Review Article

Fashion or Science? How Can Orthodox Biomedicine Explain the Body's Function and Regulation?

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Abstract

The cost of diagnosing and treating disease continues to rise inexorably. Almost every new test adds to the complexity and cost of healthcare. There is a need for better and less expensive screening, diagnostic and scanning techniques. Medical scanning technologies are based upon the body's response to an external stimulus e.g. heat, ultrasound, X-rays, magnetic resonance, etc. Biomarker and histopathology tests have inherent limitations because diseases are often polygenic and/or influence the function of multiple physiological systems. The results are compared with expected norms. This makes it difficult to diagnose the onset of disease. Such techniques measure only what the clinician wants or expects to see. A technique which can provide more information, regarding the influence of a medical condition upon the body's whole function, may be invaluable to the clinician. There is not yet a clear understanding of how the body regulates its function. A greater understanding of how the body responds to sensory input, in particular to light, has been incorporated into a mathematical model of the physiological systems developed by I.G. Grakov. This has been incorporated into a cognitive technology which improves the understanding of how the body regulates its function and has led to the development of a better method for the diagnosis and treatment of disease(s). This technique, virtual scanning, appears able to diagnose at different levels of physiological significance i.e. as systems, organs, cells (as morphologies) and molecular (as pathologies). It may be a major scientific development, conceivably more advanced than biomarker techniques, with the potential to provide far more information about a patient's health. It may have the potential to significantly reduce the complexity and cost of healthcare. This article reviews the available literature.

Keywords: Genotype, Light, Mathematical model of the physiological systems, Phenotype, Physiological systems, Systems biology, Virtual scanning

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Introduction

Science is the method that we use to make sense of our environment. We make observations and based upon these observations we make empirical predictions. In the engineering sciences this is often be reduced to formulae and mathematical modelling which can be used predictively to design newer and better engineered products however orthodox medicine has been struggling to develop such methodology. Despite the huge amounts of investment made in the life sciences there has been relatively little progress. It places in question the basic assumptions upon which orthodox biomedicine is based. The relationship between cognition and cellular and molecular biochemistry remains poorly understood.[1] The most severe stresses can cause physiological dysfunction but the mechanisms remain poorly defined. Medical research has mapped the body's surface and its interior. Systems biologists compile models of organs e.g. of the heart[2,3] and other organs, in their efforts to understand the complexity of organ function and of associated cellular and molecular biologies. It is the equivalent of knowing the most intricate details of a computer – the hardware - yet not having the software to make it work. There is little understanding of the basic mechanisms which regulate the body's function. Moreover, if there is no understanding of the mechanisms which the body uses to regulate its function and to recover from dysfunction or infection how can it be possible to assess whether a patient's recovery is due to a medicine, medical procedure, or to the natural processes of recovery?

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Modern medicine evolved from the growth of the chemical industry and the massive increase of chemical research which yielded chemicals of ever greater complexity and biological significance. Sulphonamides and Penicillins were developed which treat bacterial infections. Aspirin and Paracetamol were developed which reduce the temperature of a fever and reduce the severity of headaches. Such chemical discoveries were followed by drugs which reduce the symptoms of almost all conceivable diseases, and upon which huge swathes of the population are increasingly dependent, yet the burden of healthcare on society continues to increase. The cost of treating disease has grown by more than ten times since the mid-1970's. This leads us to question basic assumptions upon which modern biomedicine is based e.g.:

1. How accurate are biomarker techniques?
   It is increasingly understood that many medical conditions are polygenic and multi-systemic. The degree of coiling or uncoiling of proteins is associated with the onset of diabetes, cystic fibrosis, alzheimer's disease, etc. Accordingly, the measurement of the level of a single protein/biomarker may be a flawed concept.[4,5]
2. How accurate is a doctor's diagnosis?
   The ability of the GP to provide an accurate diagnosis is questionable. Many diseases are poorly defined and are often difficult to diagnose e.g. diabetes, alzheimers disease, cancers, dementia, depression, chronic fatigue syndrome, sleep disorders, etc.
3. How effective are drugs?
   The ability of drugs to treat disease is typically 50%[6] because the onset of disease involves both genotype and phenotype. Any medical assessment must take into account the level and conformation of the protein, the level and conformation of the substrate, and the factors which influence the rate at which the protein reacts with the substrate e.g. pH, levels of minerals and cofactors, etc. It must also take into account that every drug alters the body's systemic, cellular and molecular stability i.e. the body will readjust in order to maintain optimum stability.

