

Poster booklet



Plenary Speakers



Pr. Amadeu Llebaria
Institut de Química Avançada de Catalunya, Barcelona, Spain



Pr. Andrea Rentmeister
Ludwig-Maximilians-Universität, Munich, Germany



Dr. Céline Frochot
LRGP Univ Lorraine, Nancy, France



Pr. Dirk Trauner
University of Pennsylvania, Philadelphia, USA



Pr. Weiping Wang
Hong-Kong University, Hong-Kong



Pr. Wiktor Szymanski
University of Groningen, The Netherlands

Keynote Speakers

Pr. Andrea Hupfeld
Pr. Andrew Woolley
Pr. Angel Marti
Pr. Angela Casini
Dr. Charleine Zussy
Pr. Francisco Ciruela

Pr. Jörg Standfuss
Dr. Julie Le Merrer
Dr. Laetitia Mony
Dr. Laia Josa-Culleré
Pr. Matthew J. Fuchter
Dr. Michel De Waard

Pr. Oliver Thorn Seshold
Dr. Pau Gorostiza
Pr. Rob Leurs
Pr. Wan-Chen Lin
Dr. Xavier Rovira



For more information contact:
ispp2026@scienceconf.org
<https://ispp2026.scienceconf.org>



Organizers

Pr. Olalla Vázquez (U. Marburg) & Cyril Goudet (IGF, U. Montpellier)

Partners and Sponsors



Table of contents

Session 1: Photoswitches and beyond	10
Photoisomerization of Azobenzene-Extended Charybdotoxin for the Optical Control of Kv1.2 Potassium Channel Activity, Yanis Achouba [et al.]	11
Light-controlled inhibition of COX-2 using photoswitchable derivatives, Carla Arenós Bach [et al.]	13
Structure–Activity Relationship Study of 8-Bromo-7-Hydroxyquinoline based photoremovable protecting groups for Enhanced Blue-Light Photorelease, Edoardo Armano [et al.]	15
Fully Reversible Optical Regulation of 8-17 DNzyme Catalysis by Nucleoside-Based Diarylethenes, Jörn Bargstedt [et al.]	16
In vitro pharmacological evaluation of a photoswitchable modulator in dopaminergic receptors, Sofia Batres Ardón [et al.]	17
NIR Switching: Single photon, singlet manifold azobenzene photoswitching at up to 1000 nm, Benedikt Baumgartner [et al.]	18
Deuteration as a General Strategy to Enhance Azobenzene-Based Photopharmacology, Song Chen [et al.]	19
Targeting <i>Pseudomonas aeruginosa</i> LecB with Photoswitchable Glycomimetic Ligands, Alessio Colleoni [et al.]	20
An optonanobody for reversible photoactivation of recombinant and native $\alpha 7$ nicotinic receptors, Pierre-Jean Corringer [et al.]	22
Engineering Quinoline-Based Photoremovable Protecting Groups for Blue-Light Activation of Tertiary Aliphatic Amines, Ilaria Dagrada [et al.]	23
A series of photoswitchable antagonists for a precise spatiotemporal control of adenosine A2A receptors with light, Anaëlle Dumazer [et al.]	24

Traceless Photopolymerization with Non-Pulsed Red Light for Cell-Laden Bioscaffold Fabrication, Nikita Durandin	26
Coarse-grained Molecular Dynamics Simulations of Photoswitches in Photopharmacological Systems, Thilo Duve [et al.]	27
Photo-modulated cell-penetrating peptides for light-triggered release and delivery of RNA, Kai Eisenhardt [et al.]	28
Manipulating Physicochemistry with Light, Zak Elliott	30
Membrane-Targeted Azobenzene Photoswitches for Optical Control of Bacteria, Marta Ghidoli [et al.]	31
Light-activated MDM2 inhibitors: Toward spatiotemporal control in cancer therapy, Sina Katharina Goetzfried [et al.]	33
Fully reversible control over DNA-intercalation with visible light, David Grantz [et al.]	34
Design and Synthesis of Photoswitchable Ligands for Light-Controlled Modulation of Melatonin Receptors, Romane Guisiano [et al.]	35
Photoxenase engineering: establishing and optimizing reversible photocontrol in enzymes, Enrico Hupfeld [et al.]	37
Natural Product-Inspired Diketopiperazine Core Engineering for Tunable Hemipiperazine-Based Photoswitches, Fabian Klotz [et al.]	38
Elucidating Photochemical Structure-Activity Relationships in Photopharmacology via Multiscale Simulations, Ruibin Liang	40
Design and Synthesis of Styryl-Substituted Cyclic Enone Photoswitches for Photolipid-Mediated Membrane Modulation, Aline Makhloutah [et al.]	41
A photoswitchable positive allosteric modulator to control the activation of the metabotropic glutamate receptor 5 by light, Fanny Malhaire [et al.]	43
Light-Modulable AChE Inhibition Through Aurone-Based Molecular Photoswitches, Gabriele Manenti [et al.]	44
Optical control of the Gastrin-releasing peptide receptor, GRPR, using photoswitchable peptides, Ahmed Mansour Ali [et al.]	45
Molecular Photoswitches as Next Generation Contrast Agents for Photoacoustic Medical Imaging, Rosa Marquez-Garcia [et al.]	47

