

Blue Brain

Channelpedia

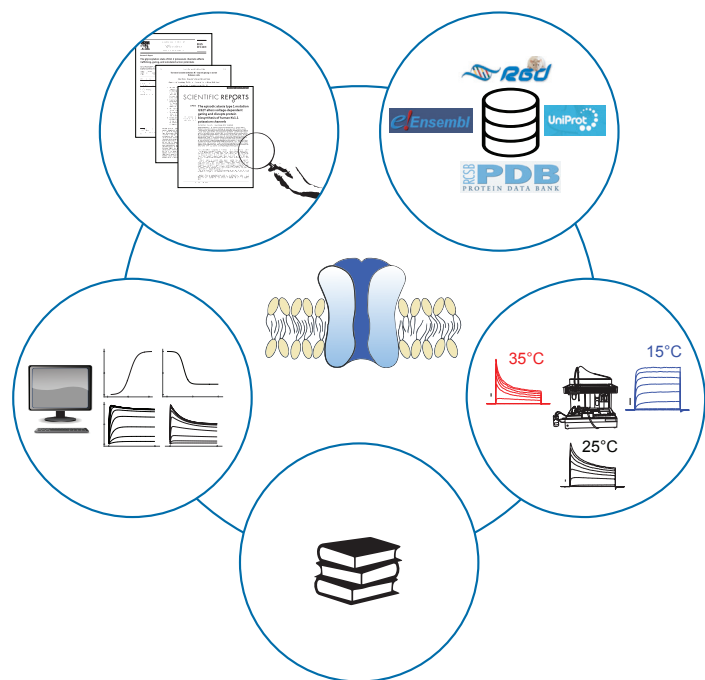
Web-based freely-accessible information management network and electrophysiology data repository for comprehensive ion channel research

Ion channels are trans-membrane proteins that control the active and passive electrical behavior of a cell by selectively conducting ions across the cell membrane. The experimental and computational approaches employed to unravel the enigma of ion channels are producing approximately 800 publications every month. However, there is not a single database designed to summarize ion channel information along with experimental data and models.

Channelpedia, a combination of a database and a wiki-like platform, allows researchers to share their data and synthesize ion channel information from the literature. Through Channelpedia, the Blue Brain Project are sharing electrophysiology data of all **40 Kv channels**, recorded through systematic kinetic characterization of more than **18,000 cells** at three different temperatures.

What is Channelpedia?

channelpedia.epfl.ch



Channelpedia is currently used globally by computational neuroscientists, ion channel researchers and ion channel modellers from universities and scientific projects.

Currently Channelpedia contains:

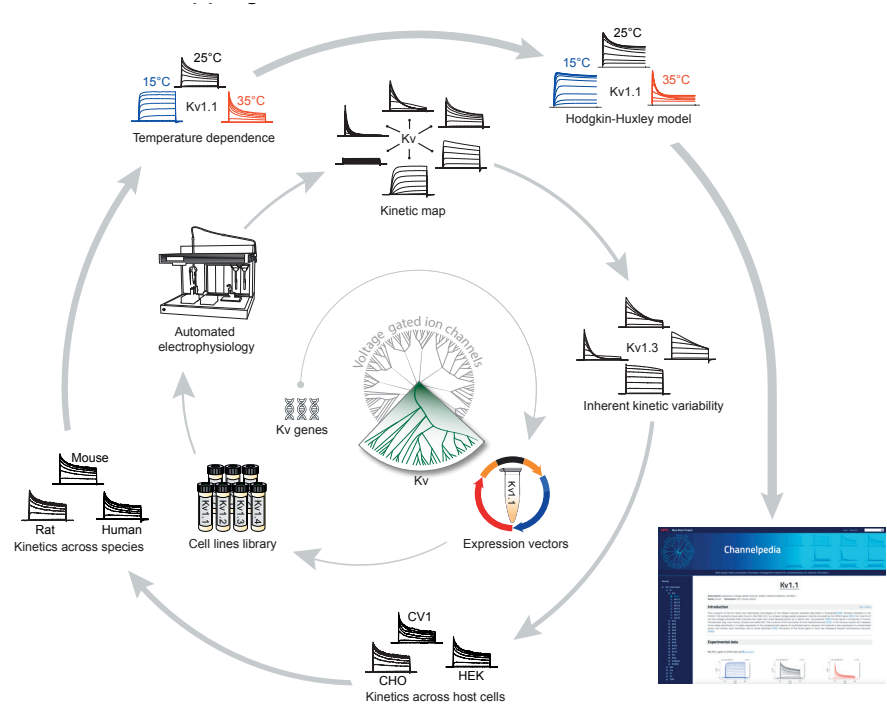
- 180 annotated ion channels with literature summary
- 50 Hodgkin-Huxley models
- Electrophysiology data from more than 18,000 cells overexpressing single Kv ion channel genes
- Electrophysiology data stored in a standardized NWB file format (Neurodata Without Borders)
- API's and helper functions which are available in Matlab/Python to read and plot the data
- A platform for ion channel models to be linked with actual raw data.

