance can lead to systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis. The accumulated pyruvate enters the GABA shunt pathway and is converted to citrate which is acted upon by citrate lyase and converted to acetyl CoA, used for cholesterol synthesis.[24] The pyruvate can be converted to glutamate and ammonia which is oxidised by archaea for energy

needs. The increased cholesterol substrate leads to increased archaeal growth and digoxin synthesis leading to metabolic channeling to the mevalonate pathway. The archaeal bile acids are steroidal hormones which can bind GPCR and modulate D_2 regulating the conversion of T_4 to T_3 which activates uncoupling proteins, can activate NRF½ inducing NQO1, GST, HOI reducing redox stress, can bind FXR regulating insulin receptor sensitivity and bind PXR inducing the bile acid shunt pathway of cholesterol detoxification.[25] The Warburg phenotype induced increased mitochondrial dysfunction, archaeal PAH and viroid induced RNA interference can lead on to systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis. The RNA viroids can recombine with HERV sequences and get encapsulated in microvesicles contributing to the retroviral state. The prion protein conformation is modulated by RNA viroid binding producing prion disease. Prions and HERV sequences can lead to systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis.[4]

Abiotic Endosymbiotic Actinidic Archaea

The metal actinides provide radiolytic energy, catalysis for oligomer formation and provide a coordinating ion for metalloenzymes all important in abiogenesis.[7] The metal actinide surfaces would by surface metabolism generate acetate which could get converted to acetyl CoA and then to cholesterol which functions as the primal prebiotic molecule self organizing into self replicating supramolecular systems, the lipid organism.[9, 26, 27] Cholesterol by radiolysis by actinides would have formed PAH generating PAH aromatic organism.[9] Cholesterol radiolysis would generate pyruvate which would get converted to amino acids, sugars, nucleotides, porphyrins, fatty acids and TCA acids. Anastase and rutile surfaces can produce polymerization of amino acids, isoprenyl residues, PAH and nucleotides to generate the initial lipid organism, PAH organism, prions and RNA viroids which would have symbiosed to

generate the archaeal protocell. The archaea evolved into gram negative and gram positive bacteria with a mevalonate pathway which had a evolutionary advantage and the symbiosis of archaea with gram negative organism generated the eukaryotic cell.[28] The data supports the persistence of an actinide and cholesterol based shadow biosphere which throws light on the actinide based origin of life and cholesterol as the premier prebiotic molecule. This shadow biosphere can mediate the pathogenesis of systemic lupus erythematosis, multiple sclerosis and rheumatoid arthritis.

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3

Digoxin Mediated Model for Rheumatic Fever and Recurrent Respiratory Infection - Hypodigoxinemic Immune Deficiency Syndrome

Introduction

The epidemiology of acute rheumatic fever is identical to that of group A streptococcal upper respiratory tract infections. As is the case for streptococcal sore throat, acute rheumatic fever most often occurs in children; the peak age related incidence is between 5 and 15 years. Studies have shown that approximately 3% of individuals with untreated group A streptococcal pharyngitis will develop rheumatic fever. The rheumatogenecity of specific strains is largely based upon epidemiologic evidence associating certain serotypes with rheumatic fever (5, 6 and 1 8).

Major efforts have focused on the abnormal immune response by the human host to one or more group A streptococcal antigens. The hypothesis of antigenic mimicry between human and bacterial antigens has been studied extensively and has concentrated on two interactions. The first is the similarity between the group specific carbohydrate of the group A streptococcus and the glycoproteins of heart valves; the second involves the molecular similarity between either streptococcal cell membrane or streptococcal M-protein and sarcolemma or other moieties of the human myocardial cell. The possibility of a predisposing genetic influence in some individuals is also postulated. Observations have been described that support the concept that this non-suppurative sequel to group A streptococcal infections results from an abnormal immune response by the human host. Thus differences in immune responses to streptococcal extracellular antigens have been reported as also the presence of a unique surface marker on non-T-lymphocytes of rheumatic fever patients.

The isoprenoidal pathway is a key regulatory pathway in the cell and produces important metabolites - digoxin, dolichol and ubiquinone. Archaeal digoxin is an endogenous membrane Na^+-K^+ ATPase inhibitor and can modulate immune activity. Lithium, an exogenous membrane Na^+-K^+ ATPase

inhibitor can produce immune activation. Elevated archaeal digoxin levels have been reported in Kawasaki's disease with cardiac involvement. Digoxin can also modulate neurotransmitter transport and dopaminergic hyperactivity has been reported in the chorea of acute rheumatic fever. Dolichol is important in N-glycosylation of proteins and glycoconjugate synthesis. Ubiquinone is an important free-radical scavenger and free radical mechanisms are important in phagocytic killing of bacteria by macrophages. Therefore it was considered pertinent to study the isoprenoid pathway in rheumatic fever to find out whether any dysregulation of the pathway can predispose to acute rheumatic fever with recurrent streptococcal infections. Hemispheric dominance has been related to immune mediated diseases. Therefore the pathway was also assessed in right hemispheric dominant, left hemispheric dominant and bihemispheric dominant individuals to find out whether hemispheric dominance has any role to play in the genesis of acute rheumatic fever.

Global warming can lead to osmotic stress consequent to dehydration. The increase in actinidic archaeal growth leads to cholesterol catabolism and digoxin synthesis. Digoxin produces membrane sodium potassium ATPase inhibition and increase in intracellular calcium producing mitochondrial dysfunction. This results in oxidative stress. The oxidative stress and osmotic stress can induce the enzyme aldose reductase which converts glucose to fructose. Fructose has got a low km value for ketokinase as compared to glucose. Therefore fructose gets phosphorylated more to fructose phosphate and the cell is depleted of ATP. The cell depletion of ATP leads to oxidative stress and chronic inflammation consequent to induction of NFKB. The fructose phosphate can enter the pentose phosphate pathway synthesizing ribose and nucleic acid. The depletion of cellular ATP results in generation of AMP and ADP which are acted upon by deaminases causing hyperuricemia. Uric acid can also produce mitochondrial dysfunction. The fructose phosphate can enter the glucosamine pathway

synthesizing GAG and producing mucopolysaccharide accumulation. Fructose can fructosylate proteins making them antigenic and producing an autoimmune response. This can lead to global warming related autoimmune disease.

Results

(1) The activity of HMG CoA reductase and the concentration of digoxin and dolichol were decreased in the serum of acute rheumatic fever cases. The concentration of serum ubiquinone, the activity of erythrocyte membrane Na^+-K^+ ATPase and serum magnesium were increased.

(2) The concentration of serum tryptophan, quinolinic acid and serotonin was decreased in the plasma of acute rheumatic fever patients while that of tyrosine, dopamine and noradrenaline was increased.

(3) Nicotine and strychnine were not detected in the plasma of acute rheumatic fever patients. Morphine was detected in the plasma of acute rheumatic fever patients.

(4) The concentration of total glycosaminoglycans (GAG) decreased in the serum of acute rheumatic fever patients with recurrent streptococcal infections. The concentration of heparan sulphate (HS) heparin (H), dermatan sulphate (DS), chondroitin sulphates (ChS) and hyaluronic acid (HA) was decreased in the serum. The concentration total hexose, fucose and sialic acid were decreased in the glycoproteins of the serum of acute rheumatic fever patients. The concentration of gangliosides, glycosyl-diglycerides, cerebrosides and sulphatides showed significant decrease in the serum of acute rheumatic fever patients.

(5) The activity of glycosaminoglycan (GAG) degrading enzymes - beta glucuronidase, beta N-acetyl hexosaminidase, hyaluronidase and cathepsin-D - was decreased in the serum of acute rheumatic fever

patients when compared to the controls. The activity of beta galactosidase, beta fucosidase and beta glucosidase decreased in the serum of acute rheumatic fever cases.

(6) The concentration of total GAG and hexose and fucose residues of glycoproteins in the RBC membrane increased significantly in acute rheumatic fever cases. The concentration of RBC membrane cholesterol decreased while that of phospholipid increased in acute rheumatic fever patients. The ratio of RBC membrane cholesterol phospholipids decreased in acute rheumatic fever cases.

(7) The activity of superoxide dismutase (SOD), catalase, glutathione reductase and glutathione peroxidase in the erythrocytes increased significantly in the serum of acute rheumatic fever cases. The concentration of malon dialdehyde (MDA), hydroperoxides, conjugated dienes and nitric oxide (NO) decreased significantly in the serum of acute rheumatic fever cases. The concentration of reduced glutathione increased in acute rheumatic fever cases.

(8) The results showed that HMG CoA reductase activity serum digoxin and dolichol were increased and serum ubiquinone, RBC membrane sodium-potassium ATPase activity and serum magnesium were reduced in left handed / right hemispheric dominant individuals. The results showed that HMG CoA reductase activity serum digoxin and dolichol were decreased and serum ubiquinone, RBC membrane sodium-potassium ATPase activity and serum magnesium increased in right handed / left hemispheric dominant individuals. The results showed that the concentration of tryptophan, quinolinic acid, serotonin, strychnine and nicotine was found to be higher in the plasma of left handed / right hemispheric dominant individuals while that of tyrosine, dopamine,

morphine and norepinephrine was lower. The results showed that the concentration of tryptophan, quinolinic acid serotonin, strychnine and nicotine was found to be lower in the plasma of right handed / left hemispheric dominant individuals while that of tyrosine, dopamine, morphine and norepinephrine was higher.

