

Optogenetic Manipulation of Neuronal Activity to Modulate Behavior in Freely Moving Mice

 Laura Berg^{1,2}, Jill Gerdey^{1,2}, Olivia A. Masseck^{1,2}
¹Biology and Chemistry, Synthetic Biology, University of Bremen ²Advanced Fluorescence Microscopy, Faculty of Biology and Biotechnology, Ruhr-Universität Bochum

Corresponding Author

 Olivia A. Masseck
 masseck@uni-bremen.de

Citation

 Berg, L., Gerdey, J., Masseck, O.A. Optogenetic Manipulation of Neuronal Activity to Modulate Behavior in Freely Moving Mice. *J. Vis. Exp.* (), e61023, doi:10.3791/61023 (2020).

Date Published

October 27, 2020

DOI

10.3791/61023

URL

jove.com/video/61023

Materials

Name	Company	Catalog Number	Comments
Ketamin	Sigma-Aldrich	K2753-64	Anestasia
20 % Glucose	AlleMan Pharma		Injection s.c. for fast recovery
Behavioral mazes	Costum made		Measure anxiety
Bepanthen	Bayer		Ophthalmic oinment
Betaisodona	Monodipharma		Sterilant containing iodine
Betaisodona	Monodipharma		Iodine oinment
Binocular	Olympus	SZ52, 110AL0.62x WD160	Surgery
Ceramic ferrules	Thorlabs	CFLC230-10	Implant
Ceramic Fiber Scribe	Thorlabs	CSW12.5	Cutting of the glass fiber
Channelrhodopsin2-YFP virus	Penn Vector Core	Addgene 20298	Optogenetic tool
Compressed air	Kontakt Chemie	Druckluft 67	Drying of the skull
Coordinate system	Stoelting		Stereotactic coordinates for the surgery
Correl Draw			Graphical software version 13
Cryoslicer	MICROM	HM5000M	Production of brain slices for staining
Ethovision XT 14	Noldus		Software for behavioral tracking
Exel			Statistical Software
Ferrule Polishing Puck	Thorlabs	D50-F	Polishing implants round side
Fiber Patch Cord dual	Prizmatix	Optogenetics-Fiber 500, 1,20 m, Ferrule core 1,25 mm	Cables, which are connected with the two implants of a bilateral implantation
Fiber Patch Cord single	Prizmatix	Optogenetics-Fiber 500, 1,20 m, Ferrule core 1,25 mm	Cable, which is connected with the implant via a sleeve
Fiber Stripping Tool	Thorlabs	T06S13	Stripping glass fiber for implant
Filter paper	VWR European	516-0300	Cut into pieces for the Novelty-Suppressed Feeding test
Food pellets	Mühle Levers	Höveler Nagerfutter	Nutrition for the mice
Glass pipettes	Harvard Apparatus	GC150-10	Injection pipettes
Gradia direct-Flo	Henry Schein	103322	Fluid dental cementum

Heating lamp	efbe-Schott/Phillips	R95E	Prevent the mice from cooling after the surgery
Heating plate	Stoelting		Integrated into coordinate system
Injection canula	Braun	100 Sterican, 0,4 x 20 mm, Gr. 20	All injections and to bore hole into the skull
Litter		T 1350	Grounding for the Novelty-Supressed Feeding test
Mouse cages	Zoonlab	405 cm ²	Single housing for experiments
Optibond FL	Kerr	26684E	Preparation of the skull for implantation
Optical glass fiber	Thorlabs	FT200EMT	Light fiber for implant
Optogenetics-LED.STSI	Prizmatix		Optogenetic toolbox for light stimulation during behavioral experiments
Paraformaldehyde	Sigma-Aldrich	16005-1KG-R	Perfusion of mice to remove the brains
Polishing sheet 0.02 µm grit	Thorlabs	LFCF	Polishing implants round side
Polishing sheet 1 µm grit	Thorlabs	LF1D	Polishing implants round side
Polishing sheet 30 µm grit	Thorlabs	LF30D	Polishing implants round side
Polishing sheet 6 µm grit	Thorlabs	LF6D	Polishing implants round side
Pulser Software	Prizmatix		Software for light device control
Rimadyl-Carprofen	Zoetis		Analgesia
Sigma Plot			Software for statistics
Sleeve	Thorlabs	FT200EMT	Connection of implant and light cable
SodiumChloride (NaCl)	Braun	3570410	Rinsing of the skull
Superglue	Pattex Henkel		To Fix the glass fiber in the ferrule
td-Tomato virus	Penn Vector Core	Addgene 51503	Optogenetic tool
UV light	KoQGHJ	wireless, 1200 mW/cm ²	Polymeration lamp for dental cementum
Xylavet-Xylazin	cp pharma		Anesthesia