Systems Biology, Micronutrients and the Skin

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Systems biology is the first new faculty at Harvard for over 20 years, and without systems biology medical practitioners will be an intellectually underclass within 15 years.

Although originally designed to deal with the complex information emanating from the genomic revolution, clinical systems biology is a lumping process that regards the patient as an integrated whole rather than a mass of protoplasm surrounded by skin. The same concept applies to many specialties e.g. gynaecology, endocrinology and cardiology.

Systems biology is an engineering and mathematic concept of input, process, output and feedback to provide stability. In the human, the dominant brain input communicates by means of nerves, blood flow and blood constituent with organs, region and systems.

The final output is cellular which balances growth and apoptosis via a genetic filter, energy provision and specific output which feeds back to provide stability. In the body, this is homeostasis - Walter Cannon’s wisdom of the body, of which Selye’s general stress reaction is the best known component.

Homeostasis in broad terms affects the central nervous system, growth, immunity and metabolism and alters according to life stages - adaptation to intrauterine life, adaptation to extrauterine life, reproduction and senescence as all life is a conflict between reproduction and survival for limited energy supplies.

This homeostasis is actually a symbiosis by interaction with environment e.g. we are born 100% human but die 90% bacterial with 10 times more bacteria than cells in the human adult body. Other important implication are that food is the most powerful drug in the world with late consequences and that the same micronutrients taken early in the life to supplement growth because of its anti apoptotic effect e.g. folate may be carcinogenic in late life because of chromosomal alterations and telomere attraction.

The effect of systems biology and genomics in clinical paractice is to a life time approach to disease, genetically based individualization of care, and the realization that preventative care is more than 5 times more effective and less costly than treatment of established conditions such as cancer, heart attacks, strokes, diabetes and Alzheimer’s disease. Above all, the whole patient homeostatic process must be treated rather than pathology as simply interaction with isolated organs such as the skin.

The skin is the largest organ in the body and normally has 20% of the cardiac output but is capable of increasing this to 7-8 litres per minute for more than the resting cardiac output by means of augmented vascular flow.

The reason why the skin has such a large blood flow, which impacts on disease, is unclear but may be due to the needs of temperature control by sweat.

The skin, as with other environmentally interactive tissues such as the mouth, lungs, G.I.T and vagina, has an activated defense mechanism which is specialized and includes a barrier function skin polypeptides IgA, friendly bacteria and melanocytes amongst many others. It is therefore prone to inflammatory process with atrophy generally being late although the forme frusta progeria syndromes produce wide individual variations.

The cell growth and apoptotic balance resides in stem cells at the basal level and interaction with the underlying connective tissue above the basement membrane - as pointed out above this is interactive with genetics and systems biological input via CNS, nerves and blood vessels together with their contents - the brain being particularly undervalued clinically.

Localized skin disease is largely due to interaction with the environment as the skin is a two dimensional condition enclosing a three dimensional structure - the fabled poincare conjective which has been resolved very recently. The systems biological approach to dermatological disease therapy and particularly micronutrients and chemotherapy is very different to current clinical practice which is heavily dependent on minute pathological differences - the flexnerian approach of splitting rather than lumping the whole organism together.

Dermatological disease is heavily influenced by genetics - the extreme being the progeria syndrome as well as the general status of homeostasis brain, input and life stages. The skin it self is viewed as either unbalanced towards activity and angiogenesis or apoptosis and atrophy.

From this point of view, there is no evidence that
micronutrients have any real effects on skin conditions and indeed may have deleterious effects in older people because of chromosomal alterations. The vaunted antioxidants are associated with increase all cause deaths because supplying an excess of several nutrients produces a stress and deficiency of other components of the homeostatic metabolism - well known examples are iron, zinc and vitamin A.

The only time that excess exogenous micronutrients are indicated are during growth periods or senescence. These are always better provided by a healthy DASH type diet with varied 3 to 8 servings of vegetables / fruits per day. You cannot alter ageing with hormones and exogenous micronutrients are never as effects as natural foods in all their complexity.

Some exception exist in complexity - the retinoids provide dermal atrophy with increased basal growth and are useful for certain clinical conditions. Similarly such treatments as laser do not treat the cause of skin lesions and must be regarded as symptomatic.

Overall the use of micronutrients, apart from clear isolated deficiency states, simply produces expensive urine and, although demanded by patients, Pakistan is the most ripped off country in the world pharmaceutically.

Local skin emollients have a place but are overused and a longterm price is paid on gap functions. Excessive cleaning also removes polypeptide antibiotic action.

Botox alter blood flow via acetyl choline and other neurohoromones.

In summary, Sir William Osler pointed out that the human is only animal that voluntarily demands medicines and pursuit of beauty, particularly by micronutrients, is expensive, ineffective and has burgeoning long term toxic effects.