Comprehensive ion channel information

Channelpedia provides a unique platform to collectively summarize current literature on ion channels in a free text/wiki-like format. It allows users to upload and share their ion channel data and models with other researchers.

How ion channel data are obtained, analyzed and shared?

We have developed a standardized method to systematically characterize ion channel electrophysiology at a specific temperature, with high level of reproducibility and reliability. Each gene is amplified from a rat, mouse, or human brain cDNA library and cloned in a mammalian-expression vector. A library of stable isogenic cell lines, over-expressing single homomeric channels in a tetracycline inducible manner, is generated after transfection of each vector in host cell lines (CHO, HEK, or CV1). The biophysics of each cell line is characterized using an automated patch clamp setup in a dedicated temperature-controlled room (14–36°C). This allows to construct comprehensive maps of ion channel electrophysiology at different temperatures and in August 2019 we published the first ever map of the kinetic behavior of all voltage-gated Potassium channels (Kv) at 15, 25 and 35°C:

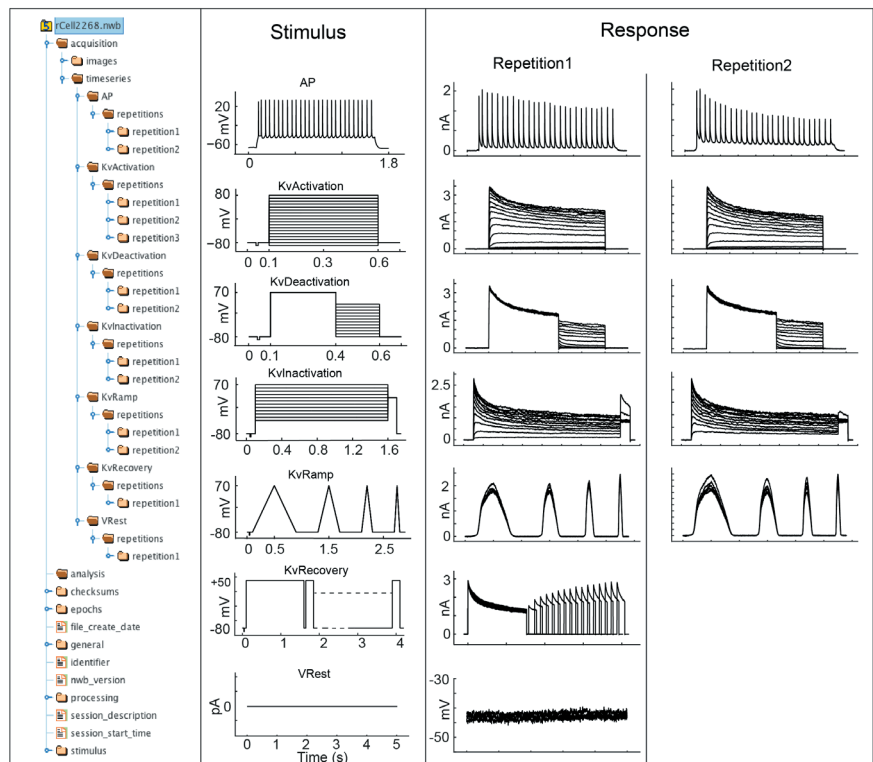


An example of electrophysiology data in NWB files

Data organization

Electrophysiology data are analyzed, stored and shared through Channelpedia. The whole cell voltage clamp data for each Kv ion channel is made available in NWB (Neurodata Without Borders) format. NWB is based on HDF5 file format and designed to promote data standardization and sharing (www.nwb.org).

Data use is subject to the data licence:
https://channelpedia.epfl.ch/terms_of_use



About EPFL's Blue Brain Project

The aim of the EPFL Blue Brain Project, a Swiss brain research initiative founded and directed by Professor Henry Markram, is to establish simulation neuroscience as a complementary approach alongside experimental, theoretical and clinical neuroscience to understanding the brain, by building the world's first biologically detailed digital reconstructions and simulations of the mouse brain.

Channelpedia is accessible from any desktop computer or mobile device - channelpedia.epfl.ch

Acknowledgements

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 epfl.ch/research/domains/bluebrain

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