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Lipidomics for a better life

PRESS RELEASE

Obesity risk quantification: a jump towards the future through the lens of artificial intelligence applied to lipid science

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According to WHO, nearly 1 out of 6 adults is obese. This makes obesity a prime threat to human health because it increases mortality and morbidity. In daily healthcare practice, the go-to indicator of overweight and obesity is the body mass index (BMI), a calculated relation between body weight and height. An international team of scientists led by Dresden researchers, with a joint effort between academy and industry in Saxony (Germany) introduces a revolutionary approach towards personalized and precision biomedicine. The discovery is that artificial intelligence can assist to design markers composed of a small combination of lipids that allow to provide significantly more information about obesity than BMI.

When academy meets industry significant jumps towards the future are possible. Researchers from TU Dresden and Lipotype GmbH, a spin-off of the Max Planck Institute for Molecular Cell Biology and Genetics, Dresden, with the international participation of scientists from Lund University (Sweden) and National Institute for Health and Welfare (Finland) teamed up to critically investigate the BMI of more than 1000 patients. The international research team applied advanced artificial intelligence tools to develop an algorithm which makes use of the human blood plasma lipid composition, the plasma lipidome.

The plasma lipidome contains hundreds of distinct lipids. “Together, they are valuable indicators to explore the state of metabolism health of an individual - like a health fingerprint”, explains Mathias Gerl from Lipotype. This lipidomic data was used for training the algorithm to predict the BMI of each patient.

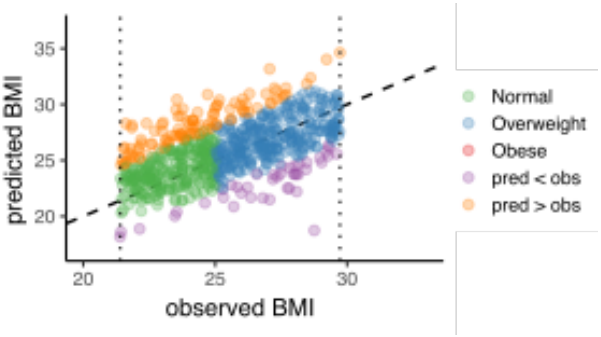

Figure 1 Comparison of observed BMI and predicted BMI. (Gerl et al. *Machine learning of human plasma lipidomes for obesity estimation in a large population cohort*)

In comparison to the ‘household measures’-based BMI (observed BMI), the lipidomic data provided the new algorithm with the power to propose a new ‘molecular lipidomic BMI’ (predicted BMI). The lipidomic BMI calculation revealed that the molecular BMI was in a number of cases significantly higher than the traditional BMI (orange). In approximately 1 out

of 7 patients, the lipidomic BMI improved the classic 'morphometric BMI', and provided more information about obesity compared to the traditional BMI measurement, e.g. about the amount of visceral fat, a harmful kind of fat deposit.

"Long-time consequences can occur when a patient in need for a weight reducing therapy to combat the risk for obesity-associated disease is sent home without remedy", states Olle Melander from Lund University. "These patients may suddenly suffer from a heart attack at age 40 leaving their doctors puzzled", comments Carlo Vittorio Cannistraci from the Biotechnology Center (BIOTEC) at the TU Dresden and adds: "We should overcome the obsolete logic that a single marker can help to assess risk in complex systems such as humans. Computational biomedicine adopts artificial intelligence to design multidimensional markers composed of many variables that increase precision of diagnosis. Hence, we hope that the traditional BMI will be replaced with a lipidomic marker to outpace the misclassification of 14% of patients."

Original Publication

Mathias J Gerl, Christian Klose, Michal A Surma, Celine Fernandez, Olle Melander, Satu Männistö, Katja Borodulin, Aki S Havulinna, Veikko Salomaa, Elina Ikonen, Carlo V Cannistraci & Kai Simons. *Machine learning of human plasma lipidomes for obesity estimation in a large population cohort*. **PLOS Biology**.
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Lipotype is the leading lipidomics service provider and delivers comprehensive, absolutely quantitative lipid analysis services for clinical and biological samples on a high-throughput scale. Drawing on many years of cutting-edge research experience, Lipotype offers high quality targeted global lipidomics services for a wide range of customers and applications. These services include biomarker identification and mode-of-action studies for clinical researchers, GMP compliant quality control and assay development for pharma and biotech companies, target validation and topical drug development for the cosmetics/dermatology industry, as well as for the small-scale profiling needs of academic researchers.

BIOTEC

The Biotechnology Center (BIOTEC) was founded in 2000 as a central scientific unit of the Technische Universität Dresden (TU Dresden) with the goal of combining modern approaches in molecular- and cell biology with the traditionally strong engineering in Dresden. Since 2016 the BIOTEC is part of the central scientific unit "Center for Molecular and Cellular Bioengineering" (CMCB) of the TU Dresden. The BIOTEC is fostering developments in research and teaching within the Molecular Bioengineering research field and combines approaches in cell biology, biophysics and bioinformatics. It plays a central role within the research priority area Health Sciences, Biomedicine and Bioengineering of the TU Dresden.

Melander research group, Lund University

The Melander research group at Lund University, Sweden, focusses their research on identification of novel metabolic and endocrine deviations, measurable in blood, which predict future cardiometabolic disease in large population-based studies with the ultimate goal of improving primary prevention.

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