Medical Xpress

Zebrafish research reveals green rooibos tea's anxiety-busting properties

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Zebrafish are genetically similar to humans. Credit: Damien Schumann

Rooibos tea is a uniquely South African product. The plant, *Aspalathus linearis*, grows mainly in the Cederberg area of the country's Western Cape province. And it's not just a tasty beverage. It is caffeine-free;

research has proved that it has anti-inflammatory properties. It's also been found to ease pain and reduce allergies. Rooibos is also good for heart health.

As our new study shows, rooibos tea—specifically unfermented or green rooibos—may also help to reduce anxiety. Our research found that this extract of the tea, prepared using ethanol rather than water, has anxiolytic properties. This means it prevents or lessens the degree of anxiety a person experiences.

We didn't reach this conclusion by testing the tea on human subjects, though. There's a huge variation in anxiety severity, so a study in humans would require too many participants to give us sufficient statistical power, and thus be too expensive.

Instead, we used zebrafish. The small, striped tropical fish may seem like an odd choice, until you realize that they are genetically quite similar to humans. For more than 80% of the genes known to cause disease in humans, similar genes are represented in zebrafish.

This fact prompted Stellenbosch University's Faculty of Medicine and Health Sciences to set up the Zebrafish Research Unit just more than a year ago. Several studies are under way involving advanced analytical pharmacology, toxicology, therapeutic target identification and drug discovery. This study is one of the first to stem from the laboratory.

A variety of data

My research group studies the connection between psychological stress and chronic inflammatory disease. This is especially important in South Africa: the South African Depression and Anxiety group estimates that many as one in six South Africans suffer from anxiety or depression. Furthermore, the current top 10 causes of death in South Africa, like

TB, diabetes and respiratory disease, all have inflammation as a common characteristic.

Zebrafish are ideal for drug discovery especially in the context of neurological and inflammatory conditions. We are able to do thorough testing including not only behavioral assessment and seeing how specific treatments work, but also assessing the risks of overdosing and long-term use of potential treatments.

So, we set out to employ our zebrafish models to see whether rooibos might have any positive effects on anxiety. Most of our research is done at the early larval stage, when the zebrafish are not yet considered a sentient animal. It's a more ethical way of using a live organism in research, as they cannot experience pain at that stage.

We immersed the 2mm-long zebrafish larvae in different concentrations of rooibos in a small dish. Essentially, they were swimming in tea; this is absorbed through their skin as well as through their gills, since their mouths are not yet open.

At different points, specialized equipment tracked their movement and this was used to construct behavioral patterns. Using a model of anxiety—which entails exposing the larvae to alternating bright light and darkness for short periods of time—we assessed whether the larvae swimming in rooibos were able to remain calm, by comparing their behavior to that of unsupplemented larvae. Normally, in this model, the larvae would "freeze" in bright light, followed by hyperactivity during the periods of darkness. In our study, rooibos-treated larvae also froze, but did not exhibit the anxious hyperactivity.

Oxidative stress

We also performed a test using the live larvae's behavior to probe a

specific mechanism: a "feel-good" neurotransmitter, GABA, whose signaling can be manipulated by either enhancing or blocking its receptor. If the receptor is blocked, the larvae exhibit a hyperactive seizure-like behavior. In our study, rooibos was able to completely prevent this response—in fact, it showed similar results to an anti-epileptic drug known to work through GABA.

The behavioral tests were complemented by whole body analyses for oxidative stress and anti-oxidant activity, as well as some cell culture work using human cells. In these models, we showed that green rooibos was able to protect human neurons against oxidative stress.

Oxidative stress increases during life and is actually responsible for aging, so a product that can protect the brain from oxidative stress, can essentially slow our aging process. In a world where advances in medicine are allowing us to grow older, it is becoming more and more important to be able to prevent the brain from aging.

Taken together, our data suggest that green rooibos tea could be considered as a functional brain food. The research suggests it may be a good option as a starting ingredient in the development of new nutraceuticals—pharmaceutical alternatives which claim physiological benefits.

The results of this study mean that we could have uncovered nature's contribution to treating some of South Africa's health problems. It shows that drinking green rooibos tea may have a calming effect if you suffer from anxiety.

Zebrafish in research

This certainly won't be the last piece of research from our lab or others that use zebrafish in drug discovery. The fish, which originate in

Malaysia, may be the new rodent in research. Apart from their genetic similarities to humans, when in their larval stage the fish are fairly transparent; that makes them great for microscopy.

We have a couple of tanks where we breed with the adult stock. The fish can live up to three years in a laboratory, compared to about a year in nature (because of excellent care in the lab, but also the absence of natural predators).

In terms of future research, assessing these effects in humans is on the cards. We are also generating very promising results on rooibos in the context of inflammatory bowel syndrome, a chronic condition affecting approximately 10% of the global population and which is the most common co-morbidity to anxiety disorders.

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