Healthcare is a fashion-led industry which seeks to exploit every perceived technological advance (penicillins, stem-cell, optogenetics, genomics, proteomics, vaccines, statins, etc) in the commercial hope or promise that these new areas of research will lead to yet greater opportunities to diagnose and treat disease at ever greater cost to the taxpayer. A better understanding of how the body regulates its function would improve the understanding of the diagnostic or therapeutic scope of such technologies. For instance the use of stem cell implants to treat type 1 diabetes overlooks that such implants are being implanted into the same or similar biochemical conditions which were associated with the original pancreatic failure. If the patient's regulatory system could not maintain the function of their pancreatic beta cells why do we think that a pancreatic stem cell implant will succeed? It can also be argued that knowledge of why type 1 diabetes occurred (e.g. viral onset) could lead to therapies which would re-establish and reactivate the pancreatic beta cells.[7]

This illustrates that changes to DNA cause physiological dysfunction of varying degrees of severity. In the case of diabetes, cited above, altered DNA structure and conformation influences the expression of proteins, can be manifest as type 1 diabetes, and can also be adapted to re-establish normal function of the pancreatic beta cells. The greater the amount of changes to the genetic structures the greater will be the scope for physiological and cognitive dysfunction.

The Significance of Phenotype

At almost every step orthodox biomedical research overlooks the influence of the environment (phenotype) despite the clear understanding that stress is a major cause of disease e.g. depression, post-traumatic stress disorder, insomnia, cardiac arrhythmia, etc. Mathematical models ignore the influence of sensory input upon the body's physiology. The most glaring example is of identical twins which have different lifestyles and which have significantly different health in their advancing years. Gene profiling identifies the genes which are no longer able to express a particular protein (genotype) and those who are genetically pre-disposed to a medical condition e.g. Gauchers disease, Fabry's disease, etc; but cannot yet elucidate the complex genetic interactions (including racial genotypes) which are involved in polygenic diseases e.g. diabetes mellitus, alzheimers disease, cystic fibrosis, etc; or the environmental influences (phenotype) which would cause this pre-disposition to be manifest as the pathology in question.

How can it deal with the daily causes of stress? How does stress influence the body's function? In particular, how does it evolve into different pathologies? This is a fundamental limitation of 21st century medicine. If it focuses solely upon genotype it can only deal with the symptoms. Furthermore by ignoring phenotype it ignores up to 50%, perhaps more, of the disease creating process(es). If it can incorporate an understanding of phenotype it may be able to deal with both the cause of a disease and its symptoms.

Systems biologists ignore the influence of sensory input upon their models of organ function. They also ignore that the body's organs are organised into organ networks and that each of these organs has a physiological significance e.g. regulating blood pressure, blood glucose, pH, sleep, etc. Perhaps the most interesting of the overlooked phenomenae are that of the EEG frequencies[8] and the role played by light.[9] These may be issues of the greatest medical significance i.e. they are indicative the mechanisms which the body uses to regulate its complex, multi-level function.

Phenotype is the influence of environmental or lifestyle upon our health.[10] It directly influences all of the reaction and extraction processes e.g. the levels of minerals, acidity, temperature, etc. It indirectly influences protein expression and ultimately the stability of the various physiological systems. It influences metabolic rate[11] and cognitive dysfunction[12] however there are few, if any, techniques which are able to measure the phenotype component of developing pathologies e.g. colour/syntonic optometry,[13] microneurography,[14] Tilt table test, Valsalva test, etc. Furthermore, the theoretical validity of such techniques varies significantly.

Neuro Regulation

The evidence suggests that human physiology is that of a dynamic, self-regulating system in which the brain acts to process sensory input, retain significant memories, and maintain the body's optimum stability. It is the precise nature, and co-ordinated function of the physiological structures which determines the levels of each key systemic parameter: pH,[15] temperature, digestion, elimination, breathing, blood pressure,[16] blood volume, blood cell content, blood glucose,[17] osmotic pressure, sexual function, posture and sleep.[16] For example if acidity increases, levels of blood glucose and blood viscosity increase. This raises blood pressure in order to maintain the appropriate level of oxygen in the brain. Over time this progressively influences the stability of most, if not all, other physiological systems e.g. body temperature, blood volume, sleep, digestion, excretion, osmotic pressure, sexual function and posture.

The body's functional parameters are based upon what is required to maintain the body's normal and/or stable function e.g. (i) It attempts to maintain its acidity at pH 7 because increased acidity alters the levels of minerals and, in particular, lowers the levels of key minerals (Zn, Cr, Mg, etc) which are essential for normal physiology. (ii) It maintains heart beat and heart pressure at a level which best absorbs oxygen in the lungs and maintains the flow of oxygen to the brain i.e. high and low levels of blood pressure can lead to haemorrhage or stroke. (iii) It maintains temperature at circa 36.8ºC because this is the optimum temperature for many biochemistries i.e. at higher temperatures proteins start to denature and their reactivity is reduced whilst at lower temperatures the rate of reaction declines. (iv) It maintains the stability of the processes of digestion and excretion in order to ensure the flow of nutrients and the elimination of toxins which could adversely influence many biochemistries. (v) It maintains blood glucose within the range 4-8mmol. per litre because deviations from such limits (a) lead to increased weight, increased release of insulin, and the onset of glycation processes in type 2 diabetes,[17] cardiological complications,[18] etc; or (b) reduce the energy generated, lowers metabolic rate, and the development of side-effects in type 1 diabetes. (vi) It maintains blood glucose within the range 4-8mmol. per litre which with blood cell content, increases blood viscosity and influences the rate at which the heart can deliver oxygenated blood to the brain. Increased blood viscosity leads to increased heart rate and increased risk of haemorrhage or stroke.

