PRESS RELEASE

Comparison of two nano rulers

Study compares two methods for distance measurement in motile proteins.

Bonn, August 01, 2022 - In the Middle Ages, every city had its own system of measurement. Even today, you can sometimes find iron rods in marketplaces that determined the length measurement valid for the city at that time. In science, however, there is no room for such uncertainties, and no matter what method you use to measure the length of a molecule, for example, the answer should always be the same. Researchers at the University Hospital Bonn (UKB), the University of Bonn and Ludwig-Maximilians-Universität (LMU) Munich have now investigated whether this is true for two methods that are very often used to measure distances in protein molecules - for example, to find out how such molecules move. The study has now appeared in the journal Nature Communications.

The researchers from PD Dr. Gregor Hagelueken's group at the Institute of Structural Biology of the UKB used so-called PELDOR spectroscopy to study the movement of so-called substrate-binding proteins. These proteins grab their substrate and transport it to a specific location in the cell. To observe this precisely, the researchers attached tiny magnets - the researchers call them "spin labels" - to the proteins and measured distances that are only about a billionth of a meter long. They then transmitted their results to the research group of Prof. Dr. Thorben Cordes at LMU Munich. There, comparative measurements were carried out using so-called FRET spectroscopy. Tiny dye molecules were used instead of spin labels.

"Although both methods are used very frequently, no one has yet systematically investigated whether the results are really comparable," says Hagelueken. Although it turned out that the measurement results were comparable in most cases, the researchers encountered inconsistencies in two cases. Bonn post-doctoral researcher Martin Peter says, "We then thoroughly investigated what caused the differences and found what we were looking for. In one case, it turned out that the dye molecules stuck to the protein and thus falsified the measurement." In the second case, the addition of a type of antifreeze, which was necessary because of the low measurement temperature of below -220 degrees Celsius, led to unexpected deviations. "We were able to show that despite the high accuracy of the methods, re-measuring with another nano ruler is always a good idea," Hagelueken says.

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Publication:
Martin F. Peter, Christian Gebhardt, Rebecca Mächtel, Gabriel G. Moya Muñoz Janin Glaenzer, Alessandra Narducci, Gavin H. Thomas, Thorben Cordes, Gregor Hagelueken: Cross-validation of distance measurements in proteins by PELDOR/DEER and single-molecule FRET; Nature Communications; https://doi.org/10.1038/s41467-022-31945-6

Visuals:

Caption:
(from left) PD Dr. Gregor Hagelueken and Dr. Martin Peter used so-called PELDOR spectroscopy in the laboratory to study the movement of so-called substrate-binding proteins.

Picture credits: University Hospital Bonn (UKB)/ Johann Saba

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About the University Hospital Bonn: The UKB cares for about 500,000 patients per year, employs 8,800 people and has a balance sheet total of 1.5 billion euros. In addition to the more than 3,300 medical and dental students, a further 580 women and men are trained each year in numerous healthcare professions. The UKB is ranked first among university hospitals in NRW in the science ranking, has the third highest case mix index in Germany and was the only one of the 35 German university hospitals to increase its performance in the Corona years 2020 and 2021.