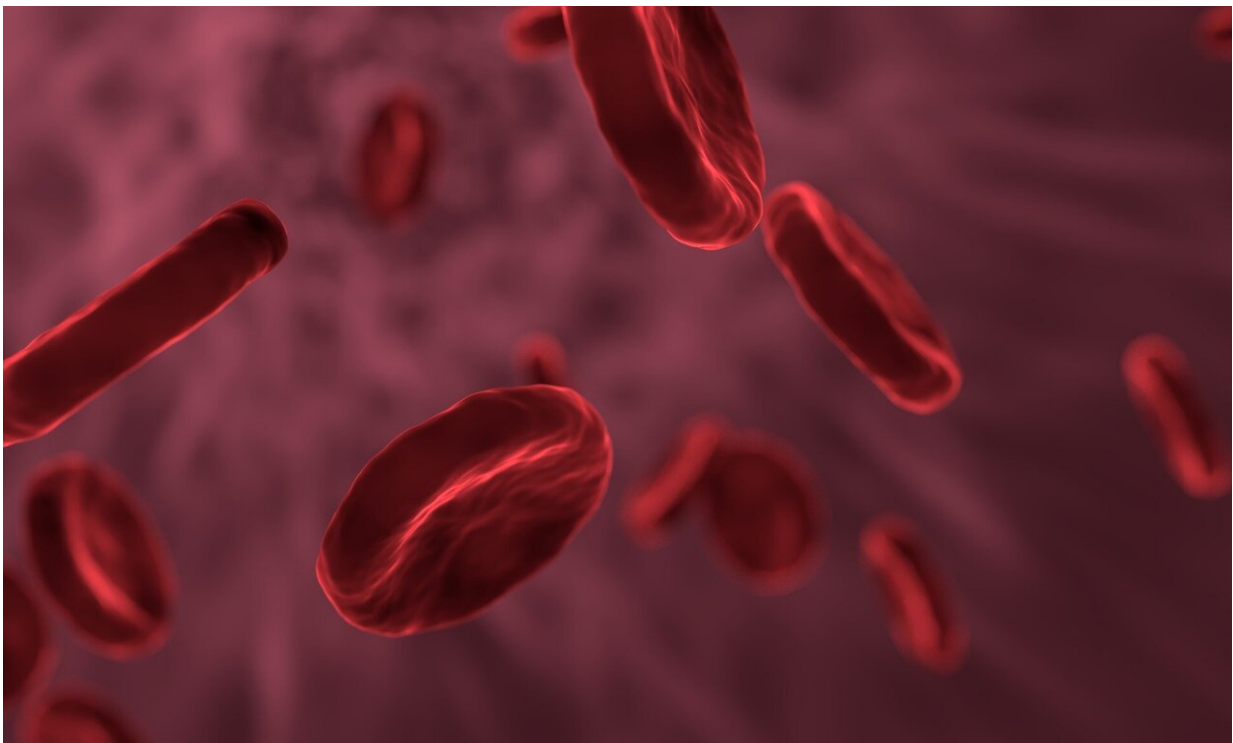


Ceramides—Blood lipids provide new insights into the link between diet and diabetes and cardiovascular disease

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Type 2 diabetes and cardiovascular disease are preceded by metabolic alterations. A current study by the DZD and DIfE indicates that specific lipid molecules (ceramides), which are produced when the body

metabolizes fats, are involved in the development of type 2 diabetes and cardiovascular diseases. The study also establishes a link between an unhealthy diet and unfavorable ceramide levels in the blood. This could explain, for example, why the risk of diabetes increases with frequent consumption of red and processed meat. As potential biomarkers, ceramides could enable more precise dietary approaches for the prevention of cardiometabolic diseases. The results of the study have now been published in *Nature Communications*.

Unhealthy dietary habits can contribute to the development of heart attack, stroke and type 2 [diabetes](#) (cardiometabolic diseases). However, it is not yet known exactly which biochemical processes underlie this. State-of-the-art high-throughput techniques make it possible to simultaneously assess a large number of metabolites in the blood and thus provide comprehensive metabolic profiles in large study groups. This shows that specific lipid molecules, ceramides and dihydroceramides, could be critical factors for long-term cardiometabolic health. Furthermore, diet influences the composition of ceramides and dihydroceramides.

Comprehensive studies on the influence of diet on ceramide levels in the blood and possible effects on the development of cardiometabolic diseases in humans have so far been lacking. The researchers therefore observed several thousand participants in the EPIC-Potsdam study over a period of several years in order to assess whether the occurrence of cardiometabolic diseases can be predicted on the basis of specific ceramides influenced by diet. The study was conducted under the leadership of the German Institute of Human Nutrition (DIfE) and supported by the German Center for Diabetes Research (DZD) and the BMBF-funded project "FAME." The study results show that ceramide profiles provide insights into the development of cardiometabolic diseases and can improve the understanding of the influence of diet on disease risk.

Ceramide profiling

At the beginning of the study, all participants provided information about their diet and blood samples. None of the participants had type 2 diabetes or cardiovascular disease. In the following years, about 550 subjects developed [cardiovascular disease](#) and nearly 800 developed type 2 diabetes. Using a novel analytical platform called lipidomics, the researchers profiled the ceramides and dihydroceramides in the blood of the EPIC-Potsdam participants.

Specific ceramides mediate adverse effects of unhealthy eating

The researchers then investigated whether disease-relevant ceramides and dihydroceramides are also linked to food consumption. "People who eat a lot of meat have a higher risk of diabetes. We have now shown for the first time that high consumption of red and processed meat was associated with unfavorable levels of diabetes-related ceramides. Our results suggest that the association between meat consumption and diabetes risk may be mediated by the influence on [ceramide](#) levels in the blood," said first author Clemens Wittenbecher, a member of the Department of Molecular Epidemiology at DIfE and the Harvard T.H. Chan School of Public Health. Matthias Schulze, head of the Department of Molecular Epidemiology at DIfE and last author of the study added that "detailed metabolic profiles in large cohort studies help us to better understand the relationship between diet and disease risk. This ultimately contributes to evidence-based and more accurate dietary recommendations."

Study opens up new prevention approaches

Cardiometabolic diseases such as heart attack, stroke and type 2 diabetes account for more than one-third of deaths worldwide. The results of the current study identified specific ceramides as potential biomarkers for

the relationship between diet and disease risk, and thus could enable more precise nutritional approaches for the prevention of cardiometabolic diseases.

More information: C. Wittenbecher et al, Dihydroceramide- and ceramide-profiling provides insights into human cardiometabolic disease etiology, *Nature Communications* (2022). [DOI: 10.1038/s41467-022-28496-1](https://doi.org/10.1038/s41467-022-28496-1)

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