Discussion

Archaeal Digoxin and Membrane Na^+-K^+ ATPase Inhibition in Relation to Rheumatic Fever

The archaeaon steroidelle DXP pathway and the upregulated pentose phosphate pathway contribute to digoxin synthesis. The decrease in the activity of HMG CoA reductase in the acute rheumatic fever patients with recurrent streptococcal infection suggests a downregulation of the isoprenoid pathway. There is a marked decrease in plasma digoxin and dolichol and this decrease may be a consequence of decreased channelling of intermediates of the isoprenoid pathway for their biosynthesis. Studies have shown that digoxin is synthesized by the isoprenoid pathway. The decrease in endogenous digoxin, a potent inhibitor of membrane of Na^+-K^+ ATPase, can increase this enzyme activity. In acute rheumatic fever patients with recurrent streptococcal infection there was significant stimulation of the RBC membrane of Na^+-K^+ ATPase. The stimulation of Na^+-K^+ ATPase by low levels of digoxin is known to cause a decrease in intracellular calcium resulting from decreased Na^+-Ca^{++} exchange, decreased entry of calcium via the voltage gated calcium channel and decreased release of calcium from intracellular endoplasmic reticulum calcium stores. This decrease in intracellular calcium by not displacing magnesium from its binding sites causes an increase in the functional availability of magnesium. This increase in the availability of magnesium can cause increased mitochondrial. ATP formation which along with increased magnesium can cause further

stimulation of Na^+-K^+ ATPase, since ATP-magnesium complex is the actual substrate for this reaction. There is thus a progressive stimulation of Na^+-K^+ ATPase activity. The increased intracellular magnesium related mitochondrial ATP synthesis results in increased calcium extrusion from the cell. High intracellular magnesium and low intracellular calcium consequent to Na^+-K^+ ATPase stimulation appear to be crucial to the pathophysiology of rheumatic fever with recurrent streptococcal infection. The intracellular negative calcium signal and positive magnesium signal can regulate diverse cellular process. Serum magnesium was assessed in rheumatic fever patients with recurrent streptococcal infection and was found to be increased.

Archaeal Digoxin and Immune Dysfunction in Relation to Rheumatic Fever

The archaeaon fructosoid contributes to fructolysis and immune activation. Fructose can contribute to induction of NFKB and immune activation. The archaeaon steroidelle synthesized digoxin induces NFKB producing immune activation. Decreased intracellular calcium consequent to membrane Na^+-K^+ ATPase inhibition in rheumatic fever with recurrent streptococcal infection inactivates the calcium dependent calcineurin signal transduction pathway involved in T-cell activation. This results in decreased secretion of interleukin-3, 4, 5, 6 and TNF alpha (tumour necrosis factor alpha). Low levels of TNF alpha can lead to immunosuppression which could also contribute to increased incidence of rheumatic fever with recurrent streptococcal infection.

Archaeal Digoxin and Regulation of Neurotransmitter Synthesis and Function in Relation to Rheumatic Fever

The archaeaon neurotransminoid shikimic acid pathway contributes to tryptophan and tyrosine synthesis and catabolism generating neurotransmitters and neuroactive alkaloids. The concentration of tryptophan, quinolinic acid and

serotonin was found to be lower in the plasma of patients with rheumatic fever with recurrent streptococcal infection while that of tyrosine, dopamine, morphine and norepinephrine was higher. Thus there is a decrease in tryptophan and its catabolites and an increase in tyrosine and its catabolites in the patient's serum. This could be due to the fact digoxin can regulate neutral amino acid transport system with preferential promotion of tryptophan transport over tyrosine and that digoxin levels are low in patients with rheumatic fever with recurrent streptococcal infection. Quinolinic acid has been implicated in immune activation and low levels of it can lead to immunosuppression. It has been reported that during immunosuppression serotonin is decreased with a corresponding increase in dopamine and noradrenaline and this can contribute to the immunosuppression in rheumatic fever patients with recurrent streptococcal infection. Morphine is also an immunosuppressive alkaloid. The increased level of morphine noted in patients with rheumatic fever patients with recurrent streptococcal infection is significant. The low level of quinolinic acid, serotonin and strychnine can contribute to reduce excitatory glutamatergic transmission as they are all positive modulators of the NMDA receptor. In the presence of hypermagnesemia, the magnesium block on the NMDA receptors is strengthened leading on to reduced NMDA transmission. The decreased presynaptic neuronal calcium can produce reduced cyclic AMP dependent dephosphorylation of synapsins resulting in decreased glutamate release into the synaptic junction and vesicular recyling. Decreased intracellular calcium in the post synaptic neuron can also inhibit the calcium dependent NMDA signal transduction. The plasma membrane glutamate transporter (on the surface of the glial cell and presynaptic neuron) is coupled with a sodium gradient which is activated by the stimulation of Na^+-K^+ ATPase, resulting in increased clearance of glutamate by presynaptic and glial uptake at the end of synaptic transmission. By these mechanisms, stimulation of Na^+-K^+ ATPase can inhibit glutamatergic

transmission. The increase in membrane Na^+-K^+ ATPase activity in rheumatic fever patients with recurrent streptococcal infection could be due to the fact that the hyperpolarising neurotransmitters (dopamine, morphine and noradrenaline) are increased and the depolarising neuroactive compounds (serotonin, strychnine, nicotine, quinolinic acid and glutamate) are decreased. Decreased serotonin can lead to depression and obsessive disorder. Such a psychopathology can lead to rheumatic fever with recurrent streptococcal infection. In obsessive compulsive disorder recurrent streptococcal infections are common. Both these movement disorders have been related to hyperdoparninergic transmission in basal ganglia and dopamine receptor supersensitivity.

Archaeal Digoxin and Regulation of Golgi Body / Lysosomal Function in Relation to Rheumatic Fever

The archaeaon glycosaminoglycoid and fructosoid contributes to glycoconjugate synthesis and catabolism by the process of fructolysis. The membrane Na^+-K^+ ATPase stimulation related increased the intracellular magnesium level in rheumatic fever patients with recurrent streptococcal infection can affect the metabolism of glycosaminoglycans, glycoproteins and glycolipids. The decrease in the level of dolichol may suggest its decreased availability for N-glycosylation of proteins. Magnesium excess can lead to increased catabolism of sphinganine leading to decreased cerebroside and ganglioside synthesis. In magnesium excess the glycolysis, citric acid cycle and oxidative phosphorylation are activated and less of glucose 6-phosphate is channelled for the synthesis of glycosaminoglycans (GAG). The results show a decrease in the concentration of serum total GAG, glycolipids (ganglioside, glycosyl-diglyceride, cerebrosides and sulphatides) and carbohydrate components of glycoproteins (hexose, fucose and sialic acid) in rheumatic fever patients with recurrent streptococcal infection. The individual GAG fractions in the serum heparan sulphate (HS), chondroitin

sulphates (ChS), heparin (H), hyaluronic acid (HA) and dermatan sulphate (DS) are decreased. The activity of GAG degrading enzymes (beta glucuronidase, beta N-acetyl hexosaminidase, hyaluronidase and cathepsin-D) and that of glycohydrolases (beta galactosidase, beta fucosidase and beta glucosidase) showed a significant decrease in the serum in rheumatic fever patients with recurrent streptococcal infection. Intracellular magnesium excess also results in increased ubiquitin dependent proteolytic processing of glycoconjugates as it requires magnesium for its infections have been described. Increased dopamine can lead to chorea and tic syndrome associated with recurrent streptococcal function. The decrease in the activity of glycohydrolases and GAG degrading enzymes could be due to increased lysosomal stability.

The altered glycoconjugates of the heart valves can make them prone to damage in rheumatic fever. There is a similarity between specific carbohydrate antigens of group A streptococcus and the glycoproteins of the heart valve. This similarity is probably accentuated by reduced N-glycosylation of valve proteins consequent to reduced dolichol levels. The protein processing defect can result in defective glycosylation of exogenous bacterial glycoprotein antigens with consequent defective formation of MHC class-1 bacterial glycoprotein antigen complex. This results in defective transport of MHC class-1 bacterial glycoprotein antigen complex to the antigen presenting cell surface for recognition by CD_4 or CD_8 cell. Defective presentation of exogenous bacterial antigens can produce immune evasion by the bacteria and its persistence. The reduction in the synthesis of glycoconjugates can impair the integrity of the mucosal barrier in the respiratory system leading to rheumatic fever with recurrent streptococcal infection. The increased lysosomal stability also impairs the defence against the invading bacteria / virus. Phagocytosis by macrophages requires the activity of lysosomal enzymes. The increased stability of the lysosomes in patients with hypodigoxinemic state leading on to rheumatic fever

with recurrent streptococcal infection inhibits the pathogocytic lysosomes mediated killing of bacteria / virus. The decrease in fucoligands and sialoligands can also contribute to immunosuppression and streptococcal infection.

Archaeal Digoxin and Alteration in Membrane Structure and Membrane Formation in Relation to Rheumatic Fever

The archaeaon steroidelle, glycosaminoglycoid and fructosoid contribute to cell membrane formation synthesizing cholesterol by the DXP pathway and glycosaminoglycans by fructolysis. The downregulation of the isoprenoid pathway in rheumatic fever patients with recurrent decrease can lead to decreased cholesterol synthesis and magnesium excess can stimulate phospholipid synthesis. Phospholipid degradation is inhibited by a decrease in intracellular calcium inhibiting phospholipase A_2 and D. The cholesterol: phospholipid ratio of the RBC membrane was decreased in rheumatic fever patients with recurrent streptococcal infection. The concentration of total GAG, hexose and fucose content of glycoprotein increased in the RBC membrane and decreased in the serum suggesting their increased incorporation into the membrane and defective membrane formation. This is due to intracellular hypermagnesemia upregulating the trafficking of membrane components. The change in membrane structure produced by alteration in glycoconjugates and cholesterol: phospholipid ratio can produce changes in the conformation of Na^+-K^+ ATPase resulting in farther membrane Na^+-K^+ ATPase stimulation. The same changes can affect the structure of organelle membrane. This results in increased lysosomal stability. The alteration in the mucosal cell membranes can also increase the risk of penetration by bacteria and virus by eroding the mucosal barrier.

