

# Researchers find the metabolic pathways responsible for weight gain through plasticisers

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Plasticisers such as phthalates are always found in plastics. They can get into our bodies through the skin or by the diet. They affect our hormone system and are suspected of having an influence on our body weight. The exact correlations and mechanisms have been unclear thus far. In cooperation with the Integrated Research and Treatment Center (IFB) Adiposity Diseases at the University of Leipzig and the University Hospital Leipzig, researchers from the Helmholtz Centre for Environmental Research (UFZ) have now published a study in the *PLOS ONE* journal showing that the phthalate DEHP leads to weight gain and revealed the metabolic processes involved.

One in two adults in Germany is [overweight](#). This figure is as high as 15% in children and young people. "The figures are alarming," said Martin von Bergen, Head of the Department of Molecular Systems Biology at the Helmholtz Centre for Environmental Research (UFZ). "Because every kilo over the ideal weight increases the medical risk of cardiovascular disease, joint damage, chronic inflammation and cancer and the number of overweight people is constantly increasing all over the world." The development of overweight has many causes: in addition to bad dietary habits and a lack of exercise, genetic factors doubtlessly play a role. Certain environmental pollutants, e.g. [phthalates](#), may also be partly responsible for the development of overweight. "Correlations between increased phthalate concentrations in the human body and the development of overweight have already been proven in epidemiological

studies and should be analysed in more detail" von Bergen said.

Phthalates are used as plasticisers in polymer processing to make plastics soft, flexible or tensile. Under certain conditions, phthalates can also emerge from the material and be uptaken into our bodies most prominently by our diet. Phthalates are mainly transferred from the food packaging of fatty products, e.g. cheese or sausages. Von Bergen added: "We currently know very little about how exactly phthalates have an effect within the body and how they can influence [body weight](#) – we intended to evaluate this in our study."

Von Bergen and his UFZ team performed the study in collaboration with researchers Nora Klötting and Matthias Blüher (spokespersons for the Collaborative Research Centre "Obesity Mechanisms") from the Integrated Research and Treatment Center (IFB) Adiposity Diseases at the University of Leipzig and the University Hospital Leipzig. The results of the study were recently published in the *PLOS ONE* journal. They show where phthalates can interfere with metabolism and pave the way for [weight gain](#). In studies at the University of Leipzig, mice exposed to the phthalate DEHP in their drinking water gained a substantial amount of weight. This was particularly true of the female animals. "It is evident that phthalates seriously interfere with the hormone balance. They give rise to significant changes, e.g. weight gain, even in low concentrations," said von Bergen.

The work at the UFZ focused on defining the metabolic products in the mice's blood. The researchers determined that the proportion of unsaturated fatty acids in the blood increased and the glucose metabolism was disrupted under the influence of phthalates. The composition of receptors in the blood also changed. These receptors are important for general metabolism and may cause it to change. "Some metabolic products that are formed by adipose tissue also act as messengers and control functions in other organs," explained von

Bergen. "However, there is no conclusive clarification of how the various effects of phthalates on metabolism influence each other and ultimately lead to weight gain."

Von Bergen will continue to research the phthalates' influence on metabolism in collaboration with his colleagues from the University of Leipzig and the University Hospital Leipzig. He is also studying the impact of phthalates on the development of early childhood diseases with UFZ colleagues from the Department of Environmental Immunology within the framework of the mother-child study (LiNA). "Our aim is to conduct solid basic research so that our results can then help the authorities responsible for assessing the risk of chemicals in Germany and at European level to perform their evaluations," said von Bergen.

**More information:** Nora Klöting et al. Di-(2-Ethylhexyl)-Phthalate (DEHP) Causes Impaired Adipocyte Function and Alters Serum Metabolites, *PLOS ONE* (2015). [DOI: 10.1371/journal.pone.0143190](https://doi.org/10.1371/journal.pone.0143190)

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