A Holistic Approach to Modern-Day Chronic Disease Management:

Pharmacological Therapies, Lifestyle Choices, and Nitric Oxide **Deficiency**

by Nathan S. Bryan, PhD

Abstract
Over the past 10 years, despite a slight increase in life expectancy and a decrease in all causes of deaths, the percentage of the US population with cardiovascular disease (CVD), cancer, diabetes, hypertension, and obesity has increased. Despite a longer life span, the morbidity rate of Americans is increasing. The trend is also prevalent in the global population, where 17.3 million people died from CVD in 2008, and another 23.6 million are expected to die by 2030. Despite improved access to medical care and disease management, there has not been a reduction in the incidence rate of CVD, indicating that prevention of chronic disease has not kept pace. The discovery of nitric oxide (NO) production in the human body is a relatively new advancement of modern medicine. NO, however, has not made progress in the therapeutic domain. There are no standard diagnostic techniques nor prescription therapies to test for and restore NO homeostasis. This dearth is despite the fact that NO has been identified as an early indicator for a number of different disease states. This review will reveal how many modern therapies and Western lifestyles actually lead to a decrease in NO homeostasis in patients from all age strata. The findings outlined here highlight why nitric oxide homeostasis should be in the forefront of chronic disease therapeutics. Tracking and understanding NO homeostasis at the individual level, and how certain treatments and procedures affect the same, allow for better medical care and improved disease prognosis.

Keywords: nitric oxide, nitrite, nitrate, chronic disease, prevention

Introduction

The past 100 years have seen many scientific and medical discoveries leading to tremendous advancements in medicine worldwide. Antibiotics/antiseptics and vaccinations have led to a drastic reduction in the morbidity burden of infectious diseases. The advent of medical devices and advancements in emergency medicine have led to better care of trauma patients and life-threatening emergencies from acute injury. Innovations in imaging and diagnostics have led to early detection of a number of chronic diseases. However, the development of safe and effective treatments or cures of chronic diseases such as cardiovascular disease, Alzheimer's disease, cancer, and diabetes have been disappointingly slow and largely ineffective. According to the 2010 National Center for Health Statistics Report, life expectancy has increased 1.1 years over the past decade, going from 76.8 to 77.9.[1] All causes of death adjusted for age have decreased by 12.5% from 2000 to 2008. However, the percent of the population 18 years and over with heart disease has risen from 10.9% to 11.8% and the population 65 and over has risen from 29.6% to 31.7% over the same 8 years. Diabetes has gone from 8.5% of the population 20 years and older to 11.9% in just 8 years. The percentage of people with hypertension has risen from 28.9% to 32.6%. Cancer has followed a similar trend, increasing from 4.9% to 6.1% in patients 18 years old and over.[1] Essentially, although the life expectancy of the average population has increased, the population is living better or healthier. A number of the increased years of life are spent with a chronic disease condition, which requires intensive treatment and care. This causes an enormous economic burden on the health-care system and, consequently, on the patients. In fact from 2000 to 2008, total health-care expenditures increased from $1.1 to $2.0 trillion dollars or from $4032 to $6411 per capita.[1] These data highlight a very serious problem with our health-care system.

While it is highly unlikely that a single event or mediator may be responsible for this trend in health and in complex chronic diseases, there is emerging evidence that nitric oxide (NO) may play a role at the earliest stages of chronic diseases. Modern pharmacotherapy and lifestyle choices are increasingly being linked to diminished NO levels in vivo, and therefore NO levels should be a primary consideration when considering the health of an individual. The discovery of NO in the 1980s as a vasodilator and signaling molecule in the cardiovascular system, immune system, and nervous system marked a point of inflexion in medicine.[2–5] The discovery that a simple molecule produced as a gas could perform so many essential and critical biological and physiological functions established a new paradigm in cell signaling. Now, almost 30 years later, endothelial dysfunction or insufficient NO production is recognized as the earliest event in the onset and progression of a number of chronic diseases. Loss of