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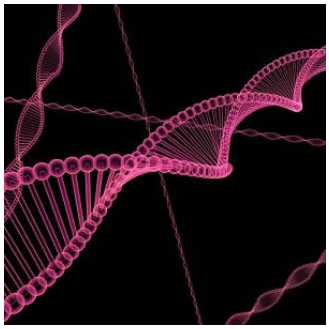
Genomic medicine may revolutionise cardiovascular care



Genomic medicine is the study of the health effects of the molecular interactions of a person's unique genes. Genomic medicine looks at all the types of molecular variation, from the DNA and RNA to the microorganisms in the human gut that seem to play an increasingly important role in maintaining health.

A new scientific statement from the American Heart Association summarises the state-of-the-science of genomic medicine for studying cardiovascular traits and disorders and for therapeutic screening.

"Genomic medicine seeks to use larger-scale data obtained on sets of DNA sequences or other types of molecules, typically with the goal of improving the prediction, prevention, diagnosis, prognosis, and treatment of more common forms of cardiovascular diseases and stroke," according to the AHA statement.

DNA and RNA are two types of molecules found in most living organisms. DNA contains genetic information that is "translated" by means of RNA into proteins and metabolites, the tiny components that form cells and which play many other critical roles in the body. While genes, which are made up of DNA, carry traits inherited from your ancestors and are relatively stable during your lifetime, their "translation" can be altered by environmental factors, such as diet, tobacco smoke, and exercise, for example.

"The promise of genomic medicine is to be able to use a patient's specific genetic material to make a personalised forecast of their risk for heart disease, and if they develop disease, predict its course and determine the particular medications that are more likely to help with their disease," said Kiran Musunuru, MD, PhD, MPH, chair of the writing committee for the statement and an associate professor of cardiovascular medicine and genetics at the Perelman School of Medicine at the University of Pennsylvania in Philadelphia.

"Over the next decade, as we learn about cardiovascular disease at the molecular level, the hope is that we can develop therapies that will take advantage of this knowledge and be able to either treat or potentially cure disease," Musunuru added.

An example of genomic medicine that is currently available to doctors is a noninvasive blood test for heart transplant patients, which measures the levels of 11 different RNA molecules to determine whether the patient's immune system is rejecting the transplant. Traditionally, physicians biopsy cells from the patient's heart on a weekly or biweekly basis by inserting a catheter into the heart to extract cells to monitor the transplanted organ for signs of rejection. While biopsies are considered relatively safe, there are risks, costs and discomfort for the patient.

"The hope is that with genomic medicine, there will be hundreds of examples of noninvasive tests like this that doctors can do to better forecast and better manage disease," Musunuru explained.

Another area that is showing promise is the use of induced pluripotent stem cells (iPSCs). These stem cells are grown from mature cells in the body, such as skin or blood, and can be converted into any type of cell. iPSCs could provide clinicians with a noninvasive method to learn more about a person's risk of cardiovascular disease and test potential treatments before they are given to a patient.

For example, doctors could use iPSCs to grow millions of a patient's heart cells in the laboratory and use these cells to identify the best course of treatment to benefit the patient.

"With induced pluripotent stem cells, we will be able to determine upfront which medications are going to work better and get a sense of a medication's potential side effects," Musunuru explained. "I am confident we will reach the point where we can start incorporating these kinds of cells into actual patient care."

Source: American Heart Association
Image Credit: Pixabay

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