A New Role for Clinical Laboratories

One lesson in medicine we have learned over the last century is that our successes often give rise to new challenges. Tremendous strides in reducing mortality from acute illness and extending life expectancy have yielded an increase in chronic, degenerative diseases among the aging population.[1] The power of antibiotics in saving lives has encouraged the hope of a "magic bullet" for treating symptoms, a model that has, to a large extent, failed to produce the same success with diseases that are multifactorial in origin and chronic in nature. Additionally, the very use of these drugs has created "super bugs" resistant to antibiotics.[2] Advances in food production and distribution have resulted in an abundance of processed foods altered from their original form and that have low nutrient-to-calorie ratios. Technological progress has created literally thousands of new chemicals that challenge the environment and our own metabolic processes.[3]

As more of the world's population experiences the benefits of our successes, overcoming the new challenges we have created requires a broader, more holistic approach that takes into account the web-like interconnectedness of human metabolism and its relation to the environment. The human body has great capacity to adapt to change, heal, and express its genetic potential if it is provided the raw materials—the basic macronutrients, micronutrients, and conditionally essential nutrients-that it requires for healthy metabolic function. What should become routine application of these principles to general patient care is already being done by some practitioners. In the U.S., they tend to be catagorized as practicing integrative or functional medicine.

Nutrition may be the single most influential component of health maintenance, since diet is a determining factor in many diseases, including obesity, cancer, diabetes, hypertension, heart disease, stroke, cirrhosis of the liver, childhood developmental and behavioral disorders, and celiac disease.[4,5] Yet optimal nutrition, the level of nutrient intake that maintains the best possible health, is highly variable from person to person.[6] The concepts of biochemical individuality and the genetotrophic theory of disease, as first described by Roger Williams, the discoverer of pantothenic acid (vitamin B_5), continue to exert a major influence on this emergent model of human health and the development of integrative functional medicine.

Biochemical individuality influences not only the individual need for nutrients, but also the expression of nutrient insufficiency.[7] Although this has been recognized for centuries, the concept has been virtually ignored by the current medical system. Diseases such as beriberi, pellagra, and scurvy, all single-nutrient deficiency diseases, are often thought of as specific sets of symptoms and disease progressions. This, however, is not the case. Biochemical individuality plays a key role in the expression of functional deficits as they develop, even in a single-nutrient deficiency disease. An excerpt from an account by the chaplain aboard Commodore Anson's British sailing ship HMS *Centurion*, which voyaged around the world from 1740 to 1744, and where 626 of 961 men died of scurvy, illustrates that even centuries ago this was apparent:

> This disease, so frequently attending all long voyages, and so particularly destructive to us, is surely the most singular and unaccountable of any that affects the human body. For its symptoms are inconstant and innumerable, and its progress and effects extremely irregular: for scarcely two persons have the same complaints, and where there is found some conformity in symptoms, the order of their appearance has been totally different. However, though it frequently puts on the form of many other diseases, and is therefore not to be described by any exclusive and infallible criterions (Chaplain Richard Walter, *Anson's Voyages Around the World in the Years 1740–1744*).

Because most essential nutrients play such fundamental roles in cellular metabolism, as insufficiencies develop, the effects can be system wide. Variation in disease expression is exponentially compounded when multiple nutrient deficiencies are involved, which is often the case in the chronic degenerative diseases. Any and every aspect of body function can potentially become compromised, depending on the patient's own unique biochemical expression.

The corollary of this situation is that nutritional and metabolic evaluations of patients with chronic illnesses also exhibit this variation, making it difficult to define a disease by any set of laboratory markers. That is, different illnesses may have very similar nutrient deficits. Conventional wisdom in diagnostic medicine requires that each diagnosed disease have its own unique set of