

## FUNCTIONAL MEDICINE UPDATE

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### **Obesity and Persistent Organic Pollutants**

Dr. Bland begins this issue by providing background information relevant to the research of Dr. David Jacobs and Dr. Duk-Hee Lee, who have collaborated on numerous projects over the last decade. Dr. Bland follows their work closely and interviews Dr. Jacobs in this issue.

Persistent organic pollutants (POPs) are endocrine-disrupting chemicals associated with the development of the metabolic syndrome and type 2 diabetes. In humans, little is known about their role in the potential origin of obesity, and this is now being studied by different groups of researchers. Dr. Bland discusses a study that recently appeared in *Obesity* titled “Obesity and Persistent Organic Pollutants: Possible Obesogenic Effect of Organochlorine Pesticides and Polychlorinated Biphenyls.” This study aimed to assess the associations between serum levels of POPs and the prevalence of obesity in a cohort of obese and lean adult men and women. Dr. Bland describes the study methods and findings. REF #1

### **The Diabetogenic Effects of Exposure to Persistent Organic Pollutants**

During the Vietnam War, Agent Orange, a defoliant containing dioxin, was used throughout the Asia-Pacific region. Recent studies have found that diabetes and hypertension are not uncommon in countries such as Cambodia. Since Cambodian society is relatively poor, and lifestyle is fairly traditional by international standards, these findings are unexpected. Dr. Bland discusses the question of what role exposure to POPs might have in the types of metabolic disturbances being seen today. Studies have also been conducted on adipose samples from US military veterans from the Vietnam era in order to find molecular biological evidence for the diabetogenic action of dioxin. Such studies have led to US government compensation for diabetes in these veterans.

REF #2-4

### **Age-Specific Reference Ranges for Polychlorinated Biphenyls (PCBs)**

Dr. Bland briefly mentions that Dr. BR Nichols and colleagues published a paper in 2007 titled “Age-specific Reference Ranges for Polychlorinated Biphenyls (PCB) Based on the NHANES 2001 – 2002 Survey” in the *Journal of Toxicology and Environmental Health*. The following statement appears in the article summary: “The NHANES 2001 – 2002 PCB serum data demonstrate strong age-related trends, with older individuals displaying higher concentrations of most congeners and of summed PCB congeners. These age-specific reference ranges for PCB concentrations are critical for accurate interpretation of measured serum concentrations of PCB congeners in individuals.” REF #5

### **The Case for Obesogens**

The term “obesogens” is now appearing in the scientific literature. According to a 2009 review article in *Molecular Endocrinology* that Dr. Bland cites, obesogens can be defined functionally as chemicals that inappropriately alter lipid homeostasis to promote adipogenesis and lipid accumulation. The authors of this review write: “The conventional wisdom holds that obesity is primarily the result of a positive energy balance, i.e. too many calories in and too few calories burned. Although it is self-evident that fat cannot be accumulated without a higher caloric intake than expenditure, recent research in a number of laboratories suggests the existence of chemicals that alter regulation of energy balance to favor weight gain and obesity. These obesogens derail the homeostatic mechanisms important for weight control, such that exposed individuals are predisposed to weight gain, despite normal diet and exercise.” REF #6

### **The Impact of Endocrine-Disrupting Chemicals**

Many substances, both natural and artificial, have been recognized to interface with endocrine signaling pathways. Environmental endocrine-disrupting chemicals (EDCs), including pesticides and industrial chemicals, have been released into the environment. Exposure to EDCs can generate effects such as alterations in male and female reproduction, and changes in neuroendocrinology, behavior, metabolism and obesity, prostate cancer, and thyroid and cardiovascular endocrinology. Dr. Bland discusses three very recent articles on this subject, one of which highlights the carcinogenic properties of EDCs. REF #8 – 10

### **Researcher of the Month**

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Dr. David R. Jacobs has a BS in mathematics from Hofstra University and a PhD in mathematical studies from John Hopkins University. He is currently Mayo Professor of Public Health at the University of Minnesota. Dr. Jacobs works in epidemiology and his research interests include whole and refined grain intake and chronic disease; inflammation, oxidation, and health; xenobiotics and health; diabetes; and periodontal disease and cardiovascular disease.

Dr. Jacobs has been collaborating with Dr. Duk-Hee Lee, from Kyungpook National University in South Korea, for a number of years and much of their work is related to the topic of persistent organic pollutants (POPs). Along with their collaborators, Dr. Jacobs and Dr. Lee have published many articles, and Dr. Bland has been following their work with great interest. Dr. Bland and Dr. Jacobs specifically discuss findings related to serum gamma-glutamyltransferase (GGT) and the risk of type 2 diabetes. This work was published in *Clinical Chemistry* in 2007 in an article titled “A Strong Interaction Between

Serum Gamma-Glutamyltransferase and Obesity on the Risk of Prevalent Type 2 Diabetes: Results from the Third National Health and Nutrition Examination Survey.” Among the findings described in the article is this: “Body mass index (BMI) was not associated with prevalent type 2 diabetes when GGT was low normal, suggesting that obesity itself may not be a sufficient risk factor for type 2 diabetes.” REF #10 – 12

Dr. Bland and Dr. Jacobs also discuss a variety of his other areas of research and publications. Dr. Jacobs describes an NHLBI-funded study he has been involved with since 1985, the Coronary Artery Risk Development in Young Adults (CARDIA) study. He also shares some insights he has developed as a result of his epidemiological research on whole grain intake and health. REF #13 – 18

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