

Product Information

99314 Sodium ionophore I – Cocktail A

(Sodium-selective membrane solution for microelectrodes)

Selectophore®

Electrochemical Transduction

Microelectrodes

Application 1 and Sensor Type¹⁻¹⁹

Assay of Na⁺ activity in intracellular (single cell) liquids with Na⁺ microelectrodes based on Sodium Ionophore I.

Sodium Ionophore I - Cocktail A ([99314](#))

Cocktail Composition

- 10.0 wt% Sodium Ionophore I ([71732](#))
- 89.5 wt% 2-Nitrophenyl octyl ether (o-NPOE) ([73732](#))
- 0.5 wt% Sodium tetraphenylborate ([72018](#))

Electrode Characteristics and Function

Selectivity coefficients $\log K_{Na,M}^{Pot}$ as obtained by the separate solution method (0.1 M solutions of the chlorides).

$\log K_{Na,Li}^{Pot}$	-0.4	$\log K_{Na,Ca}^{Pot}$	-0.2
$\log K_{Na,K}^{Pot}$	-0.2 (-2.3) ¹	$\log K_{Na,Acetylcholine}^{Pot}$	-1.8
$\log K_{Na,Mg}^{Pot}$	-2.4		

Slope of linear regression:

53.0±2.5 mV (20°C, 10⁻³ to 10⁻¹ M NaCl)

Detection limit (NaCl, intracellular ion background of 200 mM K⁺, 2.0 mM Mg²⁺, 0.001 mM Ca²⁺):

$\log a_{Na} \sim -2.5$

Electrical resistance, tip diameter ~2 µm:

~1010 Ω

Response time:

90% response time ≤5 s

Electrode Characteristics and Function

Selectivity coefficients $\log K_{Na,M}^{Pot}$ as obtained by the separate solution method.

$\log K_{Na,K}^{Pot}$	-2.7
$\log K_{Na,Cs}^{Pot}$	-3.4
$\log K_{Na,Li}^{Pot}$	-3.4

Slope of linear regression:

58.7 mV/dec (10⁻⁴ to 10⁻¹ M Na⁺)

Detection limit:

10⁻⁵ M Na⁺

Response time:

<20 s



- ¹ Neutral carrier sodium ion-selective microelectrode for intracellular studies. R. A. Steiner, M. Oehme, D. Ammann, W. Simon, *Anal. Chem.* 51, 351 (1979).
- ² Stimulus-induced changes in extracellular Na⁺ and Cl⁻ concentration in relation to changes in the size of the extracellular space. I. Dietzel, U. Heinemann, G. Hofmeier, H. D. Lux, *Exp. Brain Res.* 46, 73 (1982).
- ³ Changes in extracellular potassium and calcium in rat cerebellar cortex related to local inhibition of the sodium pump. A. Ullrich, R. Steinberg, P. Baierl, G. ten Bruggencate, *Pflügers Arch.* 395, 108 (1982).
- ⁴ Effect of strophanthidin on intracellular Na ion activity and twitch tension of constantly driven canine cardiac Purkinje fibers. C. O. Lee, M. Dagostino, *Biophys. J.* 40, 185 (1982).
- ⁵ Sodium/calcium exchange in mammalian ventricular muscle: a study with sodium-sensitive micro-electrodes. R. A. Chapman, A. Coray, J. A. S. McGuigan, *J. Physiol.* 343, 253 (1983).
- ⁶ On the temperature dependence of the Na pump in sheep Purkinje fibres. H. G. Glitsch, H. Pusch, *Pflügers Arch.* 402, 109 (1984).
- ⁷ Changes of intracellular sodium and potassium ion concentrations in frog spinal motoneurons induced by repetitive synaptic stimulation. P. Grafe, J. Rimpel, M. M. Reddy, G. ten Bruggencate, *Neurosci.* 7, 3213 (1982).
- ⁸ Intracellular Na⁺ and Ca²⁺ in leech Retzius neurones during inhibition of the Na⁺-K⁺ pump. J. W. Deitmer, W. R. Schlue, *Pflügers Arch.* 397, 195 (1983).
- ⁹ Evidence for an amiloride sensitive Na⁺ pathway in the amphibian diluting segment induced by K⁺ adaptation. H. Oberleithner, F. Lang, W. Wang, G. Messner, P. Deetjen, *Pflügers Arch.* 399, 166 (1983).
- ¹⁰ The influence of intracellular sodium activity on the transport of glucose in proximal tubule of frog kidney. F. Lang, G. Messner, W. Wang, M. Paulmichl, H. Oberleithner, P. Deetjen, *Pflügers Arch.* 401, 14 (1984).
- ¹¹ Mechanism of NaCl secretion in rectal gland tubules of spiny dogfish (*Squalus acanthias*). II. Effects of inhibitors. R. Greger, E. Schlatter, *Pflügers Arch.* 402, 364 (1984).
- ¹² Resistive artifacts in liquid-ion exchanger microelectrode estimates of Na⁺ activity in epithelial cells. S. A. Lewis, N. K. Wills, *Biophys. J.* 31, 127 (1980).
- ¹³ Relations between intracellular ion activities and extracellular osmolarity in *Necturus* gallbladder epithelium. T. Zeuthen, *J. Membr. Biol.* 66, 109 (1982).
- ¹⁴ Active sodium transport and fluid secretion in the gall-bladder epithelium of *Necturus*. F. Giraldez, *J. Physiol.* 348, 431 (1984).
- ¹⁵ Sodium Activity in drone photoreceptors. J. A. Coles, R. K. Orkand, *J. Physiol.* 332, 16P (1982).
- ¹⁶ Changes in sodium activity during light stimulation in photoreceptors, glia and extracellular space in drone retina. J. A. Coles, R. K. Orkand, *J. Physiol.* 362, 415 (1985).
- ¹⁷ Quantitative relation of twitch and tonic tensions to intracellular Na⁺ activity in cardiac Purkinje fibers. W.-B. Im, C. O. Lee, *Am. J. Physiol.* 247, C478 (1984).
- ¹⁸ Ion-selective micro-electrode studies of the electrochemical potentials in trout urinary bladder. B. J. Harvey, B. Lahlou, *J. Physiol.* 370, 467 (1986).
- ¹⁹ Preparation and use of micro- and macroelectrodes for measurement of transmembrane potentials and ion activities. D. Ammann, P. Caroni, *Methods in Enzymol.* 172, 136 (1989).

