

## MEMBRANE PROPERTIES OF CULTURED CELLS

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Intercellular communication is a prerequisite for intact organisms especially during development and differentiation, and occurs as regulation over long distances (hormones), as short distance interactions (synapses) or as direct cell to cell contact. The direct cell contact is enabled by specialized membrane areas, the so called gap junctions, which allow not only the passage of ions (ionic coupling) but also of larger molecules (metabolic cooperation). The identity of these three coupling phenomena was demonstrated with cell cultures /2/, where hormonal or neuronal regulatory processes can be excluded. Another property common to many of these coupled cell lines is the inactivation of their  $\text{Na}^+ - \text{K}^+$ -pump by  $10^{-3}$  M ouabain, as can be demonstrated with membrane potential measurements. In culture, however, uncoupled cell lines are also found, many of them depolarise with  $10^{-6}$  M ouabain /3/. No correlation between normal and malignant growth and coupled and uncoupled state could be demonstrated /4/.

Uncoupled cells, however, are of special interest for the investigation of the mechanism of gap junction formation. Since gap junctions should preferentially be built up in membranes with high fluidity, experiments have been performed to increase the membrane fluidity of uncoupled HeLa cells. They respond to the addition of 2mM butyric acid by a change in morphology from epithelioid to fibroblastoid; ionic coupling, however, is not established. Further addition of oleic-, linolic- and linolenic- acid in similar concentrations did not influence this result.

A mechanism based on increased membrane fluidity is cell fusion by polyethylene glycol (PEG) /1/. Incubation of HeLa cells with 60 % PEG (MW 1540) for 30 min depolarises the cells which recover soon after PEG exchange for medium. About 60 min later some cells are already fused, which of course appears to be ionic coupling, but also non-fused cells were ionically coupled.

Parts of the cells do not survive this procedure, the others are fused or changed their morphology to fibroblastoid growth. This morphology change is persistent at least for 48 hours, whereas the fluidity change as detected by ionic coupling is transient and disappears within 2 hours. Adjacent multinuclear cells are also non-coupled after this time.

A relation between membrane fluidity and ionic coupling can also be demonstrated with cells of a low communication ratio, e.g. baby hamster kidney cells. Their coupling ratio is increased by the addition of 2mM butyric acid.

### References

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