



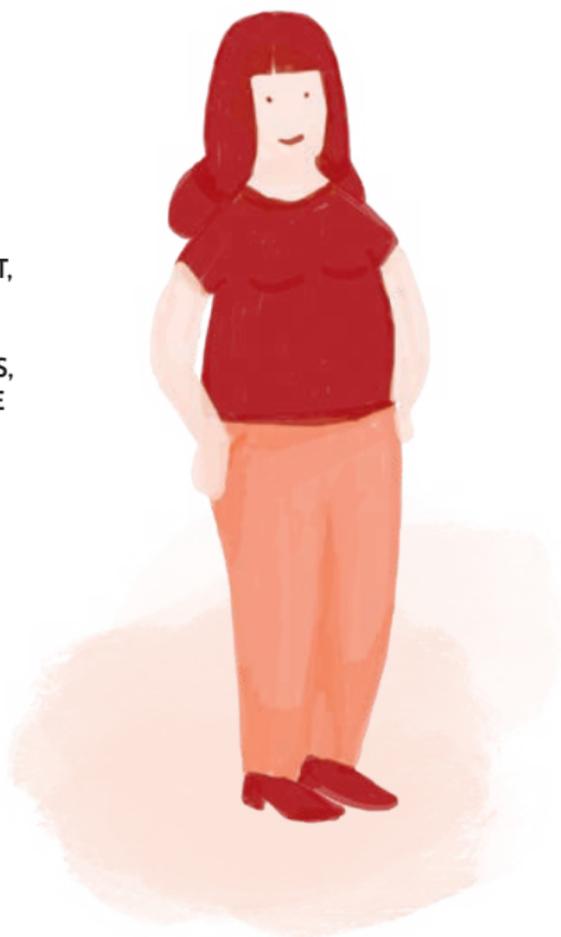
PREDIABETES

6 SUBTYPES WITH VARYING RISKS OF DEVELOPING TYPE 2 DIABETES AND SECONDARY DISEASES

THERE ARE MANY CAUSES OF DIABETES. THE HEALTH CONSEQUENCES OF THIS METABOLIC DISORDER AND THE RISK OF SERIOUS COMPLICATIONS ARE EQUALLY DIVERSE. THANKS TO THE DISCOVERY OF SIX CLEARLY DIFFERENTIATED SUBTYPES IN THE PRELIMINARY STAGE OF DIABETES, KNOWN AS PREDIABETES, THE RISK OF DEVELOPING THE DISEASE FOR THOSE AFFECTED CAN BE ESTIMATED MORE PRECISELY AND REDUCED THROUGH TARGETED PREVENTION.

