Introduction

Blood pressure control...

Nucleo Tractus Solitarius (NTS)...

Adaptive processes of neurons in the NTS...

• Electro-physiology (ms)
• Signal-transduction (s to min)
• Gene-regulation (h)

Aim

Integrated NTS model of neuronal adaptation...

Model integration

Link of signal transduction & electro-physiology...

Integrated Modeling of Signal Transduction and Electro-Physiology

How do hormones influence the signal processing of NTS neurons?

Important Issues...

• V-dependency in signaling
• Cell-size: Transport rates & ionic currents
• Ca²⁺ dynamics: Membrane & intracellular?
• Phosphorylation model: Parameters?

Results

Biology...

• $K_{Na}$ plays a major role.
• Ca²⁺ activation not through CaL
• Phosphorylation of voltage-gated ion channels can explain neuro-modulation
• PKC & CaMK II distinguish the duration of the Ang II stimulus.

Theory...

Introduction...

Fully integrated neuron model on all levels...

• Electro-physiology,
• Signal-transduction and
• Gene expression.

Conclusion

The current model ...

• highlights important issues
• inspires new experiments

Outlook

Theory...

• Parameter estimation?
• Model reduction & time-scale analysis?
• Stochastic vs. chaos?
• Network of neurons?
• Closed loop blood pressure control?

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