Archaeal Digoxin and Mitochondrial Dysfunction in Relation to Rheumatic Fever

The archaeaon vitaminocyte contributes to the synthesis of ubiquinone and mitochondrial electron transport chain function. The mitochondrial function related free radical generation is regulated by the archaeaon vitaminocyte synthesized tocopherol and ascorbic acid. The concentration of ubiquinone increased significantly in rheumatic fever patients with recurrent streptococcal infection which may be the result of increased tyrosine levels, consequent to digoxin deficiency promoting tyrosine transport over tryptophan. The decrease in intracellular calcium can stabilise the mitochondrial PT pore and improve mitochondrial function. Intracellular magnesium excess can lead to an increase in the activity of ATP synthase. All this leads to improved efficiency of mitochondrial oxidative phosphorylation and reduced free radical generation. Ubiquinone excess also leads to increased free radical scavenging. Intracellular magnesium excess due to membrane Na^+-K^+ ATPase stimulation leads to decrease in defence against an invading bacteria / virus. The decrease in intracellular calcium may lead to decreased generation of NO by inhibiting the enzyme nitric oxide synthase and reduced peroxynitrite formation. Decreased calcium also can inhibit phospholipase A_2 resulting in decreased generation of arachidonic and free radical formation. Decreased generation of free radicals like the superoxide ion and hydroxyl radical can stabilise the cell membrane and stimulate membrane Na^+-K^+ ATPase. There was decrease in lipid peroxidation as evidenced from the decrease in the concentration of MDA, conjugated dienes, hydroperoxides and NO with increased antioxidant protection as indicated by an increase in ubiquinone and increased reduced glutathione levels. The activity of enzymes involved in free radical scavenging like superoxide dismutase, catalase, glutathione peroxidase and glutathione reductase is increased in rheumatic fever patients with recurrent streptococcal infection suggesting increased free radical

scavenging. The peroxisomal membrane is stablised owing to membrane Na^+-K^+ ATPase stimulation related alteration in membrane formation and leads to increased catalase activity. Glutathione is synthesized by the enzyme glutathione synthetase which needs magnesium and ATP. The high intracellular magnesium consequent to Na^+-K^+ ATPase stimulation and the resulting increased ATP can result in increased synthesis of glutathione. Glutathione peroxidase, a selenium containing enzyme oxidises reduced glutathione (GSH) to oxidised glutathione (GSSG) which is then rapidly reduced to GSH by glutathione reductase. There is also a concomitant conversion of H_2O_2 to H_2O. The activity of glutathione reductase needs NADPH for the increased formation of glucose 6-phosphate and upregulation of the pentose phosphate pathway with a consequent increased generation of NADPH. Thus the glutathione system of free radical scavenging is activated in the presence of membrane Na^+-K^+ ATPase stimulation. The stabilisation of the mitochondrial PT pore consequent to reduced intracellular calcium produces increased efficiency of superoxide dismutase activity. Decreased free radical production could contribute to increased incidence of rheumatic fever with recurrent streptococcal infection. Phagocytic killing of bacteria / virus are mediated by free radicals in the phagosomes. Reduced free radical production will grossly impair phagocytic function leading on to rheumatic fever patients with recurrent streptococcal infection.

Archaeal Digoxin and Hemispheric Dominance in Relation to Rheumatic Fever

The archaeaon related organelle - steroidelle, neurotransminoid and vitaminocyte contribute to hemispheric dominance. Thus the immune mechanisms and the response to an invading bacteria / virus differ in the hypo and hyperdigoxinemic state. The hypodigoxinemic state is associated with immunosuppression and rheumatic fever with recurrent streptococcal infection.

Hypodigoxinemia is related to left hemispheric dominance and hyperdigoxinemia with right hemispheric dominance. Recurrent transient respiratory infection and immunosuppression is associated with left hemispheric dominance and hypodigoxinemia. Geschwind has postulated a relationship between cerebral lateralization and immune function. Hypothalamic archaeal digoxin and hemispheric dominance may thus regulate immune function.

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4

Archaeal Digoxin Mediated Model for Rheumatoid Arthritis

Introduction

The cause of rheumatoid arthritis (RA) remains unknown. It has been suggested that RA might be a manifestation of the response to an infectious agent in a genetically susceptible host. A number of possible causative agents have been suggested including mycoplasma, ebstein barr virus, cytomegalovirus, parvo virus and rubella virus. One possibility is that there is persistent infection of articular structures or retention of microbial products in the synovial tissue which generates a chronic inflammatory response. Rheumatoid arthritis presents with a characteristic constellation of features-which include hyperplasia and hypertrophy of the synovial lining cells; focal and segmental vascular changes, including thrombosis, microvascular injury and neovascularisation, edema and infiltration with mononuclear cells which aggregates around small blood vessels. The predominant infiltrating cell is the T-lymphocyte. CD_4+ T-cells predominate over CD_8+ T-cells and are frequently found in close proximity to HLA-DR+ macrophages and dendritic cells. These cells produce both polyclonal immunoglobulin and the autoantibody rheumatoid factor that results in the formation of immune complexes. The rheumatoid factor is antoantibodies reactive with the Fc portion of IgG. Cytokines and chemokines derived from T-lymphocytes such as interleukin-2, interferon gamma, IL-6, IL-10, granulocyte-macrophage colony stimulating factor, tumour necrosis factor alpha and TGF-beta play, a role in immunopathology of rheumatoid arthritis. The vascular granulation tissue produces IL-1 and TNF alpha that play a role in stimulating the pannus cells to produce degradative enzymes including collagenase, neutral proteases and stromelysin which facilitate tissue damage. The same two cytokines stimulate the chondrocyte to produce proteolytic enzymes that degrade cartilage locally. The earliest event appears to be a non-specific inflammatory response against the unknown stimulus which leads

to T-cell activation and a subsequent B-cell activation and proliferation. As tissue damage occurs additional autoantigens are revealed resulting in nonspecific T-cell activation. Finally as a result of persistent exposure to the inflammatory milieu the function of the synovial fibroblast is altered and acquires a destructive potential which no longer requires stimulation from T-cells of macrophages. Geschwind has postulated a relationship between cerebral lateralization and immune function. For example, they observed a higher frequency of left-handedness in patients with some immune disorders. There are no reports on the role of hemispheric dominance in the pathogenesis of rheumatoid arthritis.

The archaea produces an endogenous membrane Na^+-K^+ ATPase inhibitor, digoxin which is a steroidal glycoside. Digoxin is synthesized by the isoprenoid pathway. Increased level of digoxin has been documented in immune diseases like Kawasaki's disease. A viral infective theory for Kawasaki's disease has been postulated by several groups of workers. Membrane Na^+-K^+ ATPase inhibition leads to immune stimulation and increased in CD_4/CD_8 ratios as exemplified by the action of lithium. Digoxin can also modulate amino acid and neurotransmitter transport and regulated synaptic transmission, Saito has reported increased activities of the tryptophan catabolic kynurenine pathway in various tissues following systemic immune stimulation, in conjunction with macrophage infiltration of the affected tissues. These results suggest that kynurenine metabolites may have some connection with immune response. Previous reports have demonstrated induction of indoleamine 2,3 dioxygenase and increased production of quinolinic acid in immune complex disease like systemic lupus mediated by interferons. The isoprenoid pathway produces two other metabolites - ubiquinone and dolichol important in cellular metabolism. Ubiquinone functions as a free radical scavenger and dolichol is important in N-glycosylation of proteins. Free radicals are involved in immune activation.

Digoxin being a modulator of synaptic transmission could play a role in hemispheric dominance.

Global warming can lead to osmotic stress consequent to dehydration. The increase in actinidic archaeal growth leads to cholesterol catabolism and digoxin synthesis. Digoxin produces membrane sodium potassium ATPase inhibition and increase in intracellular calcium producing mitochondrial dysfunction. This results in oxidative stress. The oxidative stress and osmotic stress can induce the enzyme aldose reductase which converts glucose to fructose. Fructose has got a low km value for ketokinase as compared to glucose. Therefore fructose gets phosphorylated more to fructose phosphate and the cell is depleted of ATP. The cell depletion of ATP leads to oxidative stress and chronic inflammation consequent to induction of NFKB. The fructose phosphate can enter the pentose phosphate pathway synthesizing ribose and nucleic acid. The depletion of cellular ATP results in generation of AMP and ADP which are acted upon by deaminases causing hyperuricemia. Uric acid can also produce mitochondrial dysfunction. The fructose phosphate can enter the glucosamine pathway synthesizing GAG and producing mucopolysaccharide accumulation. Fructose can fructosylate proteins making them antigenic and producing an autoimmune response. This can lead to global warming related autoimmune disease.

It was therefore considered pertinent to study digoxin status and digoxin synthesis in rheumatoid arthritis. The glycoconjugate, free radical metabolism and RBC membrane composition were also studied. The patterns were also studied in individuals with differing hemispheric dominance for comparison with those in rheumatoid arthritis. The results are presented in this paper.

Results

(1) The results showed that HMG CoA reductase activity, serum digoxin and dolichol were increased in rheumatoid arthritis indicating upregulation of the isoprenoid pathway but serum ubiquinone was reduced.

(2) The results showed that the concentration of tryptophan, quinolinic acid, serotonin, strychnine and nicotine was found to be higher in the plasma of patients with rheumatoid arthritis while that of tyrosine, dopamine, norepinephrine and morphine was lower.

(3) There was an increase in lipid peroxidation as evidenced from the increase in the concentration of MDA, conjugated dienes, hydroperoxides and NO with decreased antioxidant protection as indicated by a decrease in ubiquinone and reduced glutathione in rheumatoid arthritis. The activity of enzymes involved in free radical scavenging like superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase and catalase is decreased in rheumatoid arthritis suggesting reduced free radical scavenging.

(4) The results show an increase in the concentration of the serum total and individual GAG fractions, glycolipids and carbohydrate components of glycoproteins in rheumatoid arthritis. The activity of GAG degrading enzymes and that of glycohydrolases showed significant increase in the serum rheumatoid arthritis.

(5) The cholesterol phospholipid ratio of the RBC membrane was increased in rheumatoid arthritis. The concentration of total GAG, hexose and fucose content of glycoprotein decreased in the RBC membrane and increased in the serum in rheumatoid arthritis.

(6) The results showed that HMG CoA reductase activity, serum digoxin and dolichol were increased and ubiquinone reduced in left handed / right hemispheric dominant individuals. The results also showed that HMG

CoA reductase activity, serum digoxin and dolichol were decreased and ubiquinone increased in right handed / left hemispheric dominant individuals. The results showed that the concentration of tryptophan, quinolinic acid serotonin, strychnine and nicotine was found to be higher in the plasma of left handed / right hemispheric dominant individuals while that of tyrosine, dopamine, morphine and norepinephrine was lower. The results also showed that the concentration of tryptophan, quinolinic acid serotonin, strychnine and nicotine was found to be lower in the plasma of right handed / left hemispheric dominant individuals while that of tyrosine, dopamine, morphine and norepinephrine was higher.