Red-Light-Responsive Stapled Peptide for Optical Control of the MDM2/MDMX-p53 Interaction, Karlijn Meerman [et al.]	49
Unified Determination of Photoisomerization and Fluorescence Quantum Yields for Accurate Photochemical Profiling of Styryl-Substituted Cyclic Enones, Cédric Mittelheisser [et al.]	50
Design of photochromic blocker for complete optical control of calcium-permeable AMPA receptor, Maxim Nikolaev	52
Motor-based DNA-binder with photocontrolled affinity, Ilayda Peduk [et al.] . . .	53
Development of photoswitchable monoamine oxidase B inhibitors targeting inflammation in osteoarthritis, Alexandre Potfer [et al.]	54
Introducing Visible-Light Addressability into Nucleoside-Based Diarylethenes, Martin Reinschmidt [et al.]	56
Modeling photoswitchable β -Blockers to uncover their Binding Mode, Guillem Rivera I Feliu [et al.]	57
DEVELOPMENT OF TETRA-ORTHO-METHOXYLATED AZOBENZENE AMINO ACIDS TO ACCESS PHOTOSWITCHABLE ANTIMICROBIAL PEPTIDES, Albert Ruiz Soriano [et al.]	59
Fluorescence: How dark quencher azobenzenes actually make fluorophores better., Carina Schmitt [et al.]	60
DEVELOPMENT OF PHOTOSWITCHABLE ANTIPSYCHOTIC DRUGS, Judith Serrano Juanós [et al.]	61
Engineering Opto-Chemical Tools – Towards Complex Function in Biological Environment, Nadja Simeth	62
Reaching subunit stoichiometry selectivity with optogenetic pharmacology: selective control of GluN1/GluN2A/GluN2B NMDA receptors with light, Shi Sophie [et al.]	63
In vivo photoreversible neuromodulation with infrared light, Rosalba Sortino [et al.]	65
Diketopiperazines: Biocompatible Photoswitches for Cell Culture Matrices and Medical Applications, Jessica Starrett [et al.]	67
SELF-ASSEMBLING PHOTOACIDIC SYSTEMS FEATURING MEROCYANINE/SPIROPYRAN AMPHIPHILES, Contena Stefano [et al.]	69

SYNTHESIS AND EVALUATION OF PHOTOSWITCHABLE PEPTIDES TO MODULATE CELL PENETRATION WITH VISIBLE LIGHT, Camille Thevenin [et al.]	70
Unlocking Tetrazine Reactivity with Light, Zsombor Unyi [et al.]	72
Mechanisms of Ziapin2-Mediated Cardiac Action Potential Generation: A Computational Study, Francesca Urbano [et al.]	73
Toward Predictive Photopharmacology: AI-Accelerated Excited-State Simulations for High-Throughput Photoswitch Screening, Lucia Vina Lopez [et al.] . . .	75
SYNTHESIS OF PHOTOSWITCHABLE FGFR3 INHIBITORS FOR IMPROVING CHEMOTHERAPY AGAINST BLADDER CANCER, Mislav Vrdoljak [et al.]	76
Thermo-Bistable Red and Sensitized Near-Infrared Photoswitches, Zhiwei Zhang [et al.]	77
Light-regulated molecules to improve the pharmacology of cancer drugs, Pere Álvarez [et al.]	78
Session 2: Optical engineering and novel applications	79
Soft self-written waveguides enable photorelease of a photocaged adenosine A1 receptor agonist for local suppression of neuronal excitability in the brain, Anastasiia Babych [et al.]	80
Non-invasive Cardiac Modulation via Triplet-Sensitized Photocontrol of Muscarinic Agonist, Pankaj Bharmoria [et al.]	82
Optical modulation of ion channels using Automated Patch-Clamp, Kim Bodum [et al.]	83
Photocleavable Ruthenium polypyridyl-based mass-tags for targeted mass spectrometry imaging in cancer tissues, Angela Casini	85
Engineering a genetically encoded fluorescent biosensor for relaxin-3, Rochelin Dalangin [et al.]	86
Localized photopharmacology using a wireless cardiac implant to modulate cardiac electrical function via photoactivatable peptides, Matthias Dereli [et al.] . .	87

