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Has man set out on a path of micro-ecological self-destruction?

The engine of highly differentiated, multicellular life on earth was an eco-catastrophe of global dimensions. Enrichment of the marine and terrestrial biosphere by poisonous O_2 gas caused by anaerobic bacteria using solar energy, was compensated through natural selection by certain bacteria, using oxygen,as a more efficient energy source. This energy revolution, which occurred about 2000 million years ago, triggered an evolutionary quantum leap. Eukaryotic unicellular species called protists whose genetic material was separated from the rest of the cell structures in the nucleus, had incorporated oxygen-using bacteria and over a very long period of time developed a very efficient symbiosis with these aerobic species.

All higher differentiated cell functions such as precise cell division (mitosis), sexual recombination, sexual reproduction etc. (known as proctoctista in evolutionary biology) were due to this new form of life. The optimisation of genetic information storage and oxidative energy production as well as the supra-genetic self-organisation of aerobic and anaerobic bacteria, became the basis for the subsequent development of animal life (about 600 million years ago), plants (about 450 million years ago) and fungi (about 400 million years ago.) Endo-symbiotic aerobic bacteria within the organisms, nowadays known as mitochondria, are essential energy producers in all three forms of life. In man, too, mitochondria are the interface in all cells of the organism with the biosphere, more than 90% of the necessary energy for the whole cell being produced in the respiratory pathway as adenosine triphosphate (ATP). The remaining energy is produced by fermentation (glycolysis).

The mitochondria are, however, the Achilles tendon of cell metabolism because -

- as former bacteria, mitochondria possess a residual genome (mt-genome),

- the mt-genome is present as a circular plasmid in the cytoplasm of the mitochondria (there is no nucleus),

- the mt-genome, unlike the nucleus, does not have an effective DNA repair mechanism nor any protective proteins around it,

- any damage to the mt-genome is reflected in ATP production in the respiratory pathway and hence in the energy supply of the whole cell in all organs,

- toxic damage to the mt-DNA, both endogenous and exogenous, interfere with the export and import of nucleic acids and proteins to and from the mitochondria and nuclear DNA,

- the mt-genome including any irreparable genome damage, is transmitted exclusively through the maternal egg cell. to the child,

New techniques have led to significant advances in our knowledge of the structure and function of mitochondria in the past decade. Mainstream medicine has not yet adequately recognised these advances mainly because of the dominance of molecular biology and the obsession with research into the nuclear genome.

A number of questions arise from this regarding man's ability to survive -

- to what extent is the performance of the mt-genome in the population as a whole already irreversibly damaged by toxic influences?

- to what extent can an increase in mt-genome damage over several generations be shown to have occurred? (This could be measured by an increase in point mutations and chains breaks as well as by the ratio of mutated to non-mutated mitochondria in individual cell types.)

- to what extent is the increase in systemic diseases (which could arguably be due to mitochondrial genome damage) being researched in the context of environmental pollution (eg. type II diabetes, Alzheimer's, Parkinson's, immune deficiencies such as AIDS)?

- to what extent does damage to the mt-genome contribute to interference with the supra-genetic symbiosis, which, under certain circumstances, is thought to be responsible for the formation of cancerous cells? (Cancer cells derives their energy mainly from fermentation analogous to anaerobic protists before the arrival of endo-symbiosis with mitochondria).

- to what extent has the mt-genome been irreparably damaged since the introduction of sulphonamides (1935) through the use and misuse of modern antibiotics and chemotherapeutic agents, which act intra-cellularly? (As former bacteria, mitochondria are structurally and functionally just as vulnerable as the bacteria being treated with antibiotics or with other chemotherapy residing within the cells. This interdependence, including the transmission of mutated mitochondria from mother to child, has up till now been completely disregarded by infectious disease theory and the pharmaceutical industry. Five out of nine of the most frequently prescribed classes of antibiotics which attack the microbial cell metabolism, are strongly suspected of causing genetic damage to the mitochondria. This figure comprises 50% of all the antibiotics prescribed.

- to what extent can resistance genes due antibiotic selection (a consequence of medicinal use or use in livestock rearing) be transmitted to the mt-genome by bacterial species-jumping gene transfer chains? (Resistance genes are predominantly found in the circular plasmid form of bacterial genomes, the form in which also occurs the mt-genome.)

- To what extent can gene fragments be re-absorbed and transmitted to the mitochondrial plasmid gene, eg. from genetically engineered plants and food, and by means of extra- and intra-cellular transfer chains (promiscuous bacterial gene pool)?

- To what extent may the delayed maturation of thymus-dependent immune cells be explained by the use and misuse of chemotherapeutic agents, eg. co-trimoxazole

(Bactrim), and damage to the mitochondrial genome be linked to this use? (As an alternative hypothesis to the far-fetched long-term effect of an up till now un-isolated, hypothetical immuno-deficiency virus).

There is an urgent need for information and research into these crucial questions. Man is so closely enmeshed with the biosphere as a whole (the Gaia principle) as to make "micro-environmental safeguards just as important as macro-environmental ones."

Because man cannot take a single breath without an intact supra-genetic symbiosis of his mitochondria and the DNA in his cell nuclei, the prevention of the degradation of external resources of the biosphere - air, sea, land - is inextricably linked to the maintenance of internal resources, ie. of the cell and mitochondrial genomes.

Otherwise the evolutionary quantum leap that occurred about 2000 million years ago could be reversed in a just a matter of a few generations by man inadvertently poisoning himself.