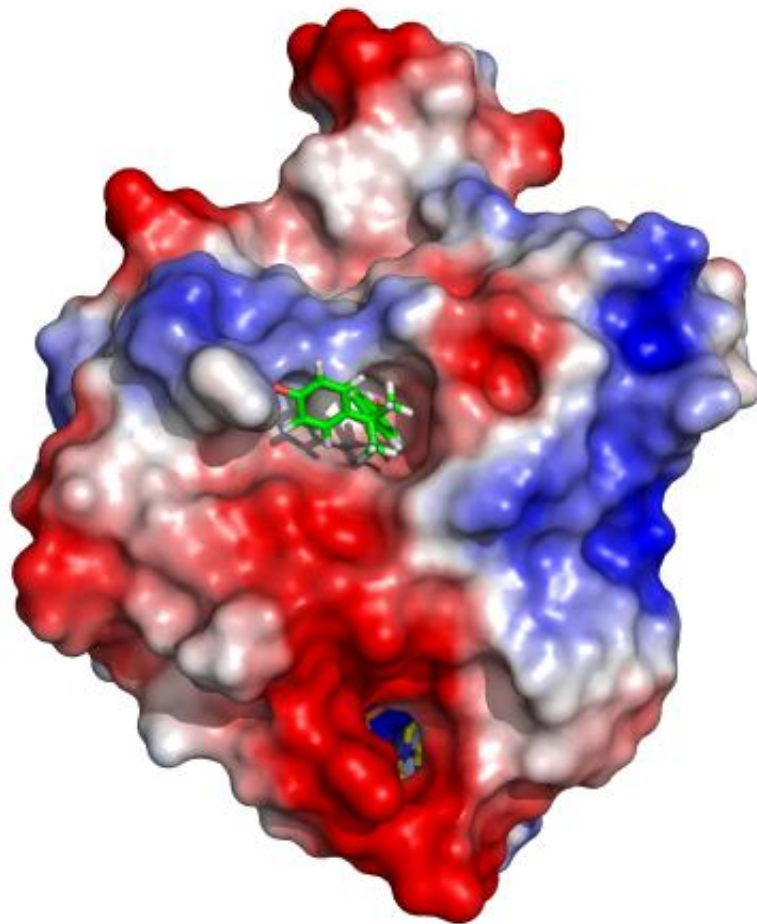


# Evidence of harmful effect of bisphenol A-based plastics

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Bisphenol A binds to the switch protein K-Ras, which is vital for cell growth processes and plays a role in tumourigenesis. Credit: RUB/Miriam Schöpel

Bisphenol A impairs the function of proteins that are vital for growth processes in cells. This finding has been reported by researchers from the Ruhr-Universität Bochum and the University of Wuppertal. The substance, short BPA, is contained in many plastic products and is suspected of being hazardous to health. To date, it had been assumed that bisphenol A produces a harmful effect by binding to hormone receptors. The chemist and biochemist team has discovered that the substance also affects the so-called small GTPases. They published their findings in the *Journal of Medicinal Chemistry*.

## **Complex mechanism of action**

"Our research provides further evidence that the physiological effects of [bisphenol](#) A may be even more complex than previously assumed," says Prof Dr Raphael Stoll, head of Biomolecular Spectroscopy at the Ruhr-Universität. "However, we have also discovered other related compounds that indicate which path the future development of pharmaceutically effective substances against GTPase-mediated tumours may take," adds synthetic chemist Prof Dr Jürgen Scherkenbeck from Wuppertal.

## **Bisphenol A impairs the function of GTPases**

Small GTPases are enzymes that occur in two states within the cell: in the active form when bound to the GTP molecule; and in the inactive form when bound to GDP, a lower-energy form of GTP. These switch proteins are crucial for transmitting signals within the cell. The researchers have demonstrated that bisphenol A binds to two different small GTPases, K-Ras and H-Ras, thereby preventing the exchange of GDP for GTP. The non-profit organisation German Cancer Aid (Deutsche Krebshilfe e. V.) has financed the project since 2011.

## **Bisphenol A is a suspected health hazard**

Various organisations have pointed out that bisphenol A may be hazardous to health: the Federal Institute for Risk Assessment (Bundesinstitut für Risikoforschung), the European Food Safety Authority, the US Food and Drug Administration (FDA), the US National Institutes of Health (NIH) and the US-American Breast Cancer Foundation. However, those organisations have not yet provided a final assessment of the substance's hazardous potential. Nevertheless, the European Commission banned the use of bisphenol A in the manufacture of baby bottles in 2011. Academic studies indicate that the substance may increase the risk of cardiovascular diseases, breast and prostate cancer as well as neuronal diseases. The researchers therefore recommend a restriction of bisphenol A-based plastic containers for food products.

**More information:** M. Schöpel, K.F.G. Jockers, P.M. Düppe, J. Autzen, V.N. Potheraveedu, S. Ince, K. Tuo Yip, R. Heumann, C. Herrmann, J. Scherkenbeck , R. Stoll (2013): "Bisphenol A binds to Ras proteins and competes with Guanine Nucleotide exchange: implications for GTPase-selective antagonists," *Journal of Medicinal Chemistry*, 56(23):9664-72; [DOI: 10.1021/jm401291q](https://doi.org/10.1021/jm401291q)

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