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Integrating Conventional and Holistic Medicine for Precision and Personalized Diagnosis in Medical Laboratory Science

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ABSTRACT

The implementation of the combination of conventional and alternative medicine swing the new style in laboratory science known as personalized diagnosis or precision. Traditional approaches to disease mechanisms, such as genomic (-), proteomic-, and metabolomic analyses are informative. Lifestyle, environmental and psychosocial factors are frequently neglected. By performing a full assessment of individual health, gaps that are missed by standard medicine can be filled in holistic treatment. A combined approach of these methods is beneficial for a wide-ranging comprehension to address the disease manifold and enables based diagnostic and therapeutic concepts. The model seeks to improve diagnosis and treatment outcomes by considering both molecular determinants of health &

disease, as well as contextual actors. Validating this integrative combination of technologies with a focus on personalized medicine will further post progress in improving clinical treatment.

Keywords: Molecular biology, holistic medicine, conventional medicine, precision and personalized diagnosis, disease.

INTRODUCTION

The inclusion of conventional and holistic value-based medicine within medical laboratory science provides a non-parallel view to precision diagnosis, intertwining biologic data with anthropometric influences on individual health status. The move toward this paradigm allows a better individualized, more comprehensive understanding of health and disease [1]. Combining both conventional and natural medicine merges state-of-the-art diagnostic tests with information about lifestyle, the environment in which we live as well as psychosocial features so that treatment can be more precise. Although conventional methods can give much detail on disease processes, holistic approaches complement this knowledge by addressing additional dimensions of the pathophysiology for a more complete view [2].

Integrating holism with conventional diagnostics empowers a personalized care model by marrying analysis of dietary, stress and lifestyle evaluation to your biomarkers reflecting the underappreciated factors contributing imbalance -thus leading up to superior patient outcomes focused therapy. Integrative medicine using a blend of the traditional and holistic model that could provide disease prediction, prevention, and management. It is an extension of nuclear medicine methods which treat the individual as a whole by examining both molecular and interdisciplinary aspects; allowing for more personalized diagnostic imaging. The concept underscores the importance of generating collaborative research and bringing into use interdisciplinary skills if advantages in medical laboratory science which cuts across histopathology and cytopathology, medical microbiology, chemical pathology and haematology and blood transfusion science are to be fully exploited [3].

The central denominator that unites the various branches of medical laboratory science is the nucleic acid, present in every cell, tissue, organ, and system. This model aims to leverage the Human Genome Project to better understand diseases at various stages, thereby enabling precise and personalized diagnosis. By integrating conventional molecular techniques with holistic approaches, we can create a comprehensive diagnostic model that not only targets genetic and molecular markers but also considers the whole person—bridging the gap between traditional and modern medicine for optimal patient outcomes.

DISEASE ETYMOLOGY

Etymologically, disease can be defined as a state of being not at ease or a condition of discomfort. This can be traced back to the old French word "desaise," which is a combination of two elements, viz., "des," meaning reversal or absence, and “aise, meaning ease. So, literally, disease is the absence of ease [4].

DISEASE ORTHODOXY

The disease Orthodoxy stands on two unwavering pillars of reality: Toxins and nutritional deficiencies are the root causes of disease. While the buildup of toxins in the body can be

traced to most diseases, the depletion of nutrients, especially minerals and vitamins, is caused by the toxins [5-7]. The authors opined that every disease has its root cause from two sources, viz., toxin and nutritional deficiency. The buildup of toxins over time, which can come from physical, emotional, or chemical toxin, can result in the lowering of the biological energy, resulting in disease or diseases. Nutritional deficiencies can equally manifest in different diseases.

DISEASE STAGES

According to [9-14]. Disease can be summarised into seven stages, viz.

Accumulation (*Sanchaya*)

Here, there is a mild accumulation of imbalances (toxins), which is central to deficiency of nutrients, lifestyle, or other factors, with resultant effects on the biological energy level (dosha) manifested in the mild feeling of heaviness, mild discomfort, etc.

Aggravation (*Prakopa)*

Here, there is a moderate buildup of toxins (imbalances), which is due to a moderate deficiency of nutrients, lifestyle, or other factors. This further lowers the biological energy level, manifesting in the moderate feeling of heaviness, moderate discomfort, etc.

Overflow (*Prasara*)

This is the dissemination or spread of the toxins (imbalances) from the primary site or site of origin to other parts of the body. Here there is the appearance of symptoms in different areas of the body.

