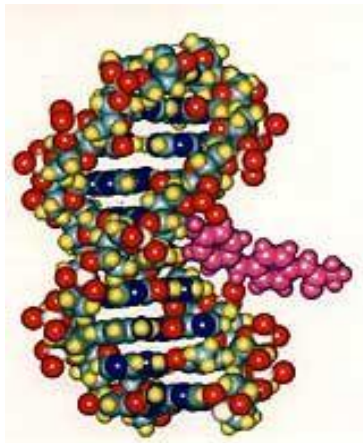


## Körber European Science Prize 1991

### Recognizing and Preventing Cancer Caused by Environmental Chemicals

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*Körber Prizewinners investigated the extent to which carcinogenic substances harm workers in the production of polyurethane and what risks these materials pose in mass-produced breast implants.*



Durch MDA modifizierte DNA-Doppelhelix. Solche Veränderungen können zu Mutationen und schlussendlich zu Tumoren führen.

Over the last few years, biologists and medical scientists have found out a great deal about the molecular mechanisms of carcinogenesis and have discovered "cancer genes" and predispositions for diseases which parents pass on to their children. Nevertheless, the fact remains that more 80 percent of the factors which cause cancer – the second most common cause of death in this country – are present in the environment. Poor and excessive nutrition alone account for more than one third of all malignant tumours. However, before a cancerous growth forms, a long, complicated process takes place in the body, beginning with changes – mutations – in the genetic substance of individual cells and leading after a cascade of further biological steps to the uncontrolled propagation of cells. As this development takes years and decades in humans and it is, in most cases, not the carcinogenic substances themselves but their metabolites in the body which trigger genetic changes, it is difficult to assess the risk potential of individual substances accurately. This is the point at which the research work subsidised by the Körber Prize comes

into play. With methods that make it possible to measure changes in the white blood cells and in the red blood pigment (haemoglobin), researchers can ascertain the effect of carcinogenic substances in the body.

The toxicologists wanted to find out what quantities of a particular substance are absorbed and what proportion is converted into genetically harmful substances, whether these changes in the blood reflect the actual risk of cancer and whether previously unknown, carcinogenic substances can be discovered. The research work focused on amines and isocyanates, chemical compounds which are the base materials in the production of polyurethane plastics and therefore of great industrial importance. It emerged, for example, that workers had metabolites of the aniline MDA (4,4'-methylenedianiline) in their blood, although there was no trace of the substance in air samples taken. The toxicologists have concluded that the air sampling was clearly not sensitive enough to detect the substance, or the aniline had been absorbed through the skin. To reduce the risk of cancer, they recommend better monitoring for the workers.

A second part of the project was dedicated to women's silicone breast implants which are encased in a thin polyurethane layer to protect against immune responses. The analyses revealed that this coating

gives off small quantities of carcinogenic toluene diamine in the human body, also over longer periods of time. The toxicologists therefore consider the synthetic coating of the implants to be a questionable measure which should be changed. The researchers are of the opinion that physicians should also reconsider the use of polyurethanes in plastic surgery. With one project, however, the scientists did hit upon difficulties. They wanted to ascertain individual differences in the metabolism of the polyurethane workers which would have revealed whether some individuals are more at risk due to the carcinogenic substances than others. The works council refused to give its consent to this because there are to date no binding guidelines which are consistent with data protection and provide protection against abuse. The findings regarding individual sensitivities could be used to employ only those people who exhibit a particularly high tolerance to the substances, instead of reducing exposure.

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