The proteins role in regulation of interaction between axon and Shwann cell in the periferal nerve

Rodionova N.N., Brazhe N.A., Maksimov G.V.

Biophysics Department, Biological Faculty, Moscow State University,
Leninskie Gory 1/12, Moscow, Russia, 119992,
Phone: +7(495) 939-19-66,
E-mail: nrodionova@mail.ru

The character of the axon-Shwann cell interaction in the myelin nerve fibre is determined by some proteins: nodal ($Na_v1.6$), paranodal (contactin, Caspr, NF 155, NF 186) and juxtaparanodal ($K_v1.1$, $K_v1.2$, Caspr-2) proteins. We study the effect of modification free SH-groups level of superficial proteins (pHMB affect), mild proteolysis of the superficial nerve proteins (pronase E) and sorption on the nerve alien protein OspA (isolated from *Borrelia burgdorferi* sensu stricto) on the axon-Shwann cell interactions. Peripheral myelinated nerves of *Rana temporaria* are used in this research. Using extracellular registration of membrane potential we have showed that pHMB, pronase E and OspA lead to the decrease in the action potential amplitude. The velocity of the conducting of action potential increased under the nerve proteins proteolysis, didn't change during binding of free SH-groups of the superficial nerve proteins and decreased during the sorption OspA on the nerve surface. Changes of the nerve electrophysiological features may be related to the activity of Na^+,K^+-ATPase, Na^+-channels and K^+-channels and to the structure and properties of the myelin. Aplying Raman spectroscopy we have showed the decrease in the axolemma microviscosity (AM) during binding of free SH-groups and sorbtion of OspA, and the increase in AM under the nerve proteins proteolysis. We have shown by fluorescent microscopy, that sorption of OspA on the nerve surface leads to the decrease in AM accompanied by the redistribution of the membrane-bound Ca^{2+} in the myelin and axolemma. The decrease in AM, caused by binding of free SH-groups of superficial nerve proteins, didn't related to the change of the membrane-bound Ca^{2+} level. Using laser interference microscopy we have revealed changes of regular fluctuations of the local refractive index in paranodal and juxtaparanodal nerve areas under the proteolysis. The role of proteins in the regulation of axon-glial interactions and myelin structure is discussed.