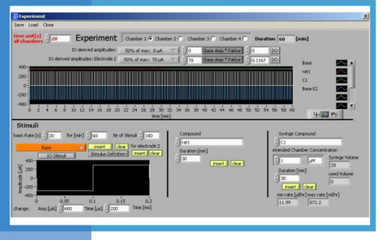
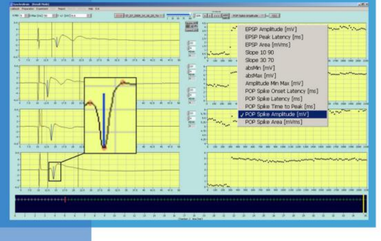
Software



Experiment

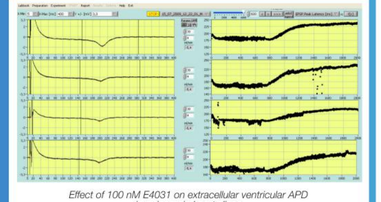
Generate the time schedule for the automated experiment.
SYNCHROBRAIN allows to set the duration of all the periods of stimuli and superfusion in a flexible and easy way for up to 2 stimulation electrodes and 4 slices in the same screen with a directly displayed time schedule. This way it is possible to perform independent experiments in different slices – e.g. a standard drug application protocol in one slice, performing an LTP experiment in a second slice and a I/O curve stimulation in a third and forth slice.
Optional the programmable drug application system (PDAS) is possible to use, which mixes automatically the compound in the ringer main stream.
All settings can be saved. So it is possible to load them for the other chambers or in other experiments, what is very comfortable because of economy of time.



Then the program automatically acquires data, displays the online results and stores all original data together with the experimental parameters into a file on the hard disc.

Analysis

Analysis parameters are selected from a predefined list and can be set as parameter for the online analysis and will be shown during the experiment together with the triggered responses.
SYNCHROBRAIN enables an easy switching between these parameters in the online display to compare effects of drugs on different signal components. Offline all analysis tools can be repeated for comparison of different analysis strategies.
With an integrated second pair of cursors the analysis – e.g. in case of double stimulation – for a second region of interest is simultaneously possible.
Data and results can be exported into standard spreadsheet and statistical programs.



Effect of 100 nM E4031 on extracellular ventricular APD in guinea pig heart slices

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Synchroslice
Multiple Slice Evaluation System

Features

A complete 4-channel SYNCHROSLICE system (8-channel version also available) consists of:

- SynchroSlice Software package for programmable stimulation protocols (SynchroBrain/SynchroHeart) incl. experimental control of perfusion and valve system.
- 4-channel tissue slice chamber, each with either submerged or interface mode inner wells. Wells manufactured from Teflon. With temperature sensor and heating pad. Chambers equipped with all necessary tubing and cables.
- 1 x Temperature controller type LRE LTR-3 for use with LRE slice chambers.
- 8-channel peristaltic pump digitally controlled via software.
- 4 x 2-channel valve system with chemically inert Teflon valves for switching between control and test solutions
- 6 x gas flow meters
- 1 x GigE inspection cameras (color) for use with TFT Video Monitor
- 1 x TFT Video monitor
- Movable camera system: 1 x XYZ manipulators for moving cameras up to 10mm in xy-direction and 20mm in z-direction.
- Base plate with mounts and stands for micromanipulators (Standard-Duty Passive Isolation Mount)
- 8 x Marzhauser micromanipulator (MM33). Each equipped with electrode holding bar.
- 4 x 2-channel headstages type MCS MPA-2. Input resistance > 1 GOhm.
- Filter amplifier with fixed bandwidth of 1 Hz to 3 kHz.
- Online stimulator - controlled via Synchroslice software. Equipped with stimulus-isolation units.
- USB data acquisition system.
- 4 x single electrodes and 4 bipolar stimulation electrodes.
- Desktop PC / Laptop - Software preinstalled

Complete system mounted in laboratory cabinet. Size approximately 220cm x 75cm x 160cm (w x d x h).

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Synchroslice
Multiple Slice Evaluation System

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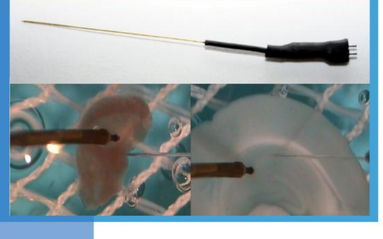
Hardware



Generals

Acute vital sections like the hippocampal slice preparation have become a valuable tool in neuro-pharmacological and toxicological evaluations of drug effects in the pharmaceutical industry. However, with a single standard experimental setup only a few tissue slices can be characterized within one day. A higher throughput of tissue sections, different drugs or drug concentrations is difficult and time consuming.
With the new SYNCHROSLICE system Lohmann Research Equipment overcomes this problem by electro-physiological evaluation in up to 8 tissue slices simultaneously. Single dose-response curves can be examined with a single loading of 8 slices in an interface or submerged type chamber. Sections can be electrically stimulated and extracellular field potentials are recorded simultaneously with eight 2-fold or single microelectrodes. Various stimulation protocols like single pulse, double pulse, HFS, LFS or theta stimulation (for LTP/LTD experiments) are possible. Electrode positions are visualized with a color GigE camera system. Drugs are applied via a multiple valve system including a multichannel peristaltic pump. The SYNCHROSLICE software controls the complete experiment. Originally designed for the classical hippocampal preparation also other tissue slices e.g. from neocortex of the brain and even acute heart slices can be evaluated.