SUBTYPE 1
SLIGHTLY OVERWEIGHT,
METABOLISM OK

LOW RISK OF DIABETES,
LOW MORTALITY RATE



SUBTYPE 2
SLIM PEOPLE, METABOLISM OK

**LOW RISK OF DIABETES AND
LOW RISK OF COMPLICATIONS,
LOW MORTALITY RATE**



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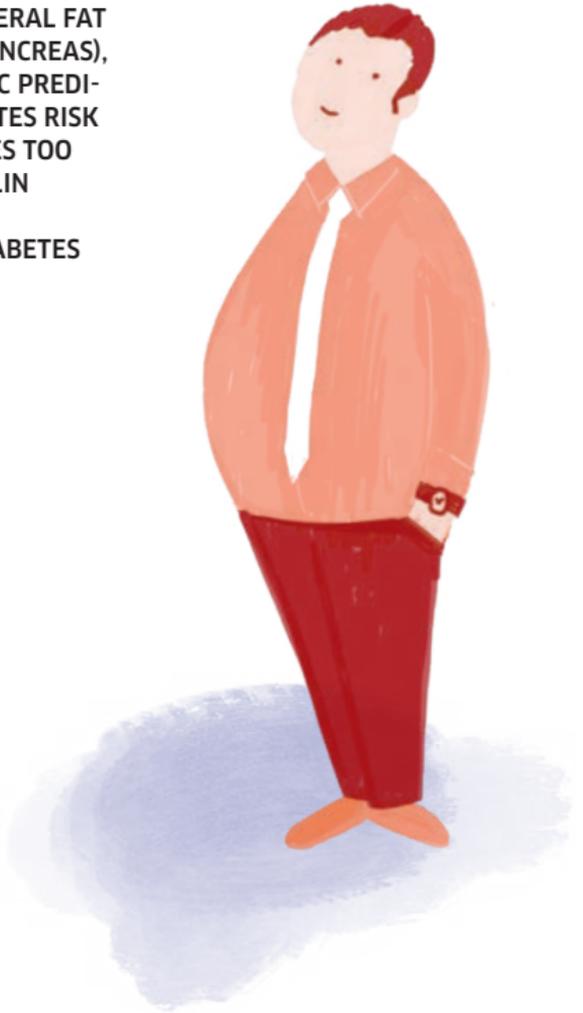
People do not become diabetic overnight. It is rather a case of blood glucose and lipid metabolism changing over a number of years. However, the speed at which clear type 2 diabetes evolves from this precursor of diabetes (prediabetes) and the risks of developing secondary diseases vary from one patient to the next. Scientists at the German Center for Diabetes Research (DZD) have identified six different subtypes of prediabetes with a varying risk of developing type 2 diabetes and secondary diseases. The distinction is made on the basis of selected physical features and metabolic characteristics.

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SUBTYPE 3

**OVERWEIGHT, VISCERAL FAT
(ABDOMEN AND PANCREAS),
FREQUENT GENETIC PREDI-
SPPOSITION (DIABETES RISK
GENE), PRODUCES TOO
LITTLE INSULIN**

HIGH RISK OF DIABETES



SIX DISTINGUISHABLE SUBGROUPS

A Tübingen-based DZD research team assembled around Prof. Andreas Fritsche and Prof. Robert Wagner under the aegis of Prof. Hans-Ulrich Häring has identified six clearly distinguishable subgroups in a group of almost 900 men and women at risk of diabetes. These findings are based on a cluster analysis with data on blood glucose and lipid levels, the fat content of the liver, the distribution of body fat, and certain genetic factors. The researchers confirmed their findings with the help of data from 7,000 Britons and were able to distinguish the same six subtypes.

DIFFERENT LEVELS OF RISK OF COMPLICATIONS

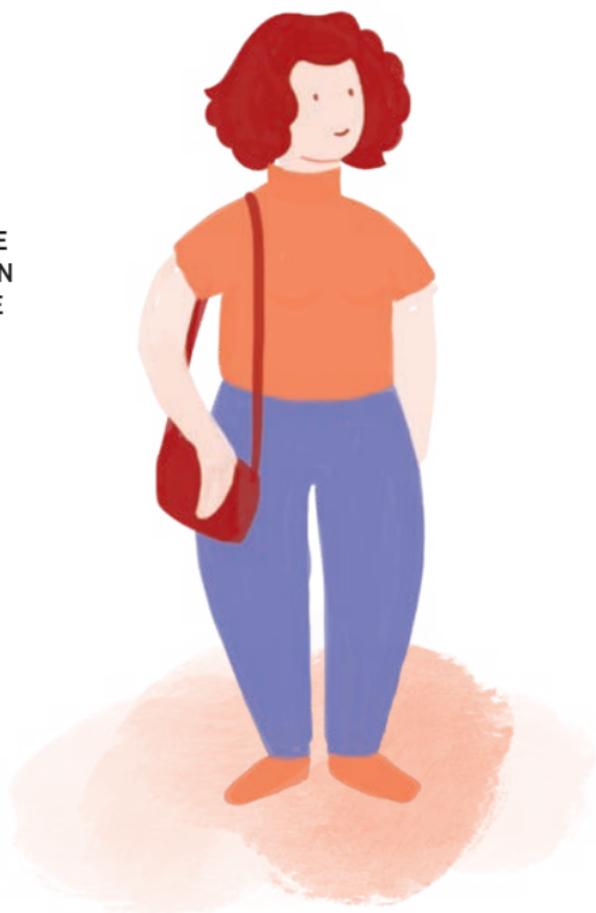
For people with prediabetes, the subtype they fall under makes a big difference: Three of the newly identified clusters are characterized by a low risk of diabetes and three by a higher risk. Subtype 1 and especially 2 are considered healthy and have a low risk of developing complications; it is predominantly slim people in cluster 2. Cluster 4 is made up of overweight individuals whose metabolism is still relatively healthy. The remaining subtypes 3, 5, and 6 are associated with an increased risk of developing type 2 diabetes or serious secondary diseases. People who fall under subtype 3 do not produce enough insulin. Subtype 5 individuals have a very fatty liver and insulin resistance. People with subtype 6 prediabetes are at higher risk of kidney damage – even before their diabetes becomes apparent. The mortality rate is also higher in this group.

