Methods for electron microscopy of cells in liquid

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Several different approaches exist to image cells in their native liquid environment using electron microscopy [1]. These methods have opened up a new experimental window for the study of cells avoiding extensive sample preparation of conventional electron microscopy techniques requiring plastic or frozen sections. Method 1: A microfluidic chamber is formed by two microchips with electron transparent windows protecting the sample from the vacuum in the electron microscope. The liquid compartment can be used in a conventional transmission electron microscope (TEM). Method 2: Environmental scanning electron microscopy (ESEM) can be used to study cells covered in a thin layer of liquid in a water vapor environment. Method 3: The wet sample is immobilized on an electron transparent support and covered by a thin membrane, e.g. grapheme, to maintain a thin layer of liquid around the sample. All methods can be used for correlative light- and electron microscopy. Of particular importance is the unique capability of these methods to study membrane proteins within the intact plasma membrane [2]. For this purpose, proteins are specifically labeled with nanoparticles providing contrast in the scanning TEM (STEM) detector.

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