Discussion

Archaeal Digoxin and Membrane Na^+-K^+ ATPase Inhibition in Relation to Rheumatoid Arthritis

The archaeaon steroidelle DXP pathway and the upregulated pentose phosphate pathway contribute to digoxin synthesis. The increase in endogenous digoxin, a potent inhibitor of membrane Na^+-K^+ ATPase, can decrease this enzyme activity in rheumatoid arthritis. There was increased synthesis of digoxin as evidenced by increased HMG CoA reductase activity. The inhibition of Na^+-K^+ ATPase by digoxin is known to cause an increase in intracellular calcium resulting from increased Na^+-Ca^{++} exchange, which displaces magnesium from its binding site and causes a decrease in the functional availability of magnesium. This decrease in the availability of magnesium can cause decreased mitochondrial ATP formation which along with low magnesium can cause further progressive inhibition of Na^+-K^+ ATPase, since ATP-magnesium complex is the actual substrate for this reaction. Low intracellular magnesium and high intracellular calcium consequent to Na^+-K^+ ATPase inhibition appear to be crucial to the pathophysiology of rheumatoid arthritis.

Archaeal Digoxin and Immune Activation in Rheumatoid Arthritis

The archaeaon fructosoid contributes to fructolysis and immune activation. Fructose can contribute to induction of NFKB and immune activation. The archaeaon steroidelle synthesized digoxin induces NFKB producing immune activation. In rheumatoid arthritis increased intracellular calcium consequent to membrane Na^+-K^+ ATPase inhibition activates the calcium dependent calcineurin signal transduction pathway, which can produce T-cell activation and secretion of interleukin-2, 6, 10 and TNF alpha. This immune activation can contribute to the genesis of rheumatoid arthritis.

Archaeal Digoxin and Regulation of Neurotransmitter Synthesis and Function in Relation to Rheumatoid Arthritis

The archaeaon neurotransminoid shikimic acid pathway contributes to tryptophan and tyrosine synthesis and catabolism generating neurotransmitters and neuroactive alkaloids. There is an increase in tryptophan and its catabolites and reduction in tyrosine and its catabolites in the serum of patients with rheumatoid arthritis. This could be due to the fact that digoxin can regulate the neutral amino acid transport system with preferential promotion of tryptophan transport over tyrosine. In the presence of hypomagnesemia, the magnesium block on the NMDA receptor is removed leading to NMDA excitotoxicity. The elevated levels of quinolinic acid, strychnine and serotonin can also contribute to NMDA excitotoxicity as they are positive modulators of the NMDA receptor. NMDA excitotoxic mechanisms have been postulated to contribute to immune activation in immune complex disorders and could possibly due the same in rheumatoid arthritis. Quinolinic acid has been implicated in immune activation in autoimmune diseases like SLE. Gamma interferons important in mediating immune injury in rheumatoid arthritis and SLE act by promoting tryptophan catabolism along the kynurenine pathway. Increased amounts of quinolinic acid

suggest increased activity of gamma interferons. Serotonin, dopamine and noradrenaline receptors have been demonstrated in the lymphocytes. It has been reported that during immune activation serotonin is increased with a corresponding reduction in dopamine and noradrenaline and this can contribute to the immune activation in rheumatoid arthritis. The schizoid neurotransmitter pattern of reduced dopamine, noradrenaline and morphine and increased serotonin, strychnine and nicotine is common to schizophrenia and rheumatoid arthritis and could predispose to its development. A schizoid type of personality could predispose to the development of rheumatoid arthritis.

Archaeal Digoxin and Regulation of Golgi Body / Lysosomal Function in Relation to Rheumatoid Arthritis

The archaeaon glycosaminoglycoid and fructosoid contributes to glycoconjugate synthesis and catabolism by the process of fructolysis. The elevation in the level of dolichol in rheumatoid arthritis may suggest its increased availability for N-glycosylation of proteins. Magnesium deficiency can lead to increased glycolipid and glycosaminoglycan synthesis. Intracellular magnesium deficiency also results in defective ubiquitin dependent proteolytic processing of glycoconjugates as it requires magnesium for its function. The increase in the activity of glycohydrolases and GAG degrading enzymes could be due to reduced lysosomal stability and consequent leakage of lysosomal enzymes into the serum. The increase in the concentration of carbohydrate components of glycoproteins and GAG inspite of increased activity of many glycohydrolases may be due to their possible resistance to cleavage by glycohydrolases / GAG degrading enzymes consequent to qualitative change in their structure. The protein processing defect can result in defective glycosylation of endogenous synovial glycoprotein antigens and exogenous viral glycoprotein antigens with consequent defective formation of

MHC-antigen complex. The MHC linked peptide transporter, a P-glycoprotein which transports MHC-antigen complex to the antigen presenting cell surface, has an ATP binding site. The peptide transporter is dysfunctional in the presence of magnesium deficiency. This results in defective transport of MHC class-1 synovial glycoprotein antigen complex to the antigen presenting cell surface for recognition by CD4 or CD cell. Defective presentation of the endogenous synovial / viral glycoprotein antigen can explain the immune dysregulation and autoimmunity in rheumatoid arthritis. This can also explain the autoantibodies developed against Fc portion of IgG as this glycoprotein is also altered consequent to the protein processing defect. Defective presentation of exogenous viral antigens can produce immune evasion by the virus. Viral and bacterial persistence has been implicated in the development of rheumatoid arthritis. A number of fucose and sialic acid containing natural ligands are involved in trafficking of leukocytes and similar breaches in the blood brain barrier and resultant adhesion and trafficking of the lymphocyte and extravasation in to the perivascular space have been described in rheumatoid arthritis.

Archaeal Digoxin and Alteration in Membrane Structure and Membrane Formation in Relation to Rheumatoid Arthritis

The archaeaon steroidelle, glycosaminoglycoid and fructosoid contribute to cell membrane formation synthesizing cholesterol by the DXP pathway and glycosaminoglycans by fructolysis. The upregulation of the isoprenoid pathway can lead to increased cholesterol synthesis and magnesium deficiency can inhibit phospholipid synthesis in rheumatoid arthritis. Phospholipid degradation is increased owing to increase in intracellular calcium activating phospholipase A_2 and D. The cholesterol: phospholipid ratio of the RBC membrane was increased in rheumatoid arthritis. The concentration of total GAG, hexose and fucose of glycoprotein decreased in the RBC membrane and increased in the

serum suggesting their reduced incorporation into the membrane and defective membrane formation. This trafficking of the glycoconjugates and lipids which are synthesized in the endoplasmic reticulum - golgi complex to the cell membrane depends upon GTPases and lipid kinases which are crucially dependent on magnesium and are defective in magnesium deficiency. The change in membrane structure produced by alteration in glycoconjugates and cholesterol: phospholipid ratio can produce changes in the conformation of Na^+-K^+ ATPase resulting in further membrane Na^+-K^+ ATPase inhibition. The same changes can affect the structure of lysosomal membrane. The results in defective lysosomal stability and leakage of glycohydrolases and GAG degrading enzymes into the serum. Increased lysosomal release of neutral proteases and collagenase by the pannus cell and chondrocyte can contribute to tissue destruction in rheumatoid arthritis.

Archaeal Digoxin and Mitochondrial Dysfunction in Relation to Rheumatoid Arthritis

The archaeaon vitaminocyte contributes to the synthesis of ubiquinone and mitochondrial electron transport chain function. The mitochondrial function related free radical generation is regulated by the archaeaon vitaminocyte synthesized tocopherol and ascorbic acid. The concentration of ubiquinone decreased significantly in rheumatoid arthritis, which may be the result of low tyrosine levels, reported in most of the disorders, consequent to digoxin's effect in preferentially promoting tryptophan transport over tyrosine. The aromatic ring portion of ubiquinone is derived from tyrosine. Ubiquinone, which is an important component of the mitochondrial electron transport chain, is a membrane antioxidant and contributes to free radical scavenging. The increase in intracellular calcium can open the mitochondrial PT pore causing a collapse of the hydrogen gradient across the inner membrane and uncoupling of the

respiratory chain. Intracellular magnesium deficiency can lead to a defect in the function of ATP synthase. All this leads to defects in mitochondrial oxidative phosphorylation, incomplete reduction of oxygen and generation of superoxide which produces lipid peroxidation. Ubiquinone deficiency also leads to reduced free radical scavenging. The increase in intracellular calcium may lead to increased generation of NO by inducing the enzyme nitric oxide synthase which combines with superoxide radical to form peroxynitrite. Increased intracellular calcium can also activate phospholipase A_2 resulting in increased generation of arachidonic acid which can undergo increased lipid peroxidation. Increased generation of free radicals like the superoxide ion and hydroxyl radical can produce lipid peroxidation and cell membrane damage which can further inactivate Na^+-K^+ ATPase, triggering the cycle of free radical generation once again. Magnesium deficiency can affect glutathione synthetase and glutathione reductase function. The mitochondrial superoxide dismutase leaks out and becomes dysfunctional with calcium related opening of the mitochondrial PT pore and outer membrane rupture. The peroxisomal membrane is defective owing to membrane Na^+-K^+ ATPase inhibition related defect in membrane formation and leads to reduced catalase activity. Mitochondrial dysfunction related free radical generation has been implicated in the pathogenesis of immune mediated diseases like rheumatoid arthritis. Free radicals have been implicated in immune activation.

Archaeal Digoxin and Hemispheric Dominance in Relation to Rheumatoid Arthritis

The archaeaon related organelle-steroidelle, neurotransminoid and vitaminocyte contribute to hemispheric dominance. Thus the immune mechanisms and the response to an invading bacteria / virus differ in the hyperdigoxinemic state. The hyperdigoxinemic state is associated with immuno

activation and viral persistence. There is an increased tendency for autoimmune diseases like rheumatoid arthritis in the hyperdigoxinemic state. The patterns in rheumatoid arthritis correlated with those obtained in right hemispheric dominance. In right hemispheric dominant individuals there is an upregulated isoprenoid pathway, increased digoxin synthesis and increased tryptophan catabolites over tyrosine. In left hemispheric dominant individuals there is a downregulated isoprenoid pathway, reduced digoxin synthesis and increased tyrosine catabolites over tryptophan. This correlates with previous reports on the relationship between left handedness and immune mediated disorders. Hemispheric dominance arid hypothalamic archaeal digoxin may play an important role in the pathogenesis of rheumatoid arthritis.

