Lipids, not calories, trigger a strong insulin response

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Fat feedback: The lipid composition of diets, not the calories, regulate Insulin release. Credit: MPI f. Molecular Cell Biology and Genetics

Insulin is a reaction to what we eat: Especially food with plenty of carbohy-drates rises the blood sugar level, and as a consequence, more of the sugar-lowering hormone Insulin is produced and secreted. Like that, the Insulin sig-naling pathway couples growth, development, and lifespan to nutritional con-ditions. Researchers at the Max Planck Institute of

Molecular Cell Biology and Genetics in Dresden, Germany, studied lipoproteins in Drosophila melano-gaster and found that that the blood brain barrier is a main sensor to report the nutritional status, especially the lipid composition of consumed food to special neurons which in turn regulate Insulin release. Calories play a rather minor role in this process.

Fruit flies in the lab of Suzanne Eaton, research group leader at the Max Planck Institute, live in a 5-star hotel: ideal temperature, constant conditions, no predator and an abundance of food! Food became a key element in the latest experiments in the Eaton Lab: How does it influence the production and secretion of Insulin? Fruit flies received two diets that had exactly the same number of calories and simply differed in the lipid composition. One food type was based on yeast with a lot of short-chain, saturated fatty acids. This yeast-containing food triggered a strong Insulin response. The other food type, merely based on plants, had the opposite effect. The blood brain barrier is the main sensor to report the lipid composition of consumed food to special neurons which in turn then up or down-regulate Insulin release.

Lowered levels of insulin signaling have been shown to increase lifespan in fruit flies. It was thought that extreme caloric restriction was what lengthens lifespan. But the experiments performed in Dresden showed that the lipid composition made the difference: Researchers could get the same effects on Insulin signaling and lifespan as if the flies had been on a calorie restricted diet. "Getting the same effect as caloric restriction just by switching the lipids in the diet would be pretty cool," says Suzanne Eaton. If this knowledge can really be turned into a medical application is yet to be seen, however.

Studies in mice done by other labs compared the Insulin signaling pathways and showed that this might be a good starting point for potential therapies of type 2 diabetes in the future. Knowing more about the lipid composition of various diets could enable even diabetes patients

to enjoy food without being bothered too much by the calories: "Provided it contains the right lipids, even a greasy steak would be no problem", says Marko Brankatschk, postdoc in Suzanne Eaton's group and first author of the paper that summarizes the experiments.

More information: "Delivery of circulating lipoproteins to specific neurons in the Drosophila brain regulates systemic Insulin signaling." *eLife* 2014;10.7554/eLife.02862 DOI: dx.doi.org/10.7554/eLife.02862

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