Nanoparticles aid the microscopic detection of a protein relevant for cancer

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Assemblies of proteins, known as protein complexes, have important functions in cells; protein complexes embedded in the cell membrane, for example, are responsible for the exchange with the extracellular environment. But because they are very small, their composition from subunits can only be determined indirectly or with extreme time-effort. Scientists at the INM – Leibniz Institute for New Materials are currently developing a novel microscopy technology for the direct detection of such individual subunits of protein complexes in the cell membrane of intact cells. The methodology is applied to investigate a protein complex acting as a calcium channel in the cell membrane. The channel plays an important role in prostate cancer.

With the new analytical technique, the scientists employ electron microscopy to examine protein complexes in whole cells in their natural aqueous environment. The protein in question, the TRPV6 calcium channel forming protein, is first provided with an "anchor" to which a gold nanoparticle can bind. Each nanoparticle thus shows the position of a protein subunit so that the composition of the channels from a multiple of proteins and their locations become visible as they are in the living cell.

The cells are examined in tiny liquid chambers using the electron microscope. "Liquid specimens cannot be studied with traditional electron microscopy", explains Professor Niels de Jonge, head of the Innovative Electron Microscopy group at the INM. Cells are typically studied in dry state via thin sectioning of solid dried plastic embedded or

frozen material, which means that the proteins are no longer in their intact and natural environment. Using tiny liquid chambers the whole cells can now be examined in an aqueous environment. The chambers are made from silicon microchips and have very thin, electron transparent silicon nitride windows.

Research by the electron microscopy experts at the INM is focussing on two aims: "We are keen to perfect our new technology and demonstrate that its application is useful for biological and pharmaceutical research." Researchers at the INM are therefore working closely with scientists from the Clinical and Experimental Pharmacology and Toxicology Department at the Saarland University.

Provided by INM - Leibniz-Institut für Neue Materialien

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