

A Maintenance Man in the Wrong Place

Heat shock protein 70 (Hsp70) is produced by cells during exertion or when subjected to heat, and acts as a kind of custodian: in the interior of the cell, it repairs or eliminates incorrectly folded proteins. In cancer cells, however, it sits on the surface of the cell. When on the surface it may influence the adhesion of the cells, and so assist the spread of metastases. Using scanning probe microscopy, the unusual behavior of Hsp70 has been investigated by Dr. Constanze Lamprecht within the framework of her LIT project, as a part of the team of Dr. Andreas Ebner.

Oncologists from the Technical University of Munich have recognized that Hsp70 reduces the success of patient therapies, and can be associated with the formation of metastases. To conduct further research at the molecular level, they brought the JKU's biophysicist on board.

"The central question for us was what Hsp70 is really doing outside the cancer cells, on the membrane, when in healthy cells it is on the inside, in the cellular fluid," says Ebner.

In order to find out, the team artificially created a membrane with Hsp70. Using the methods of biosensory scanning probe microscopy, they were able to determine the force with which Hsp70 anchors itself to the cell membrane, along with how strongly individual cancer cells anchor themselves to lung cells. When Hsp70 encounters an appropriate lipid membrane a pore forms, even at very low concentrations, through which the protein passes from the interior to the exterior of the cell. "This is quite unusual," says Ebner.

It is not yet clear whether healthy cells become cancer cells due to the "improper" accumulation of the protein on the outside of the membrane, or whether the cell first becomes a cancer cell and the protein then slips out. In any case, it is suspected that Hsp70 is involved in the creation of metastases, which drastically reduce the chances of recovering from cancer. In the future, it may play an important role in blood analysis as a cancer marker.