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Archaeal Digoxin Mediated Model for Systemic Lupus Erythematosis - Relation to Hemispheric Chemical Dominance

Introduction

The archaea produces an endogenous membrane Na^+-K^+ ATPase inhibitor, digoxin which is a steroidal glycoside. Digoxin is synthesized by the isoprenoid pathway. Increased level of digoxin has been documented in immune diseases like Kawasaki's disease. A viral infective theory for Kawasaki's disease has been postulated by several groups of workers. Membrane Na^+-K^+ ATPase inhibition leads to immune stimulation and increased in CD_4/CD_8 ratios as exemplified by the action of lithium. Digoxin can also modulate amino acid and neurotransmitter transport. There have been reports of increased activities of the tryptophan catabolic kynurenine pathway in various tissues following systemic immune stimulation, in conjunction with macrophage infiltration of the affected tissues. These results suggest that kynurenine metabolites may have some connection with immune response. Previous reports have demonstrated induction of indoleamine 2,3-dioxygenase and increased production of quinolinic acid in systemic lupus mediated by interferons. The isoprenoid pathway produces two other metabolites - ubiquinone and dolichol important in cellular metabolism. Ubiquinone functions as a free radical scavenger and dolichol is important in N-glycosylation of proteins.

Global warming can lead to osmotic stress consequent to dehydration. The increase in actinidic archaeal growth leads to cholesterol catabolism and digoxin synthesis. Digoxin produces membrane sodium potassium ATPase inhibition and increase in intracellular calcium producing mitochondrial dysfunction. This results in oxidative stress. The oxidative stress and osmotic stress can induce the enzyme aldose reductase which converts glucose to fructose. Fructose has got a low km value for ketokinase as compared to glucose. Therefore fructose gets phosphorylated more to fructose phosphate and the cell is depleted of ATP. The cell depletion of ATP leads to oxidative stress and chronic inflammation

consequent to induction of NFKB. The fructose phosphate can enter the pentose phosphate pathway synthesizing ribose and nucleic acid. The depletion of cellular ATP results in generation of AMP and ADP which are acted upon by deaminases causing hyperuricemia. Uric acid can also produce mitochondrial dysfunction. The fructose phosphate can enter the glucosamine pathway synthesizing GAG and producing mucopolysaccharide accumulation. Fructose can fructosylate proteins making them antigenic and producing an autoimmune response. This can lead to global warming related autoimmune disease.

It was therefore considered pertinent to study digoxin status and digoxin synthesis in SLE. The glycoconjugate metabolism, free radical metabolism and RBC membrane composition were also studied in these groups of diseases. These parameters were also studied in patients with right hemispheric and left hemispheric dominance in order to find the correlation between hemispheric dominance and immune mediated diseases. The results are presented in this paper.

Materials and Methods

The following groups were included in the study: (1) 10 cases of SLE (ARA criteria); all the 15 patients with SLE were right handed heft hemispheric dominant by the dichotic listening test, (2) 15 patients with right hemispheric dominance, left hemispheric dominance and bihemispheric dominance respectively detected by the dichotic listening test, (3) Each patient had an age and sex matched bihemispheric dominant healthy control. The permission of the Ethics committee of the institute as well as informed consent from the patients / relatives was obtained for the study.

None of the subjects studied was under medication at the time of removal of blood. Fasting blood was removed in citrate tubes from each of the number of patients mentioned above. RBCs were separated within one hour of collection of blood for the estimation of membrane Na^+-K^+ ATPase. Serum was used for

the analysis of various parameters. The methodology used in the study was as follows: All biochemicals used in this study were obtained from M/s Sigrna Chemicals, USA. Activity of HMG CoA reductase of the serum was determined by the method of Rao and Ramakrishnan by determining the ratio of HMG CoA to mevalonate. For the determination of the RBC Na^+-K^+ ATPase activity of the erythrocyte membrane, the procedure described by Wallach and Kamat was used. Digoxin in the serum was determined by the procedure described by Arun, Ravikumar, Leelamma and Kurup. For estimation of ubiquinone and dolichol in the serum, the procedure described by Palmer, Maureen and Robert was used. Magnesium in the serum was estimated by atomic absorption spectrophotometry. Tryptophan was estimated by the method of Bloxam and Warren and tyrosine by the method of Wong, O'Flynn and Inouye. Serotonin was estimated by the method of Curzon and Green and catecholamines by the method of Well-Malherbe. Quinohnic acid content of serum was estimated by HPLC (C_{18} column micro Bondapak™ 4.6 x 140 mm), solvent system 0.01 M acetate buffer (pH 3.0) and methanol (6:4), flow rate 1.0 ml/min and detection UV (250 nm). Morphine, strychnine and nicotine were estimated by the method described by Arun, Ravikumar, Leelamma and Kurup. Details of the procedures used for the estimation of total and individual GAG, carbohydrate components of glycoproteins, activity of enzymes involved in the degradation of GAG and activity of glycohydrolases are described before. Serum glycolipids were estimated as described by Lowenstein. Cholesterol was estimated by using commercial kits supplied by Sigma Chemicals, USA. SOD was assayed by the method of Kakkar, Das and Viswanathan. Catalase activity was estimated by the method of Maehly and Chance, glutathione peroxidase by the method of Paglia and Valentine and glutathione reductase by the method of Horn and Burns. MDA was estimated by the method of Will and conjugated dienes and hydroperoxides by the procedure of Brien. Reduced glutathione was estimated by the method of

Beutler, Duran and Kelley. Nitric oxide was estimated in the plasma by the method of Gabor and Allon. Statistical analysis was done by 'ANOVA'.

Results

(1) The results showed that serum HMG CoA reductase activity, serum digoxin and dolichol were increased in SLE indicating upregulation of the isoprenoid pathway but serum ubiquinone, magnesium and RBC membrane Na^+-K^+ ATPase activity was reduced.

(2) The results showed that the concentration of tryptophan, quinolinic acid, serotonin, strychnine and nicotine was found to be higher in the serum of patients with SUE while that of tyrosine, dopamine, norepinephrine and morphine was lower.

(3) There was an increase in lipid peroxidation as evidenced from the increase in the concentration of MDA, conjugated dienes, hydroperoxides and NO with decreased antioxidant protection as indicated by a decrease in ubiquinone and reduced glutathione in SLE. The activity of enzymes involved in free radical scavenging like superoxide dismutase, glutathione peroxidase, glutathione reductase and catalase is decreased in SLE suggesting reduced free radical scavenging.

(4) The results show an increase in the concentration of serum total and individual GAG fractions, glycolipids and carbohydrate components of glycoproteins in SLE. The activity of GAG degrading enzymes and that of glycohydrolases showed a significant increase in the serum in SLE.

(5) The cholesterol: phospholipid ratio of the RBC membrane was increased in SLE, The concentration of total GAG, hexose and fucose content of glycoprotein decreased in the RBC membrane and increased in the serum in SLE.

(6) The results showed that serum HMG CoA reductase activity serum digoxin and dolichol levels were increased and serum ubiquinone, magnesium and RBC membrane Na^+-K^+ ATPase activity were reduced in left handed / right hemispheric dominant individuals. The results also showed that serum HMG CoA reductase activity, serum digoxin and dolichol levels were decreased and serum ubiquinone, magnesium and RBC membrane Na^+-K^+ ATPase activity were increased in right handed / left hemispheric dominant individuals. The results showed that the concentration of tryptophan, quinolinic acid serotonin, strychnine and nicotine was found to be higher in the serum of left handed / right hemispheric dominant individuals while that of tyrosine, dopamine, morphine and norepinephrine was lower. The results also showed that the concentration of tryptophan, quinolinic acid serotonin, strychnine and nicotine was found to be lower in the serum of right handed / left hemispheric dominant individuals while that of tyrosine, dopamine, morphine and norepinephrine was higher.

Discussion

Archaeal Digoxin and Membrane Na^+-K^+ ATPase Inhibition in Relation to SLE

The archaeaon steroidelle DXP pathway and the upregulated pentose phosphate pathway contribute to digoxin synthesis. The increase in endogenous digoxin, a potent inhibitor of membrane Na^+-K^+ ATPase, can decrease this enzyme activity in SLE. There was increased synthesis of digoxin as evidenced by increased HMG CoA reductase activity. The inhibition of Na^+-K^+ ATPase by digoxin is known to cause an increase in intracellular calcium resulting from increased Na^+-Ca^{++} exchange, which displaces magnesium from its binding site and causes a decrease in the functional availability of magnesium. This decrease in the availability of magnesium can cause decreased mitochondrial ATP

formation which along with low magnesium can cause further progressive inhibition of Na^+-K^+ ATPase, since the ATP-magnesium complex is the actual substrate for this reaction. Low intracellular magnesium and high intracellular calcium consequent to Na^+-K^+ ATPase inhibition appear to be crucial to the pathophysiology of SLE.

Archaeal Digoxin and Immune Activation in Relation to SLE

The archaeaon fructosoid contributes to fructolysis and immune activation. Fructose can contribute to induction of NFKB and immune activation. The archaeaon steroidelle synthesized digoxin induces NFKB producing immune activation. In SLE increased intracellular calcium consequent to membrane Na^+-K^+ ATPase inhibition activates the calcium dependent calcineurin signal transduction pathway, which can produce T-cell activation and secretion of interleukin-3, 4, 5, 6 and TNF alpha. This immune activation can contribute to the genesis of SLE.

Archaeal Digoxin and Regulation of Neurotransmitter Synthesis and Function in Relation to SLE

The archaeaon neurotransminoid shikimic acid pathway contributes to tryptophan and tyrosine synthesis and catabolism generating neurotransmitters and neuroactive alkaloids. There is an increase in tryptophan and its catabolites and reduction in tyrosine and its catabolites in the serum of patients with SLE. This could be due to the fact digoxin can regulate neutral amino acid transport system with preferential promotion of tryptophan transport over tyrosine. In the presence of hypomagnesmia, the magnesium block on the NMDA receptor is removed leading to NMDA excitotoxicity. The elevated levels of quinolinic acid, strychnine and serotonin can also contribute to NMDA excitotoxicity as they are positive modulators of the NMDA receptor. NMDA excitotoxic

mechanisms have been postulated to contribute to neuronal death. Quinolinic acid has been implicated in immune activation in autoimmune diseases like SLE. Serotonin, dopamine and noradrenaline receptors have been demonstrated in the lymphocytes. It has been reported that during immune activation serotonin is increased with a corresponding reduction in dopamine and noradrenaline and this can contribute to the immune activation in SLE. The schizoid neurotransmitter pattern of reduced dopamine, noradrenaline and morphine and increased serotonin, strychnine and nicotine is common to SLE and could predispose to its development. A schizoid type of personality could predispose to the development of SLE. The present study shows that schizoid psychosis in neurolupus could as well be due to a primary neurotransmitter change.

