How Changes in Body Weight Affect the Human Metabolism

Neuherberg, Germany, 09 March 2014. The proportion of overweight people is steadily rising in Germany, leading to an increase in the number of patients later diagnosed with cardiovascular diseases, dyslipidemia or diabetes. In a just-published study in the journal BMC Medicine, scientists of Helmholtz Zentrum München report on the long-term effects of changes in body weight on the metabolism.

Susanne Vogt (left), Simone Wahl / Source: HMGU

Until now there have been few molecular epidemiological studies regarding the effects of weight changes on metabolism in the general population. In a recent study conducted and funded within the framework of the Competence Network Obesity, researchers at the Institute of Epidemiology II at Helmholtz Zentrum München (HMGU) evaluated molecular data of the KORA study*. "Techniques such as metabolomics and transcriptomics allow the simultaneous determination of a variety of low molecular weight metabolites or gene activities (transcripts of genes) using high-throughput methods," said Simone Wahl and Susanne Vogt, doctoral students at the Institute of Epidemiology II of HMGU. They found that various metabolic pathways are associated with changes in weight. These include the metabolism of lipoproteins such as VLDL (very low density lipoprotein), LDL (low density lipoprotein) and HDL (high density lipoprotein). Furthermore, the association of a group of gene transcripts with weight change suggests that weight change also has an effect on red blood cell development

Innovative approach provides new insights

"Through our experimental approach, which involves both metabolomics and transcriptomics data, we have gained insights into the molecular mechanisms that are affected by weight gain," said Dr. Barbara Thorand, who heads the research group "Diabetes Epidemiology" at the Institute of Epidemiology II. Thus, the researchers were able to establish associations between weight gain and changes in lipid and amino acid metabolism, insulin sensitivity, mitochondrial functioning and the development and function of blood cells at the molecular level. "The chosen evaluation strategy is a promising approach to better elucidate the relevant molecular relationships and to understand how weight changes affect metabolism and

contribute to the development of certain diseases," added Dr. Harald Grallert, head of the research group "Diabetes and Related Traits" of the Department of Molecular Epidemiology (AME) at the Institute of Epidemiology II.

Further Information

Original publikation: Wahl, S. et al. (2015)**.** Multi-omic signature of body weight change: results from a population-based cohort study. BMC Medicine 2015, doi:10.1186/s12916-015-0282-y

Link to publication

*For more than 20 years the **Cooperative Health Research in the Region of Augsburg** (KORA) has been examining the health of thousands of citizens in Augsburg and environs. The aim of the project is to increase understanding of the impact of environmental factors, behaviour and genes on human health. The KORA studies focus on matters relating to the development and progression of chronic diseases, in particular myocardial infarction and diabetes mellitus. To that end, research is conducted into risk factors arising from lifestyle factors (including smoking, diet and exercise), environmental factors (including air pollution and noise) and genetics. Questions relating to the use and cost of health services are examined from the point of view of health services research.

The **Helmholtz Zentrum München** the German Research Center for Environmental Health, pursues the goal of developing personalized medical approaches for the prevention and therapy of major common diseases such as diabetes and lung diseases. To achieve this, it investigates the interaction of genetics, environmental factors and lifestyle. The Helmholtz Zentrum München is headquartered in Neuherberg in the north of Munich and has about 2,300 staff members. It is a member of the Helmholtz Association, a community of 18 scientific-technical and medical-biological research centers with a total of about 37,000 staff members.

The **Institute of Epidemiology II (EPI II)** focuses on the assessment of environmental and lifestyle risk factors which jointly affect major chronic diseases such as diabetes, heart disease and mental health. Research builds on the unique resources of the KORA cohort, the KORA myocardial infarction registry, and the KORA aerosol measurement station. Aging-related phenotypes have been added to the KORA research portfolio within the frame of the Research Consortium KORA-Age. The institute's contributions are specifically relevant for the population as modifiable personal risk factors are being researched that could be influenced by the individual or by improving legislation for the protection of public health.

The**Research Unit Molecular Epidemiology (AME)** analyses population-based cohorts and case studies for specific diseases, using genomics, epigenomics, transcriptomics, proteomics, metabolomics and functional analyses. The aim of this research unit is to decipher the molecular mechanisms of complex diseases like type 2 diabetes or obesity. The unit administers the biological specimen repository of the Department of Epidemiology and stores the samples for national and international projects.

The **German Center for Diabetes Research (DZD)** brings together experts in the field of diabetes research and interlinks basic research, epidemiology and clinical applications. Members are the German Diabetes Center in Düsseldorf, the German Institute of Human Nutrition (DIfE) in Potsdam-Rehbrücke, Helmholtz Zentrum München – German Research

Center for Environmental Health, the Paul Langerhans Institutes of the University Hospital Carl Gustav Carus in Dresden and the University of Tübingen, as well as the Gottfried Wilhelm Leibniz Association and the Helmholtz Association of German Research Centres. The objective of the DZD is to find answers to open questions in diabetes research by means of a novel, integrative research approach and to make a significant contribution to improving the prevention, diagnosis and treatment of diabetes mellitus. www.dzd-ev.de

Scientific Contact

Simone Wahl, Helmholtz Zentrum München – German Research Center for Environmental Health (GmbH), Institute of Epidemiology II, Ingolstaedter Landstr.1, 85764 Neuherberg, Germany – Phone: +49 (0)89-3187-2472– Tel.: 089-3187-2472, e-mail

Susanne Vogt, Helmholtz Zentrum München –German Research Center for Environmental Health (GmbH), Institute of Epidemiology II, Ingolstaedter Landstr.1, 85764 Neuherberg, Germany – Phone: +49 (0)89-3187-3733, e-mail