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SUBTYPE 4

**OVERWEIGHT OR OBESE
(FAT TENDS TO BE ON THE
THIGHS AND HIPS, LESS ON
THE ABDOMEN), BUT THE
METABOLISM IS STILL
RELATIVELY HEALTHY**

**LOW RISK OF DIABETES,
LOW MORTALITY RATE**



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SUBTYPE 5

OBESE, OFTEN WITH A FATTY LIVER, INSULIN NO LONGER WORKS PROPERLY

HIGH RISK OF DIABETES AND CARDIOVASCULAR DISEASES



TARGETED PREVENTION

“By classifying people into subtypes, we will be able to tell more precisely in the future whether someone is at low or high risk of developing diabetes or kidney disease. We then want to show them prevention strategies so that they can positively influence how their metabolic disorder progresses,” explains Prof. Robert Wagner, now working in Düsseldorf. In order to find out how this can best be achieved, the DZD is conducting further multicenter studies in Berlin, Düsseldorf, Dresden, Heidelberg, Cologne, Leipzig, Lübeck, Munich, and Potsdam under the aegis of Prof. Andreas Birkenfeld from Tübingen. The IFIS (Intermittent Fasting to Improve Insulin Secretion) study compares the effect of intermittent fasting and a classic diet in 200 people who fall under subtype 3 or 5 and are at high risk of developing diabetes. And the LIFETIME study will investigate the effect of a diabetes drug (SGLT-2 inhibitor) on preventing diabetic nephropathy in subtypes 5 and 6.

PRECISION MEDICINE IN DIABETES

One of the DZD's aims is to find the right treatment for each patient group at the right time. In addition to the pre-diabetes subtypes, DZD researchers are also studying subgroups for clear cases of diabetes. These findings represent important steps toward precision medicine for diabetes and its secondary diseases.

◇ Scientific article: Wagner et al. (2021) *Nature Medicine*. 27:49

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SUBTYPE 6

OBESSE, A LOT OF FAT ON THE ABDOMEN (VISCERAL FAT) AND AROUND THE KIDNEYS

LOW RISK OF DIABETES, HIGH MORTALITY RATE, HIGH RISK OF KIDNEY DAMAGE - EVEN BEFORE THE DEVELOPMENT OF CLEAR DIABETES



More information about diabetes research: www.dzd-ev.de/en
More information about clinical studies within the DZD:
www.dzd-ev.de/en/forschung/multicenter-studies/index.html

ACTIVELY SUPPORT DIABETES RESEARCH!

THE DZD IS SEEKING PEOPLE TO TAKE PART IN CLINICAL STUDIES.

Sign up to the register of people interested in diabetes studies organized by the national diabetes information portal diabinfo. At www.diabinfo.de/en you will also find information on the prevention and treatment of diabetes as well as tips for everyday life.



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