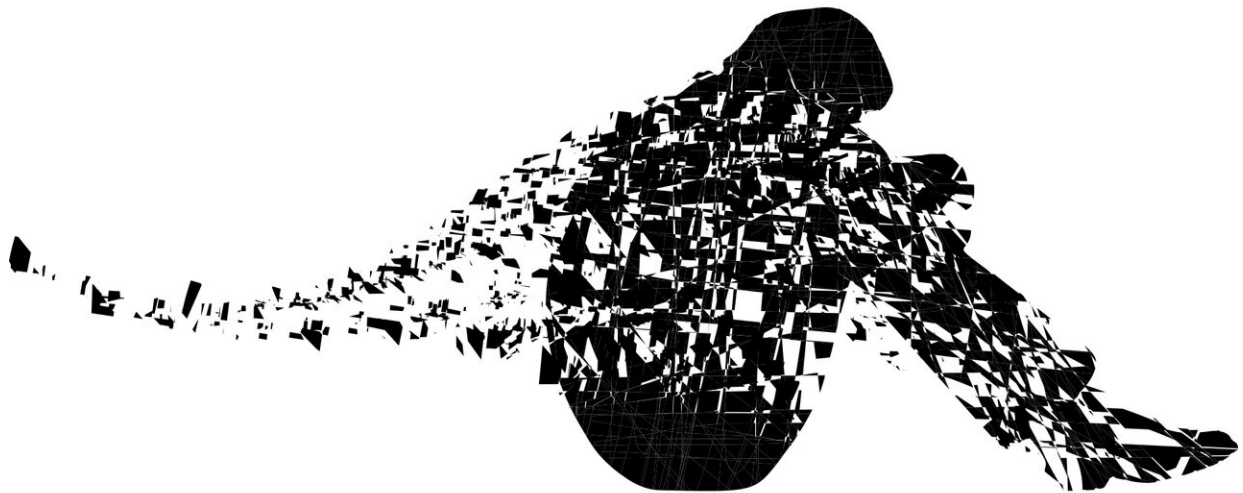


# Study identifies molecular alterations in brain tissue and blood of people who committed suicide

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More than 700,000 people take their own lives every year worldwide, according to the World Health Organization . Credit: Gordon Johnson/Pixabay

In an article [published](#) in the journal *Psychiatry Research*, Brazilian scientists describe a number of molecular alterations found in the blood

and brain tissue of individuals who committed suicide. According to the authors, the study aimed to identify susceptibility factors and potential targets for innovative pharmacological intervention.

More than 700,000 people take their own lives worldwide each year, according to the World Health Organization (WHO). The suicide rate is particularly alarming in the 15-29 age group, where it is the fourth-ranking cause of death. This information is valid for 2019 and was taken from the latest edition of the WHO/IHME Global Burden of Disease, an epidemiological survey covering the main causes of death and disability in more than 200 countries.

Several risk factors are associated with suicide, including [family history](#), personality traits, socioeconomic conditions, exposure to toxic ideas on social media, and psychiatric disturbance, especially depression and bipolar disorder.

"However, despite the huge psychological, social, and economic impact of deaths by suicide, identification of suicide risk is based on a clinical interview. The neurobiological mechanisms associated with suicidal behavior are poorly understood. They were the focus of our study," said neuroscientist Manuella Kaster, a professor at the Federal University of Santa Catarina (UFSC) and co-principal investigator for the study.

According to Kaster, the group reviewed and reanalyzed a large amount of data available in the literature regarding [molecular alterations](#) found in postmortem examination of blood and brain tissue from suicides.

"Genes, proteins, and metabolites in the samples were analyzed simultaneously and comparatively. We concluded that in complex conditions such as suicidal behavior, this kind of analysis has significant

potential as a basis for identifying susceptibility factors and potential therapeutic targets," Martins-de-Souza said.

Simply put, the molecular alterations can be interpreted as "risk markers" that point to novel pathways in neurobiology and offer strong support for the information acquired in clinical interviews. "A noteworthy finding from several of the studies reviewed is that many subjects visit a health service in the year prior to a suicide or attempted suicide, but they do not receive the kind of care that could prevent such an outcome owing to the difficulty of identifying the risk," Kaster said.

Caibe Alves Pereira, a Ph.D. candidate at UFSC supervised by Kaster and the first author of the article, analyzed data from 17 studies on alterations in brain gene and protein expression in suicides and similar data from subjects who died from other causes. The prefrontal cortex was the most frequently mentioned brain region in these sources.

"This brain region is connected to all the centers of emotional and impulse control. It plays a key role in behavioral flexibility and decision-making. Alterations to its structure or function can be highly relevant in the context of suicidal behavior," Kaster said.

This relevance is especially significant in the case of young people since the prefrontal cortex is one of the last brain regions to mature. Alterations to cortical plasticity due to social, cultural, psychological, or other factors can have a significant impact on emotional and behavioral control in the 15-29 age group.

When the data collected in the literature review was fed into an algorithm developed by Guilherme Reis-de-Oliveira, a Ph.D. candidate at UNICAMP supervised by Martins-de-Souza and a co-author of the article, it was possible to identify biological mechanisms and pathways associated with suicide. Alterations to inhibitory neurotransmitters were

among the main changes observed.

"Molecular alterations were associated above all with [glial cells](#), such as astrocytes and microglia, which interact closely and dynamically with neurons and are fundamental to control of cellular communication, metabolism, and plasticity," Martins-de-Souza said.

The analysis also pointed to alterations to certain [transcription factors](#) (molecules responsible for regulating the expression of several genes).

"These included transcription factor CREB1, which has already been widely studied for its effects on neuroplasticity and as an important target for antidepressants. However, transcription factors MBNL1, U2AF and ZEB2, which are associated with RNA splicing, formation of cortical connections and gliogenesis, have never been studied in the context of depression and suicide," he said.

"Suicide must be taken seriously in all respects, from ideation to execution," Kaster concluded. "We know deaths by suicide are more prevalent among males, whereas attempted suicides are more prevalent among females, but this is due to the potential lethality and aggressiveness of the means utilized, as well as behavioral differences. Suicide is an avoidable cause of death if intervention is timely."

"This was the main motivation for our study. The stigma of [suicide](#) should be combated, so that a profound and broad understanding can be had of its various biological, social and cultural aspects, particularly the mechanisms involved in these behavioral alterations."

**More information:** Caibe Alves Pereira et al, Depicting the molecular features of suicidal behavior: a review from an "omics" perspective, *Psychiatry Research* (2023). [DOI: 10.1016/j.psychres.2023.115682](https://doi.org/10.1016/j.psychres.2023.115682)

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