Archaeal Digoxin and Regulation of Golgi Body / Lysosomal Function in Relation to SLE

The archaeaon glycosaminoglycoid and fructosoid contributes to glycoconjugate synthesis and catabolism by the process of fructolysis. The elevation in the level of dolichol in SEE may suggest its increased availability for N-glycosylation of proteins. Magnesium deficiency can lead to increased glycolipid and glycosaminoglycan synthesis. Intracellular magnesium deficiency also results in defective ubiquitin dependent proteolytic processing of glycoconjugates as it requires magnesium for its function. The increase in the activity of glycohydrolases and GAG degrading enzymes could be due to reduced lysosomal stability and consequent leakage of lysosomal enzymes into the serum. The increase in the concentration of carbohydrate components of glycoproteins and GAG inspite of increased activity of many glycohydrolases may be due to their possible resistance to cleavage by glycohydrolases / GAG degrading enzymes consequent to qualitative change in their structure. The protein processing defect can result in defective glycosylation of endogenous

neuronal glycoprotein antigens and exogenous bacterial glycoprotein antigens with consequent defective formation of MHC-antigen complex. The MHC linked peptide transporter, a P-glycoprotein which transports MHC antigen complex to the antigen presenting cell surface, has an ATP binding site. The peptide transporter is dysfunctional in the presence of magnesium deficiency. This results in defective transport of MHC class-l glycoprotein antigen complex to the antigen presenting cell surface for recognition by CD_4 or CD_8 cell. Defective presentation of the endogenous neuronal / nuclear glycoprotein antigen can explain the immune dysregulation and autoimmunity in neurolupus. Defective presentation of exogenous viral can produce immune evasion by the virus as in SLE. Viral and bacterial persistence has been implicated in the development of SLE also. The antinuclear antibodies in SLE are developed against methylated bases. Methylated bases are seen commonly in bacteria and rarely in humans. A number of fucose and sialic acid containing natural ligands are involved in trafficking of leukocytes and similar breaches in the blood brain barrier and resultant adhesion and trafficking of the lymphocyte and extravasation in to the perivascular space have been described in the brain in neurolupus.

Archaeal Digoxin and Alteration in Membrane Structure and Membrane Formation in Relation to SLE

The archaeaon steroidelle, glycosaminoglycoid and fructosoid contribute to cell membrane formation synthesizing cholesterol by the DXP pathway and glycosaminoglycans by fructolysis. The upregulation of the isoprenoid pathway can lead to increased cholesterol synthesis and magnesium deficiency can inhibit phospholipid synthesis in SLE. Phospholipid degradation is increased owing to an increase in intracellular calcium activating phospholipase A_2 and D. The cholesterol: phospholipid ratio of the RBC membrane was increased in SLE. The concentration of total GAG, hexose and fucose of glycoprotein decreased in

the RBC membrane and increased in the serum suggesting their reduced incorporation into the membrane and defective membrane formation. This trafficking of the glycoconjugates and lipids which are synthesized in the endoplasmic reticulum - golgi complex to the cell membrane depends upon GTPases and lipid kinases which are crucially dependent on magnesium and are defective in magnesium deficiency. The change in membrane structure produced by alteration in glycoconjugates and cholesterol phospholipid ratio can produce changes in the conformation of Na^+-K^+ ATPase resulting in further membrane Na^+-K^+ ATPase inhibition. The same changes can affect the structure of the lysosomal membrane. The results in defective lysosomal stability and leakage of glycohydrolases and GAG degrading enzymes into the serum.

Archaeal Digoxin and Mitochondrial Dysfunction in Relation to SLE

The archaeaon vitaminocyte contributes to the synthesis of ubiquinone and mitochondrial electron transport chain function. The mitochondrial function related free radical generation is regulated by the archaeaon vitaminocyte synthesized tocopherol and ascorbic acid. The concentration of ubiquinone decreased significantly in SLE, which may be the result of low tyrosine levels, reported in most of the disorders, consequent to digoxin's effect in preferentially promoting tryptophan transport over tyrosine. The aromatic ring portion of ubiquinone is derived from tyrosine. Ubiquinone, which is an important component of the mitochondrial electron transport chain, is a membrane antioxidant and contributes to free radical scavenging. The increase in intracellular calcium can open the mitochondrial PT pore causing a collapse of the hydrogen gradient across the inner membrane and uncoupling of the respiratory chain. Intracellular magnesium deficiency can lead to a defect in the function of ATP synthase. All this leads to defects in mitochondrial oxidative phosphorylation, incomplete reduction of oxygen and generation of superoxide

which produces lipid peroxidation. Ubiquinone deficiency also leads to reduced free radical scavenging. The increase in intracellular calcium may lead to increased generation of NO by inducing the enzyme nitric oxide synthase which combines with superoxide radical to form peroxynitrite. Increased intracellular calcium also can activate phospholipase A_2 resulting in increased generation of arachidonic acid which can undergo increased lipid peroxidation. Increased generation of free radicals like the superoxide ion and hydroxyl radical can produce lipid peroxidation and cell membrane damage which can further inactivate Na^+-K^+ ATPase, triggering the cycle of free radical generation once again. Magnesium deficiency can affect glutathione synthetase and glutathione reductase function. The mitochondrial superoxide dismutase leaks out and becomes dysfunctional with calcium related opening of the mitochondrial PT pore and outer membrane rupture. The peroxisomal membrane is defective owing to membrane Na^+-K^+ ATPase inhibition related defect in membrane formation and leads to reduced catalase activity. Mitochondrial dysfunction related free radical generation has been implicated in the pathogenesis of immune mediated diseases like neurolupus. The increased intracellular calcium and ceramide related opening of the mitochondrial PT pore also leads to volume dysregulation of the mitochondria, causing hyperosmolality of the matrix and expansion of the matrix space. The Outer membrane of the mitochondria ruptures and releases apoptosis inducing factor and cytochrome C into the cytoplasm. This results in activation of caspase-9. Caspase-9 can produce apoptosis of the cell. Apoptosis has been implicated in the genesis of cell death in SLE.

Archaeal Digoxin and Hemispheric Dominance in Relation to SLE

The archaeaon related organelle - steroidelle, neurotransminoid and vitaminocyte contribute to hemispheric dominance. The biochemical patterns obtained in neurolupus is similar to those obtained in left handed / right

hemispheric chemically dominant individuals by the dichotic listening test. But all the patients with neurolupus were right handed / left hemispheric dominant by the dichotic listening test. Hemispheric chemical dominance has no correlation with handedness or the dichotic listening test. Neurolupus occurs in right hemispheric chemically dominant individuals and is a reflection of altered brain function. Thus the immune mechanisms and the response to an invading bacteria / virus differ in the hypo and hyperdigoxinemic state. The hypodigoxinemic state is associated with immunosuppression. But there is no viral persistence in the hypodigoxinernic state. The hyperdigoxinemic state is associated with immunoactivation and viral persistence. There is an increased tendency for autoimmune diseases like SLE in the hyperdigoxinemic state.

Hypodigoxinemia is related to left hemispheric chemical dominance and hyperdigoxinemia with right hemispheric chemical dominance. The immune response and immune mediated disease in right hemispheric and left hemispheric chemical dominance differ. SLE is probably associated with right hemispheric chemical dominance and hyperdigoxinemia. Immunosuppression is associated with left hemispheric chemical dominance and hypodigoxinemia. Geschwind has postulated a relationship between cerebral lateralization and immune function. They observed a high frequency of left handedness in patients with immune disorders. Bardos, Degenne, Lebranchu, Biziere and Renoux demonstrated that lesions of the left neocortex in mice depress T-cell immunity, whereas lesions of right neocortex enhance T-cell immunity. These earlier reports are in agreement with our studies. Archaeal digoxin and hemispheric dominance may regulate immune function.

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6

Neurology of Myalgic Encephalomyelitis

Introduction

Several theories have been put forward with respect to chronic fatigue syndrome or myalgic encephalomyelitis. Persistent viral infections especially the Epstein barr virus and enteroviruses have been described in ME. Several immune system abnormalities have been described. Deficiencies in the amounts of IgG_1 and IgG_3 and decreased amounts of IgA have been noticed. Elevated levels of alpha interferon in the spinal fluid and increased levels of interleukin-2 have been reported by some groups. T_4 cells have been reported to not function as effectively as normal when stimulated with phytohaemagglutinin in ME. T_8 suppressor cell changes have also been reported. F delayed type of hypersensitivity skin testing is abnormal in 80% of patients. Physical and mental stress have been reported to predispose one to ME. Muscle fatigue, myalgia and muscle twitching are noticed in ME. Mitochondrial abnormalities have also been reported in the muscle in ME. Altered brain function has been reported in ME including loss of concentration and loss of recent memory.

Global warming can lead to osmotic stress consequent to dehydration. The increase in actinidic archaeal growth leads to cholesterol catabolism and digoxin synthesis. Digoxin produces membrane sodium potassium ATPase inhibition and increase in intracellular calcium producing mitochondrial dysfunction. This results in oxidative stress. The oxidative stress and osmotic stress can induce the enzyme aldose reductase which converts glucose to fructose. Fructose has got a low km value for ketokinase as compared to glucose. Therefore fructose gets phosphorylated more to fructose phosphate and the cell is depleted of ATP. The cell depletion of ATP leads to oxidative stress and chronic inflammation consequent to induction of NFKB. The fructose phosphate can enter the pentose phosphate pathway synthesizing ribose and nucleic acid. The depletion of cellular ATP results in generation of AMP and ADP which are acted upon by

deaminases causing hyperuricemia. Uric acid can also produce mitochondrial dysfunction. The fructose phosphate can enter the glucosamine pathway synthesizing GAG and producing mucopolysaccharide accumulation. Fructose can fructosylate proteins making them antigenic and producing an autoimmune response. This can lead to global warming related autoimmune disease.

