

Individual efficacy of chemotherapies

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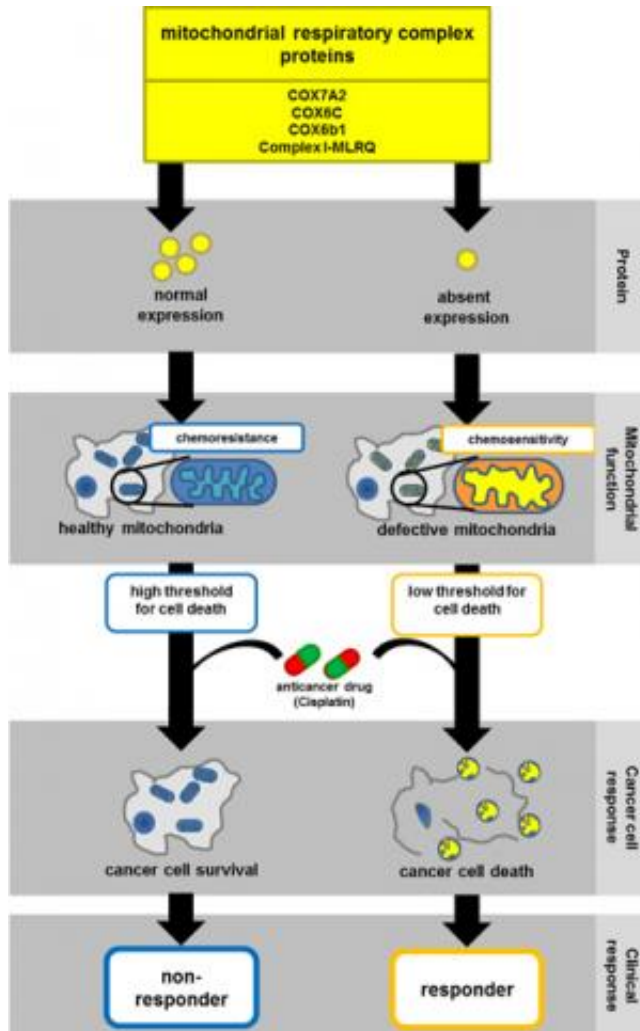


Diagram of the response to cisplatin-based chemotherapies subject to the COX function. Credit: AAP, Helmholtz Zentrum München

The function of the mitochondria – also defined as "power plants" within

the cells – is essential as to whether, and how, some chemotherapeutic agents take effect in tissue. Scientists at the Helmholtz Zentrum München have thus discovered a significant cell characteristic that could possibly predict the success of therapy. Their results will soon be published in the trade magazine *The Journal of Pathology*.

The response of [cancer patients](#) to a specific chemotherapy line can vary dramatically. The reasons for this are manifold and unknown for the most part. Scientists in the Analytical Pathology Department (AAP) of the Helmholtz Zentrum München have recently been successful in exposing a mechanism that is relevant to this phenomenon. Dr. Michaela Aichler and her colleagues have found out that the function of enzymes within the respiratory chain, which takes place in the mitochondria of cells, regulates the sensitivity of cells for [cisplatin](#)-based chemotherapeutic agents.

The scientists examined tissue, to this end, from tumours in the oesophagus, stomach and chest of a total of 428 patients. By means of an image-guided procedure (the so-called MALDI-Imaging and LC-MS/MS), protein patterns within the cells were able to be established and the illustrated enzymes identified. These patterns of existing and/or missing enzyme functions were compared by the scientists with the [clinical response](#) of the patients to a chemotherapy line containing cisplatin. If a defect was present in the respiratory chain complex within the [tumour cells](#) – particularly in subunits of the specific [cytochrome c oxidase](#) (COX) – an improvement in the effect of the chemotherapy could be observed. This correlation was able to be additionally proved in subsequent experiments with the tissue samples. When the COX function was missing, a quicker cell death was noted with the introduction of cisplatin or other related treatments. Conversely, cells with an intact respiratory chain proved to be resistant to the administered substances.

"Recognition of these correlations contributes to an improved ability to predict the efficacy of certain chemotherapies", explains Prof. Dr. Axel Walch, Director of AAP. "It is possible that mitochondria, and/or their function enzymes, can be used in the future as biomarkers for personalised therapeutic approaches."

The focus of health research at the Helmholtz Zentrum München is placed on serious widespread diseases. This includes diabetes, lung diseases as well as cancer. It is the goal of the Helmholtz Zentrum München to quickly refine results from basic research to provide society with concrete benefits.

More information: Aichler, M. et al. (2013), Clinical response to chemotherapy in oesophageal adenocarcinoma patients is linked to defects in mitochondria, *Journal of Pathology*. [doi: 10.1002/path.4199](https://doi.org/10.1002/path.4199)

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