Relocation (*Sthana samshraya*)

Here, the toxins (imbalances) settle in a new location, causing more specific symptoms associated with that area. This is when a specific disease or condition can be identified, as the toxin (imbalances) manifest in a particular tissue or organ.

Manifestation (*Vyakti*)

There is manifestation of clear and distinct symptoms associated with the tissue or organ. This is the stage at which a diagnosis can be made in a conventional medical setting.

Diversification (Bheda)

There is a chain of dysfunctions (complications) across the cells, down to the organs or system, and this is central to the interconnectedness of the body as symptoms become more severe and complex, resulting in chronic conditions or secondary diseases.

Disruption (*Vikalpa*)

There is significant disruption of the body's systems leading to advanced disease, organ failure, or other serious health conditions (cancer). This stage is often difficult to treat and may require intensive medical intervention.

The various stages of the disease can be understood at the molecular level through the lens of epigenetic changes, oxidative stress, inflammation, mitochondrial dysfunction, telomere

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shortening, RNA processing, alternative splicing, impaired mitochondrial biogenesis, and nutrient sensing pathways.

The central denominator that unites the various branches of the medical laboratory science is the nucleic acid, which is present in every cell, tissue, organ and system. The aim of this model is to leverage the human genome project to better understand diseases at the various stages, which will invariably leads to a precise and personalized diagnosis.

EPIGENETIC CHANGES

In the accumulation stage, a poor diet and long-term stress can cause aberrant DNA methylation patterns. These have the power to either activate genes that cause illness or mute genes required for regular cellular function. For instance, a diet heavy in processed foods and poor in nutrients may cause specific genes to be hyper- or hypomethylated, which may result in diseases including cancer, diabetes, and obesity.

In the accumulation stage, histones can be chemically altered to alter the degree to which DNA is coiled around them, controlling the expression of particular genes. Inappropriate histone modifications can result from lifestyle choices including inactivity and exposure to toxins, which can change gene expression and aid in the development of disease processes.

In the aggravation stage, changes in methylation can lead to inappropriate activation or silencing of genes. This can result in aberrant DNA methylation patterns that are associated with various diseases, including cancer and metabolic disorders.

Moderate accumulation of toxins can alter chromatin structure, influencing gene expression. This can result in disrupted histone modifications, which can lead to misregulation of gene expression, contributing to disease states [15].

In the overflow stage, systemic spread of imbalances can affect DNA methylation patterns across different tissues. Aberrant methylation can lead to the inappropriate activation or silencing of genes. This can disrupt normal cellular functions and contribute to disease progression. Imbalances can alter histone modifications such as acetylation, methylation, and phosphorylation. These changes affect chromatin structure and gene expression. Dysregulated histone modifications can lead to widespread gene expression changes associated with disease.

In the relocation stage, the presence of toxins can lead to altered DNA methylation patterns in the affected tissue. Hypermethylation or hypomethylation of CpG islands can silence or activate genes inappropriately. Epigenetic changes can contribute to the development of specific diseases, such as cancer, in the affected organ. Toxins can disrupt histone acetylation, methylation, and other modifications in the new location. These changes can affect chromatin structure and gene expression. Dysregulated gene expression can lead to tissue-specific diseases [16].

In manifestation, Sustained exposure to toxins and imbalances can lead to significant changes in DNA methylation patterns. Hypermethylation or hypomethylation of promoter regions affects gene expression. These epigenetic changes can silence tumour suppressor genes or

activate oncogenes, contributing to disease manifestation. Long-term exposure to imbalances affects histone acetylation, methylation, and other modifications. Altered histone modifications change chromatin structure, impacting gene accessibility and expression. Misregulated gene expression leads to the manifestation of disease symptoms [16].

Diversification, Chronic exposure to stressors and toxins alters DNA methylation patterns across various tissues. Epigenetic dysregulation can lead to inappropriate gene silencing or activation. Aberrant gene expression contributes to the systemic dysfunction characteristic of chronic conditions and secondary diseases. Long-term exposure to stress and imbalances affects histone modifications such as acetylation and methylation. Changes in chromatin structure result in altered gene expression. Histone modification dysregulation leads to the systemic manifestation of chronic diseases.