DESIGN AND CHARACTERIZATION OF A LIGHT-CONTROLLED ION TRANSPORTER MODULATOR: IN VITRO AND IN VIVO PROTECTIVE ROLE IN MYOCARDIAL ISCHEMIA/REPERFUSION INJURY MODELS, Jorge Gandia [et al.]	89
Characterizing Channelrhodopsin2 using a 384-well automated patch-clamp setup - SOL for SyncroPatch 384, Tom Goetze [et al.]	91
Three-colour Photopharmacology: Chromatically Orthogonal Photocages for Precision Optical Control of G-protein Coupled Receptors, Eszter Kozma [et al.] . .	92
How to time GltTk transporter: towards kinetic probing with photo-triggered substrate release, Quynh Le [et al.]	94
Photoresponsive prodrug-based loaded nanoparticles for enhanced anti-retinoblastoma therapy, Jia Li [et al.]	95
Photocontrolled hERG Channel Blockade by Diazirine Integrated into BeKm-1 Pharmacophore, Mathilde Poulet [et al.]	96
Multiplexing: Caging the central step in chemigenetic ligation for multipurpose imaging and photocontrol, Jan Philip Prohaska [et al.]	98
TOWARDS IN VIVO BRAIN BIOLUMINOGENESIS OF A G PROTEIN-COUPLED RECEPTOR PHOTODRUG, Glòria Salort [et al.]	99
Switching Pain On and Off with Light: Photopharmacology and Drug-Free Analgesia through Two-Pore-Domain K ⁺ Channels, Guillaume Sandoz	101
Targeted covalent photoswitch for two-photon control of endogenous receptors, Ramona Santini [et al.]	102
Rhodamine-based photocages in chemical biology and drug delivery, Molnár Tibor [et al.]	103
Limiting the phototoxicity of meso-Methyl BODIPY photocages using Contact-Ion Pair stabilization strategies., Quentin Vivien [et al.]	104
Photocaging Enables Optical Control of S-acyltransferase Activity in Mammalian Cells, Jana Volaric [et al.]	106
Photocontrolled Delivery of a STING Agonist Using Photoresponsive Lipid Nanoparticles, Shuxian Wen [et al.]	108
Metronomic photodynamic immunotherapy via wireless LED-triggered drug release for postsurgical care of breast cancer, Yichi Zhang [et al.]	109

NIR-responsive Ru-COUBPY complexes as potent next-generation phototherapeutic agents, Diego Abad-Montero [et al.]	111
Arylazopyrazoles enable high affinity photoswitchable inhibitors of N-myristoyltransferase, Lisa Dollhopf [et al.]	113
PhotoCORMs Rhenium(I) complexes: impact of isomerism on 1O ₂ /CO production, Alexis Grosjean [et al.]	115
Recent progress in the photopharmacology of select potassium and calcium channels, Michael Kienzler [et al.]	117
LIGHT-INDUCED PHOTOTHERMAL TRANSPORT OF ION AND WATER CHANNELS MEDIATED BY A TWO-PHOTON-RESPONSIVE MOLECULAR TRANSDUCER, Kirrthana Makenthirathan [et al.]	118
Optimized xanthenium photocages with fused ring systems for photoactivated chemotherapy and GPCR photopharmacology, Tibor Molnár [et al.]	120
Restoration of edge detection and visually guided behavior in ambient white light with photoswitchable small molecules, Joaquín Martínez Tambella [et al.]	121
Azoheteroarene-stapled peptides for the photoregulation of protein-protein interactions, Sinead Mc Cann [et al.]	123
A novel non-invasive photoswitchable molecule restores light sensitivity and visual acuity in blind animal models, Santiago Milla Navarro [et al.]	125
Novel 3D-Printed Biophotonic Scaffold Displaying Luminescence under Near-Infrared Light for Photopharmacological Activation, Ekin Opar [et al.]	127
When Light Meets Protein Kinase Inhibition: The Promise and Obstacles of pi-Extended Coumarin as Photolabile Protecting Groups, Sandrine Piguel [et al.]	129
Photocontrol of zebrafish behavior with a photoswitchable antagonist of $\alpha 7$ nicotinic acetylcholine receptors, Nayeli Fernanda Pérez [et al.]	130
Spatiotemporal Control of Inflammation via Light-Responsive Anti-Inflammatory Agents, Álex Pérez-Sánchez [et al.]	131
Light-controlled modulation of neuronal activity with photoswitchable sodium channel blockers, Ailín Ramírez Abreu [et al.]	133

