Association of signaling active ErbB2 homodimers with actin-rich membrane structures of cancer cells revealed by liquid phase electron microscopy

Indra Navina Dahmke[1], Zahra Mostajeran[1], Franziska Lautenschläger[1,2] and Niels de Jonge[1,2]

[1]INM – Leibniz Institute for New Materials, Saarbrücken, Germany
[2]Department of Physics, Saarland University, Saarbrücken, Germany

Growth factor receptor 2 (ErbB2) is found overexpressed in many cancers such as gastric or breast cancer and acts as therapeutic target [1]. ErbB2 plays a central role in cancer cell invasiveness and is, as such, closely linked to cytoskeletal reorganization [2]. In order to study the spatial correlation of single ErbB2 proteins and actin filaments, we applied correlative fluorescence microscopy (FM) and high resolution scanning transmission electron microscopy (STEM) on specifically labeled breast cancer cells as described before [3]. For this purpose SKBR3 cells were grown on microchips and transformed with BacMam-GFP-Actin in order to label the actin cytoskeleton. Before prospected to STEM imaging, the cells were labeled with quantum dot (QD) nanoparticles attached to specific anti-ErbB2 Affibodies and covered with graphene. Spatial distribution patterns of ErbB2 in the membrane was studied on actin-rich structures and compared to adjacent flat regions of the same cell, revealing an association of ErbB2 homodimers with actin-rich regions which were not found in flat parts. Next, we treated the cells with 2 µM of Cytochalasin D, disrupting the actin network and inducing ErbB2 distribution patterns similar to that of flat regions. This links signaling active ErbB2 homodimers to actin-rich membrane structures in cancer cells, pointing to a role during cancer cell invasion.

[1] R Jr. Roskoski, Pharmacol Res. 139:395-411 (2019)
[2] J.C. Feldner, BH Brandt, Exp. Cell Res. 272, 39 (2002).
[3] I.N. Dahmke et al., ACS Nano, 11, 11, 11108-11117 (2017).