The isoprenoid pathway is an important pathway crucial in cellular regulation. It produces important metabolites (digoxin, dolichol, ubiquinone and cholesterol). Digoxin is an endogenous membrane Na^+-K^+ ATPase inhibitor secreted by the human hypothalamus. Dolichol is important in N-glycosylation of proteins and protein processing. Ubiquinone is an important component of the mitochondrial electron transport chain. Cholesterol is an important component of cellular membranes. It was therefore considered pertinent to assess the isoprenoid pathway in ME. Since endogenous digoxin can regulate multiple neurotransmitter systems it could possibly play a role in the genesis of hemispheric dominance. The pathway was also assessed in individuals of differing hemispheric dominance to find out the role of hemispheric dominance in the predisposition to ME.

Results

(1) The activity of HMG CoA reductase and the concentration of digoxin and dolichol were increased in ME. The concentration of serum ubiquinone, the activity of erythrocyte membrane Na^+-K^+ ATPase and serum magnesium were decreased.

(2) The concentration of serum tryptophan, quinolinic acid and serotonin was increased in the plasma while that of tyrosine, dopamine and noradrenaline was decreased in ME.

(3) Nicotine (1.07 ug/l00 ml) and strychnine (9.54 ug/dL) were detected in the plasma of patients with ME but were not detectable in the control serum. Morphine was not detected in the plasma of ME patients.

(4) The concentration of total glycosaminoglycan increased in the serum of ME patients. The concentration of heparan sulphate (HS), heparin (H), dematan sulphate (DS), chondroitin sulphate (ChS) and hyaluronic acid (HA) was increased. The concentration of total hexose, fucose and sialic acid was increased in the glycoproteins of the serum in these patients. The concentration of gangliosides, glycosyl diglycerides, cerebroside and sulphatide showed significant increase in the serum of these patients.

(5) The activity of glycosaminoglycan (GAG) degrading enzymes (beta glucuronidase, beta N-acetyl hexoseaminidase, hyaluronidase and cathepsin-D) was increased in ME when compared to the controls. The activity of beta galactosidase, beta fucosidase and beta glucosidase increased in ME.

(6) The concentration of total GAG and hexose and fucose residues of glycoproteins in the RBC membrane decreased significantly in ME. The concentration of RBC membrane cholesterol increased in ME while that of phospholipid decreased. The ratio of RBC membrane cholesterol against phospholipids increased in ME.

(7) The activity of superoxide dismutase (SOD), catalase, glutathione reductase and glutathione peroxidase in the erythrocytes decreased significantly in ME. In ME the concentration of MDA, hydroperoxides, conjugated dienes and NO increased significantly. The concentration of glutathione and alpha tocopherol decreased in ME. Iron binding capacity, ceruloplasmin and albumin decreased significantly in ME.

(8) The results showed that HMG CoA reductase activity, serum digoxin and dolichol were increased and ubiquinone reduced in left handed / right hemispheric dominant individuals. The results also showed that HMG CoA reductase activity, serum digoxin and dolichol were decreased and ubiquinone increased in right handed / left hemispheric dominant individuals. The results showed that the concentration of tryptophan, quinolinic acid serotonin, strychnine and nicotine was found to be higher in the plasma of left handed / right hemispheric dominant individuals while that of tyrosine, dopamine, morphine and norepinephrine was lower. The results also showed that the concentration of tryptophan, quinolinic acid serotonin, strychnine and nicotine was found to be lower in the plasma of right handed / left hemispheric dominant individuals while that of tyrosine, dopamine, morphine and norepinephrine was higher.

Discussion

Archaeal Digoxin and Membrane Na^+-K^+ ATPase Inhibition in Relation to Myalgic Encephalomyelitis

The archaeaon steroidelle DXP pathway and the upregulated pentose phosphate pathway contribute to digoxin synthesis. The increase in the activity of HMG CoA reductase in ME suggests an upregulation of the isoprenoid pathway. There is a marked increase in plasma digoxin and dolichol and this increase may be a consequence of increased channeling of intermediates of the isoprenoid pathway for their biosynthesis. In this connection, incorporation of ^{14}C-acetate into digoxin in rat brain has been shown by us indicating that acetyl CoA is the precursor for digoxin biosynthesis in mammals also. The increase in endogenous digoxin, a potent inhibitor of membrane Na^+-K^+ ATPase, can decrease this enzyme activity. In ME there was significant inhibition of the RBC membrane Na^+-K^+ ATPase activity. The inhibition of Na^+-K^+ ATPase by

digoxin is known to cause an increase in intracellular calcium resulting from increased Na^{+}-Ca^{++} exchange, increased entry of calcium via the voltage gated calcium channel and increased release of calcium from intracellular endoplasmic reticulum calcium stores. This increase in intracellular calcium by displacing magnesium from its binding sites causes a decrease in the functional availability of magnesium. This decrease in the availability of magnesium can cause decreased mitochondrial ATP formation which along with low magnesium can cause further inhibition of Na^{+}-K^{+} ATPase, since ATP-magnesium complex is the actual substrate for this reaction. Cytosolic free calcium is normally buffered by two mechanisms: ATP dependent calcium extrusion from cell and ATP dependent sequestration of calcium within the endoplasmic reticulum. The magnesium related mitochondrial dysfunction results in defective calcium extrusion from the cell. There is thus a progressive inhibition of Na^{+}-K^{+} ATPase activity first triggered by digoxin. Low intracellular magnesium and high intracellular calcium consequent to Na^{+}-K^{+} ATPase inhibition appears to be crucial to the pathophysiology of ME. Serum magnesium was assessed in ME and was found to be reduced.

Archaeal Digoxin and Immune Activation in Myalgic Encephalomyelitis

Increased intracellular calcium activates the calcium dependent calcineurin signal transduction pathway which can produce T-cell activation and secretion of interleukin-3,4, 5, 6 and TNF alpha. TNF alpha binds to its receptor TNFRI and activates the transcription factors NFkB and AP-l leading to the induction of proinflammatory and immunomodulatory genes. This can explain the immune activation in ME. Polyclonal B cell activation and proliferation have been described in ME. Membrane Na^{+}-K^{+} ATPase inhibition can produce

immune activation and is reported to increase CD_4/CD_8 ratios as exemplified by the action of lithium.

Archaeal Digoxin and Regulation of Neurotransmitter Synthesis and Function in Relation to Myalgic Encephalomyelitis

The archaeaon neurotransminoid shikimic acid pathway contributes to tryptophan and tyrosine synthesis and catabolism generating neurotransmitters and neuroactive alkaloids. Digoxin apart from affecting cation transport is also reported to influence the transport of various metabolites across cellular membranes, including amino acids and various neurotransmitters. Two of the amino acids in this respect are important, tryptophan, a precursor for strychnine, and nicotine and tyrosine, a precursor for morphine. We have already shown the presence of endogenous morphine in the brain of rats loaded with tyrosine and endogenous strychnine and nicotine in the brain of rats loaded with tryptophan. The results showed that the concentration of tryptophan, quinolinic acid, nicotine, strychnine and serotonin was found to be higher in the plasma of patients with ME while that of tyrosine, morphine, dopamine and norepinephrine was lower. Thus there is an increase in tryptophan and its catabolites and a reduction in tyrosine and its catabolites in the patient's serum. This could be due to the fact that digoxin can regulate neutral amino acid transport systems with preferential promotion of tryptophan transport over tyrosine. The decrease in membrane Na^+-K^+ ATPase activity in ME could be due to the fact that the hyperpolarising neurotransmitters (dopamine, morphine and noradrenaline) are reduced and the depolarising neuroactive compounds (serotonin, strychnine, nicotine and quinolinic acid) are increased.

The schizoid neurotransmitter pattern of reduced dopamine, noradrenaline and morphine and increased serotonin, strychnine and nicotine is common to ME and schizoid state. This could be the basis of the schizophreniform

psychosis described in ME. Quinolinic acid, an NMDA agonist, can contribute to NMDA excitotoxicity reported in schizoid state. Strychnine by blocking glycinergic transmission can contribute to the decreased inhibitory transmission in schizoid state. Recent data suggest that the initial abnormality in schizoid State involves a hypodopaminergic state and the low dopamine levels now observed agree with this. Nicotine by interacting with nicotinic receptors can facilitate the release of dopamine, promoting the dopaminergic transmission in the brain. This can explain the increased dopaminergic transmission in the brain in the setting of decreased dopamine synthesis. The increased serotoninergic activity and reduced noradrenergic outflow from locus coreuleus reported earlier in the schizoid state agrees with our finding of elevated serotonin and reduced noradrenaline levels in ME and schizophrenia. Quinolinic acid has been implicated in immune activation in other autoimmune diseases like SLE and could contribute to the same in ME. Serotonin, dopamine and noradrenaline receptors have been demonstrated in the lymphocytes. It has been reported that during immune activation serotonin is increased with a corresponding reduction in dopamine and noradrenaline in the brainstem monoaminergic nuclei. Thus elevated serotonin and reduced noradrenaline and dopamine could contribute to the immune activation in ME. Endogenous morphine deficiency is noticed in patients with ME. Morphine has an immunosuppressive effect and its deficiency can contribute to immune activation in ME. Quinolinic acid as well as neurotransmitter induced immune activation can promote ME. Thus a schizoid neurotransmitter pattern can predispose to ME.

In the presence of hypomagnesemia, the Mg^{++} block on the NMDA receptor is removed leading to NMDA excitotoxicity. The increased presynaptic neuronal Ca^{++} can produce cyclic AMP dependent phosphorylation of synapsins resulting in increased neurotransmitter release into the synaptic junction and vesicular recycling. Increased intracellular Ca^{++} in the post synaptic neuron can

also activate the Ca^{++} dependent NMDA signal transduction. The plasma membrane neurotransmitter (on the surface of the glial cell and presynaptic neuron) is coupled to a Na^{+} gradient which is disrupted by the inhibition of Na^{+}-K^{+} ATPase, resulting in decreased clearance of glutamate by presynaptic and glial uptake at the end of synaptic transmission. By these mechanisms, inhibition of Na^{+}-K^{+} ATPase can promote glutamatergic transmission. The elevated levels of quinolinic acid and serotonin can also contribute to NMDA excitotoxicity. Quinolinic acid and serotonin are positive modulators of the NMDA receptor. Strychnine can also contribute to NMDA excitotoxicity. Strychnine displaces glycine from its binding sites and inhibits glycinergic inhibitory transmission in the brain. The glycine is free to bind to the strychnine insensitive site of the NMDA receptor and promote NMDA excitatory transmission. NMDA excitotoxicity has been implicated in neuronal degeneration and could contribute to altered brain function including loss of concentration and memory in ME.