Multiple Slice Chambers and Mechanical Setup

The SYNCHROSLICE system is equipped with either one or two 4-channel tissue chambers. Both interface type as well as submerged type chambers are available. Inner wells of the recording chambers can be made either from Acrylic glass or Teflon (PTFE). The temperature is regulated with a high precision temperature controller. The multi-slice chambers are mounted on top of a base plate which also holds the 3-D micromanipulators for stimulation and recording electrodes and allow easy integration of all kind of manipulation units. The complete mechanical setup is located on an anti-vibration table.

Recording Electrodes

The SYNCHROSLICE system can be used either with 1 or 2-channel recording electrodes for each slice. In case of 2-channel electrodes the inter-electrode distance is fixed, but can be selected by the customer, usually in a range of 200-400 µm. Electrodes are made from quartz glass insulated platinum-tungsten wires and are reusable over many weeks and months.

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Hardware

Drug Application

The SYNCHROSLICE system is equipped with a multi-channel valve system in combination with a 8-channel peristaltic pump. Valves controlling the flow of standard ACSF and compound solution for each slice chamber. Under standard configuration 8 slices can be evaluated with 8 different concentrations of a compound or alternatively with 8 different compounds (in the 8-channel SYNCHROSLICE). If further compounds or concentrations are necessary the system can be extended by additional valves or automated systems (e.g., PDAS, Gilson pipette robot, etc.). All fluids are oxygenated with Carbogene controlled separately for each channel via flow controllers. The complete fluidic system is housed in a plastic container to avoid spillage of fluids into electronic devices. To make sure that you have an exact flow in all chambers flow controllers can be installed additionally and monitored via Synchroslice software.

Camera System

Brain slices within the submerged or interface type chambers are visualized during the experiment with a camera system. The color GigE camera can be moved to each chamber and single pictures or video sequences can be stored directly to the laptop. Also 4 cameras are available for split screen display of all chambers simultaneously. Each camera is equipped with a zoom objective and can be focused with a fine adjustment. The camera system can be moved away with sliding rails allowing easy exchange of tissue slices. The mounted X-Y-translation stages for the camera system simplify placing slices into the chamber

Data Acquisition and Signal Conditioning

Recorded signals are amplified with a 16-channel amplifier with customized amplification and bandwidth. Amplified signals are fed into a USB-2 16-channel data acquisition which acquires with a maximum sampling rate of 25kHz per channel. Electrical stimulation is achieved via a USB multichannel pulse generator.

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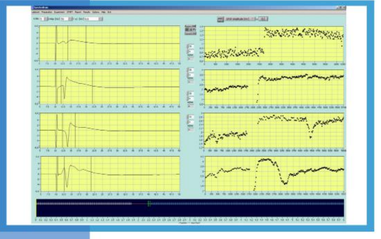
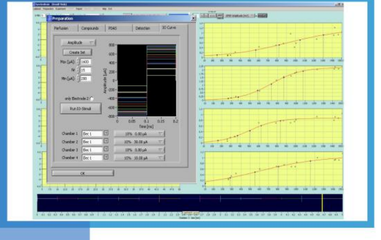
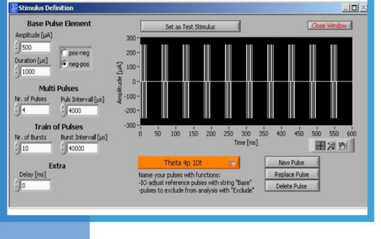
Software







Generals

Stimulation parameters, data acquisition, online and offline analysis, drug application and labbook functions are completely controlled via the SYNCHROSLICE - Software SYNCHROBRAIN. Predefined values and simple dialogs improve the navigation process and reduce training times substantially.
Parameters like peak amplitudes, slopes, latencies, areas under curves, etc. are determined online and displayed during the experiment.
All parameter settings, experimental data and tissue identifications are stored on HD.
Export functions allow a transfer of data into conventional spreadsheet and analysis programs.

Labbook

SYNCHROBRAIN gives the opportunity to document all settings of the experiment – important factors about the animal and the slice can be set and saved together with the experimental data.

Preparation

To check all necessary parameters before starting an experiment SYNCHROBRAIN allows to test the function of the valve system and the peristaltic pump, set the detection criteria and test the responses for every single slice. The viability of the slices is checked with the Input-Output relationship on up to 4 slices simultaneously and gives characteristic stimulus parameters for each slice.
In case of working with a second stimulation-electrode per slice, it is possible to run the IO-curve separately for each electrode.
Slices can be easily exchanged if the quality does not reach the customer defined criteria.
When using the optional “Programmable Drug Application System” - PDAS - the parameters can also be set.

Stimulus Definition

Define complete new pulses or pulse patterns, which can be applied in the detection and in the Experiment.
Define a positive-negative going pulse or a negative-positive going pulse. Change the stimulation amplitude or create Multi Pulses with a direct virtual screen of your actual pulse.
You get the option of saving the pulses in a list, for later use in the experiments.

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