Disruption: Chronic disease states cause widespread changes in DNA methylation patterns. Aberrant methylation can lead to silencing of tumour suppressor genes and activation of oncogenes. Epigenetic dysregulation contributes to the development and progression of advanced cancers and other severe diseases [17].

OXIDATIVE STRESS

In accumulation, environmental pollutants, stress, and an unhealthy diet high in fats, sweets, and processed foods can all lead to an increase in ROS production. ROS have the ability to oxidatively damage proteins, RNA, and DNA. This can result in mutations, a reduction in cellular function, and ultimately illnesses, including cancer and neurological disorders [18] . The body's capacity to neutralise reactive oxygen species (ROS) can be compromised by a diet low in antioxidants, which are present in fruits, vegetables, and whole foods. This can increase oxidative stress and molecular damage [19].

In aggravation, toxins and imbalances often lead to increased production of reactive oxygen species (ROS). ROS can cause oxidative damage to DNA, leading to mutations, strand breaks, and base modifications (e.g., 8-oxoguanine). This damage can disrupt normal cellular function, contribute to genomic instability, and activate DNA repair mechanisms.

In overflow, the dissemination of toxins can increase ROS production systemically. ROS can cause oxidative damage to DNA and RNA in multiple tissues, leading to mutations, strand breaks, and modifications like 8-oxoguanine. Accumulation of such damage can impair cellular functions and contribute to the pathology of various diseases.

The relocation of toxins to a specific organ increases localised oxidative stress. This can cause site-specific DNA damage, including strand breaks, base modifications, and mutations. Mutations in critical genes (e.g., tumour suppressors, oncogenes) can lead to diseases such as cancer.

In the manifestation stage, persistent oxidative stress and other damaging factors lead to the accumulation of mutations in the DNA of affected cells. These mutations can result in the activation of oncogenes, inactivation of tumour suppressor genes, and disruption of other critical genes. The cumulative genetic alterations lead to the development of cancer or other genetic disorders, with symptoms now becoming apparent.

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In the diversification stage, chronic conditions and secondary diseases perpetuate systemic oxidative stress. Continuous oxidative damage leads to widespread DNA strand breaks, base modifications, and mutations. Persistent DNA damage contributes to genomic instability and the progression of chronic diseases like cancer, diabetes, and neurodegenerative disorders.

INFLAMMATION

In the accumulation stage, unhealthy lifestyle choices can lead to a state of chronic inflammation, which can damage DNA and impair its repair mechanisms. Pro-inflammatory cytokines can induce the expression of genes involved in inflammation, perpetuating a cycle of cellular damage [20].

In the aggravation stage, imbalances can activate inflammatory pathways, leading to increased production of cytokines and other inflammatory mediators.

In the overflow stage, the spread of imbalances can trigger a systemic inflammatory response, often characterised by the excessive release of cytokines (cytokine storm). Pro-inflammatory cytokines can induce oxidative stress and DNA damage in various tissues. This can lead to widespread cellular dysfunction and contribute to the development of chronic inflammatory conditions. Pathways such as NF-κB and JAK-STAT become activated across multiple tissues. This activation can lead to the transcription of numerous inflammatory genes, resulting in increased production of inflammatory proteins. Sustained inflammation can cause further DNA damage and alter RNA processing [21]. The epigenetic basis of common human disease. In the relocation stage, the presence of toxins triggers a localised inflammatory response. Inflammatory cytokines can cause DNA damage and alter RNA processing.

Chronic inflammation can lead to tissue damage and contribute to disease progression. Pathways such as NF-κB and JAK-STAT are activated in the affected tissue. Activation of inflammatory genes can lead to increased production of inflammatory proteins. Sustained inflammation can cause tissue-specific damage and disease [22 & 23].

In the manifestation stage, persistent imbalances maintain a state of chronic inflammation. Inflammatory cytokines induce DNA damage and alter RNA processing. Chronic inflammation leads to tissue damage and disease manifestation, with clear clinical symptoms. Pathways like NF-κB and JAK-STAT are chronically activated. Continuous activation of inflammatory genes disrupts normal cellular functions. Symptoms related to inflammation, such as pain and swelling, become apparent [22 & 23].

In the diversification stage, inflammatory cytokines cause DNA damage and alter RNA processing. Inflammatory cytokines cause DNA damage and alter RNA processing. Chronic inflammation leads to tissue damage and systemic disease progression. Pathways like NF-κB and JAK-STAT are continuously activated across various tissues. Sustained activation of inflammatory genes disrupts normal cellular functions. Symptoms related to chronic inflammation, such as pain and tissue degeneration, become more severe and complex [22 & 23].

