ENVIRONMENTAL FACTORS WHICH TRIGGER SILENT DISEASES

A research project by the Center for the Study of Autoimmune Diseases of the Universidad de Rosario (CREA) showed that the surroundings in which we live and exposure to environmental factors cause alterations in the immune system and trigger diseases like lupus, rheumatoid arthritis, type 1 diabetes mellitus or multiple sclerosis, among others.

By: Ximena Serrano Gil
Photos: Leonardo Parra, Ximena Serrano

Hair dye, cigarettes, acetone, asbestos and some environmental agents like ultraviolet rays, the quality of air or water, and lifestyle, together with a genetic predisposition, may be the causes of one or more autoimmune diseases, like lupus, rheumatoid arthritis, type 1 or Crohn´s disease, among others. Researchers at the Universidad del Rosario are trying to find out which of those environmental factors cause such alterations.

In normal conditions, we all have a defense mechanism: The immunological system, whose purpose is to protect and defend us from everything which wants to attack us. But, on occasions, our defenses get out of control and instead of protecting, what they do is attack the healthy cells of the body. These kinds of disorders are known as autoimmune diseases. It is as though soldiers on a battlefield stop attacking the enemy troops and begin to attack themselves.

In Colombia these conditions are more common than is thought, with a prevalence of around 5%, that is, one in twen-

ty persons suffer from such disorders. The rheumatologic autoimmune disease is more frequent in women, at a rate of 9 women to 1 man: It appears to have something to do hormonal problems.

Carolina Ramírez Santana, Yovana Pacheco Nieva, Yeny Acosta Ampudia and Diana Marcela Monsalve, researchers at the Center for the Study of Autoimmune Diseases (CREA) of the Universidad del Rosario, are working on projects in autoimmune ecology which have to do with the environmental factors which unbalance the body and lead to an alteration of the immunological tolerance which triggers such diseases.

The study, done within the framework of the "Common mechanisms of autoimmune diseases" project, combined the information obtained from surveys of patients with lupus and rheumatoid arthritis with the biological results of blood samples, in order to find out if there is a pattern of association with the development of those diseases.

Triggers of the autoimmune disease

"Although, due to genetic inheritance, there are people who are more likely to suffer from one of these diseases, if they are exposed to those triggers, the disorders do not emerge. That is why it is important to learn about the surroundings where the patient lives and the number of years he or she has worked in certain places in order to find out the factor which has triggered the autoimmune disease," remarks Carolina Ramírez, leader of the research project and director of the *Translational Medicine Group* of the Universidad del Rosario.

"This kind of research is difficult, since there are many confusing factors when it comes to exactly learning which components are triggering the disease. In this context, autoimmune ecology covers all of the internal factors (microbiomic and genetic) and external factors (toxic substances, air contamination, lifestyle, quality of water, tobacco, alcohol, etc.) which may contribute to the development of autoimmune diseases. The set of external factors to which an individual is exposed is called the exposome: Our study seeks to find out what the exposome´s effect on the development of a disease is," explains Yovana Pacheco, biologist and immunologist.

In this process of inquiring into and finding associations between diseases and their environments, the patients are

surveyed on such details as whether they smoke, how much coffee they daily drink and whether they dye their hair, live near factories, cook with wood, work in flower-growing, shoe manufacturing or mining companies, among others. For example, it is known that those who work in greenhouses where flowers are grown are prone to scleroderma (the tightening and hardening of the skin of the hands), but the chemical which causes it is still unknown, one subject which is being investigated.

Carolina Ramírez Santana, a biologist and immunologist points out that some of the associations have been thoroughly studied: One is that between the Zika virus and the Guillain-Barré Syndrome, where some patients infected by Zika develop that syndrome. The question was: Why do some patients suffer from Guillain-Barré while others do not, if both were exposed to the Zika virus? According to a recent study by the Universidad del Rosario, the answer has to do with the amount of previous infections the patient has had.

On another front, the researchers are on the trail of a genetic mutation found in patients with Guillain-Barré Syndrome who had Zika as well. They are searching for the protein which this gene expresses and why it causes the syndrome. This will be a great advance for science and personalized or translational medicine, since it will enable us to find a more specific treatment.

