Popular science summary

Women suffering from Polycystic Ovary Syndrome (PCOS) have a 4- to 5-fold higher risk of mood disorders compared to healthy women. Researchers suggest that the gut microbiota and its neuroactive metabolites, such as gamma-aminobutyric acid (GABA) and short-chain fatty acids (SCFAs) - mainly butyrate, propionate and acetate - may play a key role in understanding the mechanisms that trigger these disorders. Diet, especially some of its components, is one of the most important factors affecting the gut microbiota, its functioning and the overall health of the host.

It is believed that women with PCOS and mood disorders are characterized by a more imbalanced diet, abnormal composition of the gut microbiota and impaired ability to produce neuroactive metabolites (GABA and SCFAs) compared to healthy women with mood disorders and women with PCOS without these disorders. Clear correlative links are also observed between certain dietary components, the gut microbiota and its neuroactive metabolites and PCOS symptoms and mood disorders.

The main goal of the study is to understand the role of the gut microbiota and its neuroactive metabolites (GABA and SCFAs) in the pathophysiology of mood disorders in women with PCOS, with a particular focus on the role of diet in this relationship. In this regard, we plan to:

1. Evaluate the differences in gut microbiota composition, its neuroactive metabolites (GABA and SCFAs) and dietary habits between women with PCOS and mood disorders and control groups.
2. Analyze the relationship between the composition of the gut microbiota, neuroactive metabolites (GABA and SCFAs) and the clinical manifestations of PCOS and mood disorders to understand the possible contributing factors.
3. Investigate the influence of selected dietary components on the occurrence of these relationships.

The study will include 50 women with PCOS and 50 women without PCOS, matched for age and BMI. We will exclude women with celiac disease, inflammatory bowel disease, diabetes mellitus, serious mental health problems, Cushing's syndrome, thyroid disorders, hyperprolactinemia, serious liver and kidney disease, who are pregnant or breastfeeding, are on a reduction diet, smoke, abuse alcohol or use certain medications (antibiotics, antidepressants, probiotics, laxatives, in the last 3 months preceding the study). PCOS will be diagnosed based on the Rotterdam Criteria, and mood disorders will be assessed using specialized screening questionnaires. Analysis of bacterial DNA, isolated from stool samples, will also be performed. Body weight, waist circumference, visceral fat content, lipid profile, blood insulin and glucose levels, blood GABA levels, and fecal SCFAs will also be assessed. Participants' diets will be assessed using a validated questionnaire on the frequency of consumption of foods and products, and an interview of the past 24 hours (conducted three times).

The scientific impact of the results appears to be significant. The gut microbiota, through its influence on the production of GABA and SCFAs, may play an important role in the complex relationship between PCOS and mood disorders. The obtained results will allow the development of novel methods for the prevention and treatment of depression in women with PCOS, based on the evaluation of the relationship between the composition of the gut microbiota and its neuroactive metabolites and the occurrence of these disorders, with precise identification of the dietary factors modulating these relationships.