In the disruption stage, advanced disease stages trigger chronic and severe inflammation. Inflammatory cytokines cause extensive DNA damage and alter RNA processing. Chronic

inflammation leads to tissue damage, immune dysregulation, and disease progression (Medzhitov, 2008), persistent activation of inflammatory pathways such as NF-κB and JAK-STAT. Continuous activation of inflammatory genes disrupts normal cellular functions [24].

MITOCHONDRIAL DYSFUNCTION

Mitochondria are particularly susceptible to damage from oxidative stress. Damage to mtDNA can impair cellular energy production and increase the production of ROS, creating a vicious cycle. Impaired mitochondrial function is associated with various chronic diseases, including metabolic disorders and neurodegenerative diseases [25].

In the aggravation stage, mitochondria are particularly susceptible to oxidative damage due to their role in energy production. ROS can cause mutations in mtDNA, impairing mitochondrial function. Mitochondrial dysfunction can lead to reduced ATP production and increased apoptosis, contributing to disease.

In the overflow stage, the spread of toxins can impair mitochondrial function in various tissues. Increased oxidative stress can damage mitochondrial DNA (mtDNA).

Impaired mitochondrial function can lead to decreased ATP production and increased apoptosis, affecting tissue health. Toxins can disrupt pathways regulating mitochondrial biogenesis. This contributes to the progression of systemic diseases.

TELOMERE SHORTENING

Telomeres are protective caps on the ends of chromosomes that shorten with each cell division. Chronic stress, poor diet, and unhealthy lifestyle choices can accelerate telomere shortening. Shortened telomeres are associated with ageing and increased risk of age-related diseases, including cardiovascular disease and cancer [26].

RNA MODIFICATIONS

MicroRNAs are small non-coding RNAs that regulate gene expression post-transcriptionally. Diet and lifestyle factors can alter miRNA expression profiles. Dysregulated miRNA expression can lead to the inappropriate silencing or activation of genes, contributing to disease development [27].

In aggravation, similar to DNA, RNA can be damaged by ROS, leading to oxidation. Oxidative modifications to RNA can affect its stability and function, particularly mRNA. Damaged RNA can result in aberrant protein synthesis and cellular dysfunction [28].

In overflow, increased ROS can lead to oxidative modifications of RNA. Oxidised RNA molecules may have reduced stability and altered functionality. This can result in the production of dysfunctional proteins and contribute to cellular stress.

In the relocation stage, localised oxidative stress can cause oxidative modifications to RNA. Oxidised RNA may be unstable and dysfunctional. This can result in the production of aberrant proteins, contributing to disease. Toxins can affect the splicing machinery in the specific tissue. Abnormal splicing can produce defective mRNA transcripts. Production of dysfunctional proteins can lead to tissue-specific diseases.

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THE HUMAN GENOME PROJECT

Leveraging the advancements of the Human Genome Project, which successfully mapped the full human genome, precision and personalized diagnosis have become the cornerstone of effective medical treatment. This approach, often involving the targeting of nucleic acids through the analysis of DNA and RNA, ensures the right diagnosis for the right person at the right time. By employing molecular techniques such as PCR, gene sequencing, and the use of molecular markers, it is possible to comprehensively examine genetic material, revealing mutations, gene expressions, and pathogen features. These techniques enable accurate diagnosis of diseases at various stages. For example, finding infectious disease markers like 16s rRNA, ITS, OMP, PlasmoB, and predictive markers can identify disease-associated genetic markers, while single nucleotide polymorphisms (SNPs) are used for precise identification of genes involved in drug metabolism, and short tandem repeats are utilized for clonal relatedness analysis [29].

THE PANACEAS

From the forgoing teleological analysis, the marriage between the conventional and holistic approaches in achieving precision and personalised diagnosis in medical laboratory science in order to further a robust human existence remains the goal. In furtherance to this marriage, taking care of the chemical, physical, and emotional stressors, being the root causes of these diseases, becomes high yield. This can be achieved by being in a constant parasympathetic dominant phase, by having enough sleep, good diets rich in methyl donors, regular exercise, constant detoxification of the system, correcting subluxations, etc.

Authors Contribution

SEI conceptualised and finalised the article; YNA, LHY, HK, OFO, and OA did the literature search.

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