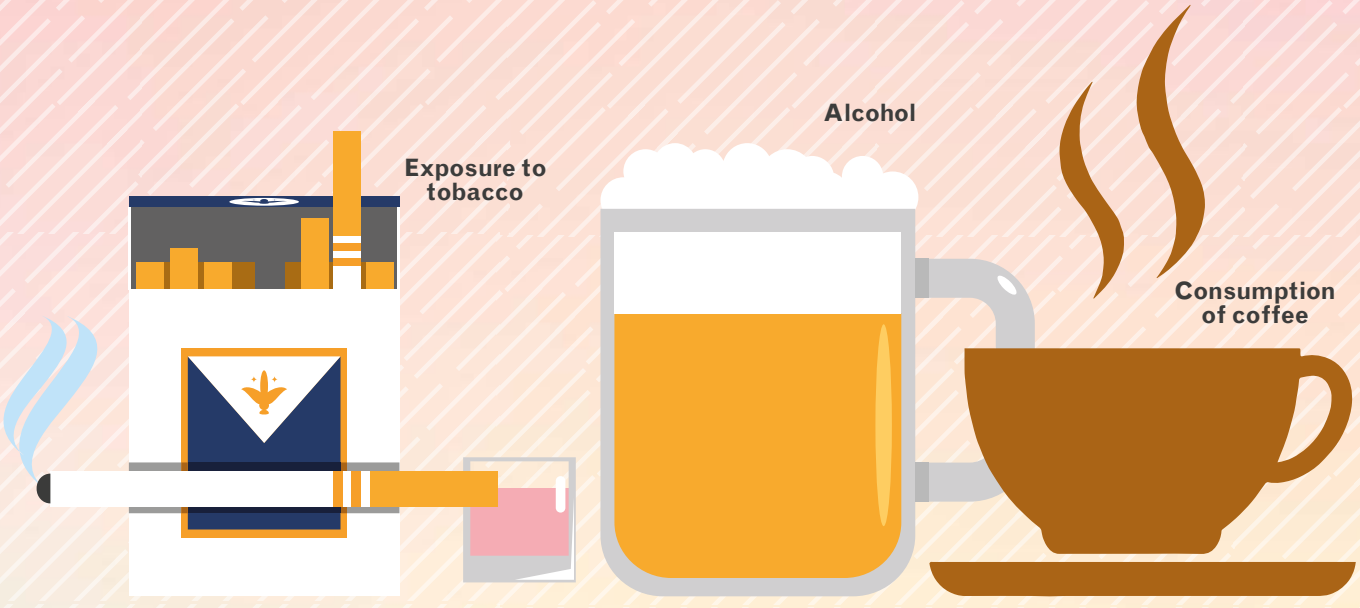
According to the publications of the research group, it has been scientifically proven that cigarettes are a factor which aggravates rheumatoid arthritis. Smoking makes it more serious and painful and difficult to treat. Likewise, the consumption of coffee seems to be a factor of risk for type 1 diabetes mellitus and rheumatoid arthritis, but drinking two cups a day may be a protective factor for multiple sclerosis and primary biliary cholangitis (cirrhosis).

New paths of research

Considering the recent rise in environmental threats and that it is becoming more and more complex to study the effect of contaminants on the immune response with epidemiological studies, the Translational Medicine Group has shifted the guidelines of the research, varying epidemiological analyses with clinical and laboratory studies, since, as Carolina Ramírez underlines, "the core or nucleus of the group´s work is to transfer what you see in the clinic to the laboratory, and, in turn, enable the laboratory to contribute knowledge to the clinic."

Those innovations consist of *in vitro* studies with the cells of the patients, which are exposed to different agents to find out how they immunologically respond to the stimuli of caffeine, nicotine and hair dye. According to the experts, this research project aims at discovering what the biomarkers of prediction

EXTERNAL FACTORS WHICH MAY TRIGGER AUTO-IMMUNE DISEASES



are which will allow science to know what a person is prone to, and undertake treatments and forward-looking preventive actions.

In particular, there are some chronic diseases which have been found to be associated with external factors, like pulmonary fibrosis or cancer, which is related to asbestos.

In the opinion of Yovana Pacheco, these studies of association are complex, because, for example, the old roof tiles with the brand name of *Eternit* contained asbestos and people are not aware of it. That is why they are carrying out *in vitro* studies to find out what the consequences of exposure to this mineral are in cells.

Speaking of these effects of asbestos, Carolina Ramírez explains that their research also found that it is possible that this substance is associated with patients who, due to their contact with asbestos, develop poly-autoimmunity, that is, they have more than one autoimmune disease. The results of their research project will shortly be published in a scientific journal.

The study of environmental exposure and the identification of the common mechanisms of autoimmune diseases will improve our understanding of these disorders and make it easier to categorize, predict and prevent them and find new therapeutic targets, conclude the researchers of the Rosario.

→ Carolina Ramírez and Yovana Pacheco are researchers at the Center for the Study of Autoimmune Diseases, whose scientific publications have proved that cigarettes are a factor which aggravates rheumatoid arthritis and makes it more serious and difficult to treat.