

Connecting Environmental Exposures to Chronic Inflammation and Diseases

Increasing evidence suggests that environmental exposures are a cause of or contributing factor to chronic inflammation, which leads to a wide variety of diseases and conditions. Heart disease, asthma, obesity, Alzheimer's, arthritis, cancer and other conditions may all be related to or even caused by chronic inflammation. To address this issue, the PEPH hosted a webinar on connecting environmental exposures to chronic inflammation and diseases on February 28, 2012. This webinar featured presentations by:



Michael Humble, Ph.D., program director for the immunotoxicology/autoimmune disease research program in the Cellular, Organs, and Systems Pathobiology Branch, NIEHS Division of Extramural Research and Training (DERT).



Sri Nadadur, Ph.D., health sciences administrator and program director for the Nanotechnology Environmental Health and Safety (Nano-EHS) and environmental cardiopulmonary health extramural research programs at NIEHS.



Rodney Dietert, Ph.D., professor of immunotoxicology in the Department of Microbiology and Immunology at Cornell University's College of Veterinary Medicine.



PEPH Webinar Series

The Partnerships for Environmental Public Health (PEPH) Program established the PEPH Webinar series to promote interactions among PEPH grantees and to increase awareness of common issues and approaches. The webinars facilitate consideration of emerging issues. While the primary audience is grantees within the PEPH network, anyone interested in environmental public health is welcome to register.

If you have any questions about this webinar or future webinars please contact Justin Crane (cranej2@niehs.nih.gov, 919-794-4702).

Michael Humble opened the webinar by providing background information about the immune system and inflammation. Humble indicated that inflammation is typically a protective process that allows the body to heal following an attack on the immune system. However, inflammatory responses that are excessive or prolonged can cause damage to tissues and organs and lead to a variety of diseases. Harmful environmental exposures have been linked to damaging chronic inflammation.

Sri Nadadur followed up by discussing the role air pollution plays in human disease morbidity. Nadadur provided an overview of significant historic air pollution events and the subsequent regulatory programs that were implemented in response to these events. Although air pollution has previously been linked to respiratory or cardiopulmonary health effects, Nadadur indicated that recent research has drawn associations between exposure to air pollution and exacerbation of other diseases, such as cardiovascular diseases and diabetes. Nadadur concluded by noting that air

pollutants induce systemic inflammation and oxidative stress, and may exacerbate chronic inflammation implicated in several disease conditions.

Rodney Dietert explained that the prevalence of chronic diseases, such as autoimmune conditions, is often hidden because of the way we categorize disease. Dietert asserted that chronic diseases are the leading cause of deaths worldwide and cost an estimated 48% of the global gross domestic product. He emphasized that we need to reassess the way we test for and treat these diseases. Dietert said that early-life environmental exposures during critical maturation windows for immune system development can result in altered functional capacity and imbalances that can lead to later-life chronic disease. Chronic diseases exist as interlinked patterns that play out across an individual's lifetime. For example, the target tissue of an initial inflammatory disease (e.g., asthma in the lung, psoriasis in the skin) is at elevated risk for later-life cancer (e.g., asthma carries with it an elevated risk for lung cancer). Additionally, many diverse chronic diseases share some common problems, such as depression, sensory loss and sleep problems. Dietert wrapped up his talk by discussing the inadequacies of current required safety testing of chemicals and drugs for determining the risk of chronic diseases. He emphasized that outcome-based testing is needed.

The webinar concluded with a question and answer session. Participants asked questions on the following themes.

Chronic inflammation as a link to developing more than one autoimmune disease. The response was that inflammation is definitely a factor, especially misregulated inflammation, but that it probably needs to be paired with immune imbalance to increase risk.

Ways to correct underlying immune dysfunction. The answer referenced a recent talk at NIH (by Dr. Serhan) about reversing chronic inflammation at the cellular level rather than simply treating tissue mediators.

Steps people can take to lower background levels of inflammation other than using moderation in their diet and alcohol consumption and not smoking. Dietert said that getting a balance of antioxidants is important, as is maintaining your gut microflora.

Exposure to electromagnetic radiation or extreme temperatures (because it affects ambient air pollutants) affect inflammation. With electromagnetic radiation, the literature hasn't established a connection yet, but it is worth investigating further. With regard to temperature and air pollution, Nadadur indicated that there are seasonal variations in outdoor pollutants but that people can be exposed to pollutants in an air conditioned or heated indoor environment too. Dietert mentioned that an interesting point related to outdoor exposures is that inadequate sunlight/vitamin D intake is associated with a number of immune and inflammatory-based conditions. Studies examining multiple generations of migrant populations under the lens of latitude effects and amount of sunlight exposure are very interesting.

Diagnostic tests to link diet and autoimmunity. Dietert indicated that he hasn't seen any general tests, but there is some research underway about the diet of infants concerning the type of solids eaten, the time of introduction of those food solids, and immune system maturation.