A Mathematical Model of the Physiological Systems

There has for many years been interest in having a Mathematical Model of the Physiological Systems[19] however it is only in the last 10-20 years that western research has recognise the significance of the physiological systems and of integrative theories linking cognition, the autonomic nervous system and visceral organs.[20-23] This is an area in which Russian researchers have excelled.[24,25] A core group of researchers[26] have researched the relationship between the physiological systems and the nervous structures for almost 50 years. Such research has led to the first comprehensive Mathematical Model of the Physiological Systems.[27] It incorporates an understanding of how stress influences the stability of each system. This autonomic instability leads to cellular and molecular change(s) and, ultimately, to what we know as pathologies. It uses cognitive measurements, in particular of colour perception, as the data set for this model.

Virtual Scanning

Such methodology has been incorporated into an advanced cognitive technology which have been widely reported.[28,29] This is the first technique which is able to diagnose all of the major medical conditions in a single cognitive test. It incorporates an understanding that stress/sensory input, an estimated 85% of which is in the form of light, influences cellular and molecular biology. In particular it influences the expression of proteins and the rate at which such proteins subsequently react - which can be measured. The absorption and emission of light from proteins provides the means to do so by measuring colour contrast and colour perception.

Virtual scanning embraces an unprecedented understanding of the mechanisms which the body employs to regulate its function e.g.

- To provide more information which has the potential to advances the understanding of multi-systemic etiologies e.g. migraine,[30] diabetes,[5,17] developmental dyslexia,[31,32] and sleep apnoea.[33] Biomarker tests only diagnose the selected indication(s). By comparison, Virtual scanning can track the emergence of typically 5-15 pathologies in each of over 30 organs.
- To illustrate the influence of both genotype and phenotype upon each pathology[5] i.e. of (i) protein expression, (ii) the rate which expressed proteins subsequently react with their reactive substrates and (iii) which incorporates an understanding of the reaction conditions governing such reactions.
- To diagnose from presymptomatic origins. The emission of biophotons of light, which are characteristic of pathologies, occurs from the first pathological reaction. This influences colour perception from typically 50-100 biophotons per second (range 10^2-10^9 biophotons per second). It is a linear relationship. Many pathological reactions produce biophoton of particular colour(s). It contrasts with biomarker techniques which compare the analysed results with that of expected norms.
- To differentiate between normal and abnormal cell morphologies. Altered DNA and protein conformation influences their spatial orientation in the cell and their ability to conduct their cellular function e.g. facilitating the passage of glucose through the cell membranes.
  i. Increased or decreased cell function (hyperfunction or hypofunction).
  ii. Increased or decreased arterial or venal flow to and from each organ indicative of an inflammatory reaction or ischaemia.
  iii. Abnormality of a limit of cell division i.e. indications of the changes taking place to cell morphology.
  iv. Growth of new cells or death of old cells.
- By assessing the degree of System Stability or Instability. An advanced understanding of EEGs can be used to regulate systemic stability.[8,33-35]
  How is it possible to evaluate the existence or function of a system or the stability or instability of a system? Whilst it is recognised that organs function in organ networks there are no other technologies which are able to justify the stability of systems except by using the only available technology, Virtual scanning.
- To predict the onset of further Pathologies. The knowledge that there are physiologically regulated systems has a predictive and therapeutic capability. If a system becomes destabilised this will lead to pathologies in each organ of that particular system.

Discussion

The purpose of this series of articles is to establish the scientific basis for Virtual scanning and to prove the methodology developed by Dr. I. G. Grakov. Virtual scanning was first approved for use by the Russian Health Services in 2001. These articles illustrate the scope of this technology. They highlight that there is a more advanced technological concept, based upon an understanding of how the body responds to light, which can advance the diagnosis and treatment of disease.

The problem for many is that they base their decision-making upon that which they have seen in their lifetime. This is completely natural however it illustrates the difficulties which inventors face when they develop and seek to commercialise novel and potentially disruptive technologies e.g. computers, mobile phones, etc. Consequently there is resistance to anything which challenges the status quo and which could introduce new and potentially better ways.

"*All truth passes through three stages. First it is ridiculed. Secondly, it is violently opposed. Third, it is accepted as being self-evident*." – Arthur Schopenhauer

Dr. Grakov appears to have produced a first mathematical model of the physiological systems. This has been incorporated into a technology which uses cognitive measurements as its data sets. The resulting report is one of an apparently unprecedented level of sophistication. In healthcare there is a mechanism to overcome such obstacles i.e. through clinical studies however in order to reach this stage clinicians have to be convinced of the validity of the concept. The purpose of this series of articles has been to illustrate that this technology exists, that there are precedents for a technology of this type, and that the underlying scientific methodology holds the promise of being more advanced, sophisticated and cost-effective than many of the medical techniques which are routinely employed in orthodox biomedicine.

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