Solving the mystery behind Schizophrenia

Johanna Hedin
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Biology Education Centre, Uppsala University

Schizophrenia is a mental disorder affecting around 1 % of the world population. The disease is defined by episodes of hallucinations and delusions, when the individual sees or hear things that are not present, or have strong irrational beliefs such as being tapped, and spied on, by the government. The right treatment is essential for a manageable life with schizophrenia. Unfortunately, today's treatments have a poor effect on some patients, and some patients do not respond at all to medication. The big challenge is to find out what are the mechanisms that create these bizarre symptoms, so scientists can come up with a treatment that prevents them more efficiently.

The mystery of schizophrenia

There is a knowledge gap in schizophrenia research concerning the mechanisms behind the symptoms. Even though there are theories regarding how the symptoms of the disorder are expressed, the actual mechanisms are still unknown. This knowledge is important to be able to obtain a more efficient treatment. The treatments available today are not that effective against all symptoms and can cause severe side effects. In addition, some patients do not respond to medication at all. The mental disorder schizophrenia is a severe disease that affects several aspects of the human being. Typical symptoms could include a withdrawn, asocial, behaviour and difficulties of communicating due to disorganized thinking. The most characterized symptoms however are hallucinations and delusions. As an example the patient can taste, see, or hear things that are not present; it could be voices, perceived as someone else and not yours, speaking to you in your head. The patient can hold strong beliefs of something that is irrational; it could be that your house is tapped by the government and that your family and friends are conspiring against you. There is no cure for the disease and the patients need medication and a lifelong support from society.

The mechanisms behind the symptoms

There are documented structural differences in the brain that are believed to be associated with the disease. The mechanisms behind this and the symptoms are still unknown, though there are many theories. The most debated theories involve an over or under expression of signal substances in the brain; dopamine and glutamate. These are chemicals that send signals between nerve cells, telling the brain how to interpret information from the outer world as well as the inner organs. There are conflicting studies indicating there could be categories of schizophrenia that express different mechanisms. The medication today specifically treats the dopamine system and reduces the risk of psychosis (episodes with hallucinations and/or delusions).

A puzzle of genes

A recent breakthrough in the field was the discovery of more than 100 genes that could possibly be involved in schizophrenia. It is a big puzzle still to be made to find out how and if these genes really are related to the disease. What the genetic findings do show is that there is some support for dysfunction in the dopamine and glutamate systems, but maybe the most interesting is that there are indications of the immune system playing a role in the mechanism. Noteworthy is that severe infections and autoimmune diseases, where the immune system

attacks its own body, have been reported to increase the risk of getting schizophrenia.

The immune system and microglia
Further studies of the connection between the immune system and schizophrenia have been made on a specific region in the human genome. The genes expressed in this area of the genome are important for the body to stay healthy. A gene called *C4* in this region has shown in animal studies to associate with the degradation of synapses through microglia, which is a part of the brain immune system. The neuronal synapses, which are connections between nerve cells, create the essential network in the brain, and an impaired nervous system would affect different brain functions, depending on where the damage is done. This is not an established mechanism behind schizophrenia, but it is one possible hypothesis that needs to be further investigated.

Finding a more efficient treatment
Finding out the mechanisms and a solution to the symptoms is a complex subject, and there are still only hypotheses that we can discuss since there are still more research that needs to be done. Schizophrenia today is treated by interfering with the dopamine system, but since the medication is not that effective for all patients, and comes with severe side effects, there is an interest in finding new treatments. The fact that the glutamate system has been found to be impaired in some studies shows that there could be a new way of treatment by restoring the glutamate levels to normal. The immune system can have a significant role in the mechanisms of schizophrenia, and for example, treating the degradation response from the microglia may be future treatments. An antibiotic drug called minocycline show a promising effect when it comes to reducing the harmful activity of microglia. There are yet challenges to overcome, but due to the findings of potential treatment fields the future of schizophrenia looks bright.

Further reading
Hedin, J. 2017. Vad är den bakomliggande mekanismen till Schizofreni och kan vi effektivisera behandlingen?