

Nitrates May Be Environmental Trigger For Alzheimer's, Diabetes And Parkinson's Disease

ScienceDaily (July 6, 2009) — A new study by researchers at Rhode Island Hospital have found a substantial link between increased levels of nitrates in our environment and food with increased deaths from diseases, including Alzheimer's, diabetes mellitus and Parkinson's. The study was published in the *Journal of Alzheimer's Disease*.

Led by Suzanne de la Monte, MD, MPH, of Rhode Island Hospital, researchers studied the trends in mortality rates due to diseases that are associated with aging, such as diabetes, Alzheimer's, Parkinson's, diabetes and cerebrovascular disease, as well as HIV. They found strong parallels between age adjusted increases in death rate from Alzheimer's, Parkinson's, and diabetes and the progressive increases in human exposure to nitrates, nitrites and nitrosamines through processed and preserved foods as well as fertilizers. Other diseases including HIV-AIDS, cerebrovascular disease, and leukemia did not exhibit those trends. De la Monte and the authors propose that the increase in exposure plays a critical role in the cause, development and effects of the pandemic of these insulin-resistant diseases. De la Monte, who is also a professor of pathology and lab medicine at The Warren Alpert Medical School of Brown University, says, "We have become a 'nitrosamine generation.' In essence, we have moved to a diet that is rich in amines and nitrates, which lead to increased nitrosamine production. We receive increased exposure through the abundant use of nitrate-containing fertilizers for agriculture." She continues, "Not only do we consume them in processed foods, but they get into our food supply by leeching from the soil and contaminating water supplies used for crop irrigation, food processing and drinking." Nitrites and nitrates belong to a class of chemical compounds that have been found to be harmful to humans and animals. More than 90 percent of these compounds that have been tested have been determined to be carcinogenic in various organs. They are found in many food products, including fried bacon, cured meats and cheese products as well as beer and water. Exposure also occurs through manufacturing and processing of rubber and latex products, as well as fertilizers, pesticides and cosmetics. Nitrosamines are formed by a chemical reaction between nitrites or other proteins. Sodium nitrite is deliberately added to meat and fish to prevent toxin production; it is also used to preserve, color and flavor meats. Ground beef, cured meats and bacon in particular contain abundant amounts of amines due to their high protein content. Because of the significant levels of added nitrates and nitrites, nitrosamines are nearly always detectable in these foods. Nitrosamines are also easily generated under strong acid conditions, such as in the stomach, or at high temperatures associated with frying or flame broiling. Reducing sodium nitrite content reduces nitrosamine formation in foods. Nitrosamines basically become highly reactive at the cellular level, which then alters gene expression and causes DNA damage. The researchers note that the role of nitrosamines has been well-studied, and their role as a carcinogen has been fully documented. The investigators propose that the cellular alterations that occur as a result of nitrosamine exposure are fundamentally similar to those that occur with aging, as well as Alzheimer's, Parkinson's and Type 2 diabetes mellitus.

De la Monte comments, "All of these diseases are associated with increased insulin resistance and DNA damage. Their prevalence rates have all increased radically over the past several decades and show no sign of plateau. Because there has been a relatively short time interval associated with the dramatic shift in disease incidence and prevalence rates, we believe this is due to exposure-related rather than genetic etiologies."

The researchers recognize that an increase in death rates is anticipated in higher age groups. Yet when the researchers compared mortality from Parkinson's and Alzheimer's disease among 75 to 84 year olds from 1968 to 2005, the death rates increased much more dramatically than for cerebrovascular and cardiovascular disease, which are also aging-associated. For example, in Alzheimer's patients, the death rate increased 150-fold, from 0 deaths to more than 150 deaths per 100,000. Parkinson's disease death rates also increased across all age groups. However, mortality rates from cerebrovascular disease in the same age group declined, even though this is a disease associated with aging as well.

De la Monte notes, "Because of the similar trending in nearly all age groups within each disease category, this indicates that these overall trends are not due to an aging population. This relatively short time interval for such dramatic increases in death rates associated with these diseases is more consistent with exposure-related causes rather than genetic changes." She also comments, "Moreover, the strikingly higher and climbing mortality rates in older age brackets suggest that aging and/or longer durations of exposure have greater impacts on progression and severity of these diseases."

The researchers graphed and analyzed mortality rates, and compared them with increasing age for each disease. They then studied United States population growth, annual use and consumption of nitrite-containing fertilizers, annual sales at popular fast food chains, and sales for a major meat processing company, as well as consumption of grain and consumption of watermelon and cantaloupe (the melons were used as a control since they are not typically associated with nitrate or nitrite exposure).

The findings indicate that while nitrogen-containing fertilizer consumption increased by 230 percent between 1955 and 2005, its usage doubled between 1960 and 1980, which just precedes the insulin-resistant epidemics the researchers found. They also found that sales from the fast food chain and the meat processing company increased more than 8-fold from 1970 to 2005, and grain consumption increased 5-fold.

The authors state that the time course of the increased prevalence rates of Alzheimer's, Parkinson's and diabetes cannot be explained on the basis of gene mutations. They instead mirror the classical trends of exposure-related disease. Because nitrosamines produce biochemical changes within cells and tissues, it is conceivable that chronic exposure to low levels of nitrites and nitrosamines through processed foods, water and fertilizers is responsible for the current epidemics of these diseases and the increasing mortality rates associated with them.

De la Monte states, "If this hypothesis is correct, potential solutions include eliminating the use of nitrites and nitrates in food processing, preservation and agriculture; taking steps to prevent the formation of nitrosamines and employing safe and effective measures to detoxify food and water before human consumption."

Other researchers involved in the study with de la Monte include Alexander Neusner, Jennifer Chu and Margot Lawton, from the departments of pathology, neurology and medicine at Rhode Island Hospital and The Warren Alpert Medical School of Brown University.

The study was funded through grants from the National Institutes of Health. Two subsequent papers have been accepted for publication in the near future that demonstrate experimentally that low levels of nitrosamine exposure cause neurodegeneration, NASH and diabetes