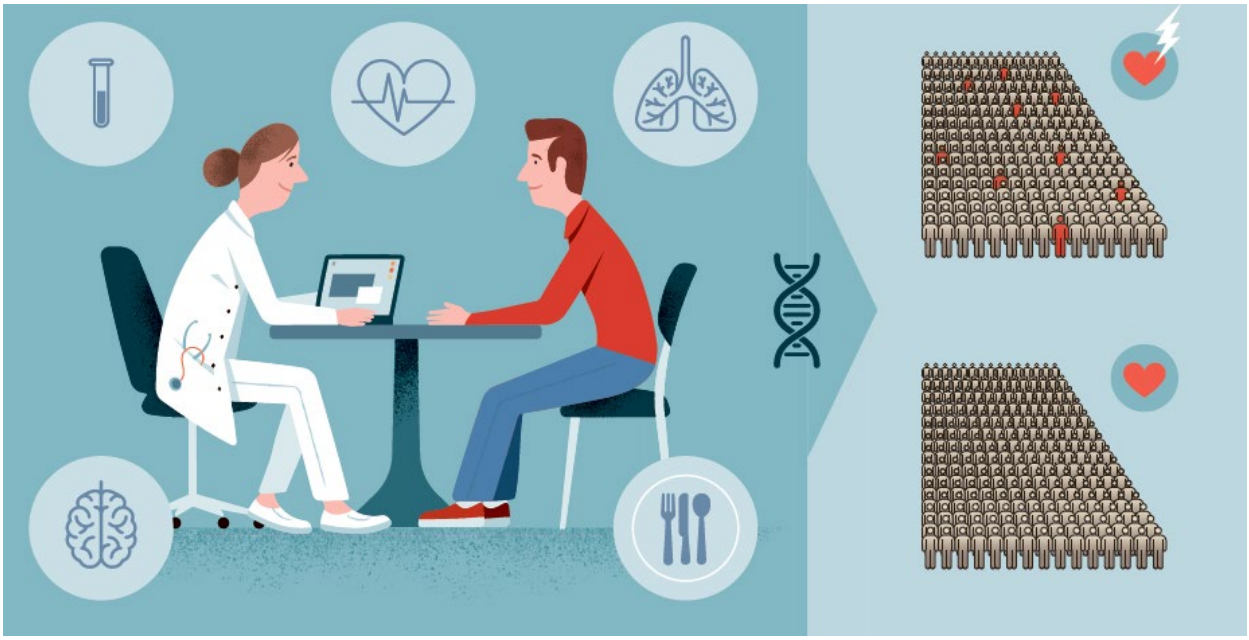
Original article published in the Davoser Zeitung, February 22, 2022, p. 10

Science City Davos

Are heart attacks hereditary?

Davos and Hamburg in search of disease related genes



After clinical examination, research is conducted to determine whether heart attack patients have particular mutations. Image credit: Cardio-CARE. Illustrator: Gert Albrecht.

The question

Circulatory disorders of the coronary arteries are the most common cause of death worldwide. If heart attacks occur in a family over generations, the offspring are also more likely to suffer a heart attack. But what role do genes play in this? If we can discover genes that are in part responsible for a heart attack, it may be possible to develop new treatments based on this knowledge.

From scientific research to pharmaceutical drug

The village of Limone on Lake Garda with its 1.000 inhabitants provides a particular example of this. Until the 1930s, Limone was isolated and only accessible by boat. In the 1970s, a medical examination of a man from Limone revealed that he had very high blood lipid levels, but his blood vessels were not calcified as expected. The researchers went to investigate and found in the man's blood a special variant in the so-called apolipoprotein A-I gene, which is very beneficial and helps to transport fats from the arteries to the liver and excrete them from there. Subsequently, blood was taken from many residents of Limone and it was found that a large number of them carried this gene mutation. The "miracle" apolipoprotein was developed into a drug and tested in a clinical trial

on people with heart disease. The results were fantastic, as the new substance significantly reduced deposits of cholesterol, fatty acids and calcium.

Comprehensive ongoing study

With this example in mind, Cardio-CARE in Davos and the Clinic for Cardiology at the University Medical Center Hamburg-Eppendorf launched the largest genetic study of cardiovascular diseases in the German-speaking world two years ago, in which the entire genome of 9.000 people is being examined. Of these, 8.000 people were randomly selected via the residents' registration office and invited to participate in the study. Each of these people was examined for about seven hours at the study center. This health check included numerous examinations ranging from heart ultrasound to lung function test. The other 1.000 people in the study had specific heart conditions. For example, a group of people was examined who had suffered a heart attack at a comparatively young age. For each individual position measured in the genome, the researchers will now look whether genetic changes can be detected in people with heart disease. Is a particular mutation found more frequently in heart patients (figure on the right in red) than in healthy people (figure on the bottom right)?

Since our human genome has about 3.2 billion positions, two challenges arise in these analyses: One is the immense amount of data. For example, the raw data for all individuals amount to the storage capacity of 1.000 commercially available computers. But the computing time required is also extensive, because the comparisons are made for all the positions measured. These calculations would not be feasible without the new high-performance computer installed at the Medical Campus in Davos. We are curious to see whether a "Davos-Hamburg" variant of a heart attack gene will be found.

Andreas Ziegler/Cardio-CARE

Cardio-CARE is a full subsidiary of the Kühne Foundation at the Davos Medical Campus. The bioinformaticians and biostatisticians specialize in the planning, execution and evaluation of clinical studies, quality assurance and evaluation of molecular biological data as well as the use of artificial intelligence in medicine. www.cardio-care.ch