Archaeal Digoxin and Regulation of Golgi Body / Lysosomal Function in Relation to Myalgic Encephalomyelitis

The archaeaon glycosaminoglycoid and fructosoid contributes to glycoconjugate synthesis and catabolism by the process of fructolysis. The Mg^{++} depletion can affect the metabolism of glycosaminoglycans, glycoproteins and glycolipids. The elevation in the level of dolichol may suggest its increased availability for N-glycosylation of proteins. Magnesium deficiency can lead to increased cerebroside and ganglioside synthesis. In Mg^{++} deficiency the glycolysis, citric acid cycle and oxidative phosphorylation are blocked and more of glucose 6-phosphate is channelled for the synthesis of glycosaminoglycans (GAG). The results show an increase in the concentration of serum total and differential GAG fractions, glycolipids and carbohydrate components of

glycoproteins in ME. The increase in the carbohydrate components total hexose, fucose and sialic acid in ME was not to the same extent suggesting qualitative change in glycoprotein structure. The activity of GAG degrading enzymes and that of glycohydrolases showed significant increase in the serum of ME patients. Intracellular Mg^{++} deficiency also results in defective ubiquitin dependent proteolytic processing of glycoconjugates as it requires Mg^{++} for its funetin. The increase in the activity of glycohydrolases and GAG degrading enzymes could be due to reduced lysosomal stability and consequent leakage of lysosomal enzymes into the serum. The increase in the concentration of carbohydrate components of glycoproteins and GAG inspite of increased activity of glycohydrolases may be due to their possible resistance to cleavage by glycohydrolases consequent to qualitative change in their structure. Proteoglycan complexes formed in the presence of altered calcium/magnesium ratios intracellularly may be structurally abnormal and resistant to lysosomal enzymes and may accumulate.

The protein processing defect can result in defective glycosylation of exogenous viral glycoprotein antigens with consequent defective formation of MHC-glycoprotein antigen complex. The MHC linked peptide transporter, a P-glycoprotein which transports MHC antigen complex to the antigen presenting cell surface, has an ATP binding site. The peptide transporter is dysfunctional in the presence of magnesium deficiency. This results in defective transport of MHC class-1 (viral glycoprotein antigen complex to the antigen presenting cell surface for recognition by CD_4 or CD_8 cell). Defective presentation of exogenous viral antigens can produce immune evasion by the virus in ME and viral persistence. This could be the reason for the persistence of enterovirus and EB virus in ME. A number of fucose and sialic acids containing natural ligands are involved in adhesion of the lymphocyte, producing leukocyte

trafficking and extravasation into the perivascular space and the same phenomena could contribute to the pathology of ME.

Archaeal Digoxin and Alteration in Membrane Structure and Membrane Formation in Relation to Myalgic Encephalomyelitis

The archaeaon steroidelle, glycosaminoglycoid and fructosoid contribute to cell membrane formation synthesizing cholesterol by the DXP pathway and glycosaminoglycans by fructolysis. In the alteration in the isoprenoid pathway specifically, cholesterol as well as changes in glycoproteins and GAG can affect cellular membranes. The upregulation of the isoprenoid pathway can lead to increased cholesterol synthesis and magnesium deficiency can inhibit phospholipid synthesis. Phospholipid degradation is increased owing to an increase in intracellular calcium activating phospholipases A_2 and D. The cholesterol phospholipid ratio of the RBC membrane was increased in ME. The concentration of total GAG, hexose and fucose of glycoprotein decreased in the RBC membrane and increased in the serum suggesting their reduced incorporation into the membrane and defective membrane formation. The glycoproteins, GAG and glycolipids of cellular membrane are formed in the endoplasmic reticulum, which is then budded off as a vesicle which fuses with the golgi complex. The glycoconjugates are then transported via the golgi channel and the golgi vesicle fuses with the cell membrane. This trafficking depends upon GTPases and lipid kinases which are crucially dependent on magnesium and are defective in magnesium deficiency. The change in membrane structure produced by alteration in glycoconjugates and cholesterol: phospholipid ratio can produce changes in the conformation of sodium-potassium ATPase resulting in further membrane Na^+-K^+ ATPase inhibition. The same changes can affect the structure of organelle membrane. This results in defective lysosomal stability and leakage of glycohydrolases and

GAG degrading enzymes into the serum. Defective peroxisomal membranes lead to catalase dysfunction which has been documented in ME.

Archaeal Digoxin and Mitochondrial Dysfunction in Relation to Myalgic Encephalomyelitis

The archaeaon vitaminocyte contributes to the synthesis of ubiquinone and mitochondrial electron transport chain function. The mitochondrial function related free radical generation is regulated by the archaeaon vitaminocyte synthesized tocopherol and ascorbic acid. The concentration of ubiquinone decreased significantly in ME which may be the result of low tyrosine levels, consequent to digoxin's effect in preferentially promoting tryptophan transport over tyrosine. The aromatic ring portion of ubiquinone is derived from tyrosine. Ubiquinone, which is an important component of the mitochondrial electron transport chain, is a membrane antioxidant and contributes to free radical scavenging. The increase in intracellular calcium can open up the mitochondrial PT pore causing a collapse of the hydrogen gradient across the inner membrane and an uncoupling of the respiratory chain. Intracellular magnesium deficiency can leads to a defect in the function of ATP synthase. All these lead to defects in mitochondrial oxidative phosphorylation, incomplete reduction of oxygen and generation of a superoxide ion which produces lipid peroxidation. Ubiquinone deficiency also leads to reduced free radical scavenging. The increase in intracellular calcium may lead to increased generation of NO by inducing the enzyme nitric oxide synthase which combines with superoxide radical to form peroxynitrite. Increased calcium can also activate phospholipase A_2 resulting in increased generation of arachidonic acid which can undergo increased lipid peroxidation. Increased generation of free radicals like the superoxide ion and hydroxyl radical can produce lipid peroxidation and cell membrane damage which can further inactivate Na^+-K^+ ATPase, triggering the

cycle of free radical generation once again. Magnesium deficiency can affect glutathione synthase and glutathione reductase function. The mitochondrial superoxide dismutase leaks out and becomes dysfunctional with an increased intracellular calcium-related opening of the mitochondrial PT pore and outer membrane rupture. The peroxisomal membrane is defective owing to membrane Na^+-K^+ ATPase inhibition-related defect in membrane formation and leads to reduced catalase activity. There was an increase in lipid peroxidation as evidenced from the increase in the concentration of MDA, conjugated dienes, hydroperoxides and NO with decreased antioxidant protection as indicated by a decrease in ubiquinone and reduced glutathione in ME. The activity of enzymes involved in free radical scavenging like superoxide dismutase, catalase, glutathione peroxidase and glutathione reductase is decreased in ME suggesting reduced free radical scavenging. Mitochondrial dysfunction related free radical generation could be implicated in the pathogenesis of ME. The mitochondrial dysfunction could account for the muscle pain and fatigability described in ME.

The increased intracellular calcium and ceramide-related opening of the mitochondrial PT pore also leads to volume dysregulation of the mitochondria causing hyperosmolallty of the matrix and expansion of the matrix space. The outer membrane of the mitochondria ruptures and releases an apoptosis inducing factor and cytochrome C into the cytoplasm. This results in activation of caspase-9 and caspase-3. Caspase-9 can produce apoptosis of the cell. Increased apoptosis could also contribute to pathogenesis of ME.

Archaea, RNA Viroids and Retroviruses in Myalgic Encephalomyelitis

Retroviruses have been related to the parthogenesis of ME. The retroviral genome is probably integrated into the genome of mammals including humans as vertically transmitted endogenous proviruses. These retroviral sequences are

transposable. The retroviral transposons are kept silent by DNA methylation. Increased secretion of hypothalamic archaeal digoxin contributes to an intracellular magnesium deficiency, which leads to a DNA methylation defect. DNA methylation requires abundant supply of S-adenosyl methionine which requires magnesium for its generation. In the presence of hyperdigoxinemia, DNA methylation is defective and the retroviral transposons are activated and expressed. This leads to transcription of retroviral proteins and assembly of the virus and on to retroviral persistence and ME.

Archaeal Digoxin and Hemispheric Dominance in Relation to Myalgic Encephalomyelitis

The archaeaon related organelle - steroidelle, neurotransminoid and vitaminocyte contribute to hemispheric dominance. Thus the isoprenoid pathway and endogenous Na^+-K^+ ATPase inhibition can play a role in the genesis of the ME. The neurotransmitter patterns of reduced dopamine, morphine and noradrenaline and increased serotonin, strychnine and nicotine is associated with right hemispheric dominance. The digoxin and dolichol synthesis is also increased and ubiquinone levels are low in right hemispheric dominant individuals. The membrane Na^+-K^+ ATPase activity is inhibited and serum magnesium depleted in right hemispheric dominance. Right hemispheric dominant individuals may have an increased predilection for ME. Left hemispheric dominant individuals have reduced digoxin and dolichol levels, increased ubiquinone levels, upregulated RBC membrane Na^+-K^+ ATPase activity, serum hypermagnesemia, increased levels of serum dopamine, noradrenaline and morphine and reduced levels of serum strychnine, nicotine and serotonin. These neurotransmitter patterns and hypodigoxinemia could protect against ME. Thus, myalgic encephalomyelitis may be a reflection of

right hemispheric dominance and the neurotransmitter and immune changes related to it.

(1) NMDA excitotoxicity due to: (a) membrane Na^+-K^+ ATPase inhibition related hypomagnesemia, (b) presence of NMDA agonists like quinolinic acid, strychnine and serotonin.

(2) Digoxin induced hypomagnesemia and elevated dolichol related protein processing defects and defective presentation of viral glycoprotein antigen leading to an immune evasion by the virus and viral persistence.

(3) Mitochondrial dysfunction due to low ubiquinone levels, digoxin induced alteration in intracellular calcium/magnesium ratios and increased ceramide levels leading on to: (a) apoptosis (b) free radical generation.

(4) DNA methylation defect due to digoxin induced hypomagnesemia and retroviral transposon expression.

(5) ME occurs in the right hemispheric dominant state.

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ISBN: 978-1-946898-11-1

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Price: US $80