Light-Regulated Agonists Spatiotemporally Activating the Vitamin D Receptor Mitigate Psoriasis-like Inflammation in Mice without Inducing Hypercalcemia, Prieto Rivero [et al.]	134
X-ray activated Photopharmacology, Albert Schulte [et al.]	136
Obtaining Optical Control of the Glucocorticoid Receptor, Zoe Sessions [et al.] .	137
Validation of mGlu6 as novel photoswitchable drug target to restore vision, Rosalba Sortino [et al.]	138
Silencing alanyl-tRNA synthetase AARS1 Gene Based on Photosensitive Lipid Nanoparticles for Esophageal Cancer Immunotherapy, Huiyan Sun [et al.]	140
Computational Design of Photoswitchable Aspirin Analogues for Targeted Inflammation and Metastasis Control, Alba Villar-Yanez	141
A Novel Photoresponsive Curcumin-PAMAM Conjugate for Co-Delivery of VEGF siRNA and Chemotherapeutics in Uveal Melanoma, Jinming Xing [et al.]	142
Multifunctional BODIPY Photocages for Photoactivatable Combination Therapy, Chang Yang [et al.]	143
Development of Photoswitchable Cholesterol Derivatives through Side Chain Replacement, Michael Zott [et al.]	144
Session 4: Brain, diseases and photopharmacology	145
In Silico to in Cerebro - Development of the Orexin Receptor Antagonist ‘Photorexant’ for Photomodulation in Vitro and in Mouse Brains, Marcus Angermann [et al.]	146
Optochemical modulation of cold-activated TRPM8 channels, Jose Miguel Arcas [et al.]	148
Light-controlled uncaging of a mGlu4 positive allosteric modulator restores social behavior in a mouse model of autism, Florian Bolot [et al.]	150
Targeting epilepsy with photoactivatable drugs in post-surgical human brain tissue, Mayan Baues [et al.]	152
Photoactuation of mGlu5–Homer Interactions to Control Synaptic Plasticity, Nathalie Bouquier [et al.]	154
Control of Wildtype Zebrafish Optomotor Response with a Photoswitchable Drug, Luisa Camerin [et al.]	156

Photocontrol of muscarinic receptor activity in the mouse somatosensory cortex monitored by two-photon calcium imaging, Víctor Cilleros-Mañé [et al.]	158
Functional mapping of the extrasynaptic dopaminergic neurotransmission and dopaminergic circuits of <i>C. elegans</i> , Susana Colinas Fischer [et al.]	160
A photoswitchable cannabinoid enables precise, low-side-effect seizure control in a mouse model of drug-resistant epilepsy, Dimitri De Bundel [et al.]	161
Photoswitching endogenous glutamate receptors in neural ensembles and single synapses in vivo, Aida Garrido Charles [et al.]	163
Light-Activated Agonist-Potentiator of GABAA Receptors for Reversible Neuroinhibition in Wildtype Mice, Galyna Maleeva [et al.]	165
Circuit-Specific Control of mGlu5 Receptors by Photopharmacology in Neuro-pathic Pain and Stroke Recovery, Serena Notartomaso [et al.]	167
Photomodulation of Plinabulin – a Tubulin Polymerization Inhibitor with low-nanomolar Toxicity, Angelika Seliwjorstow [et al.]	169
Photopharmacological Targeting of the Adenosine A1 Receptor: From Concept to Photochemical Pitfalls, Ruben Tack [et al.]	171
Investigating the role of peripheral metabotropic glutamate receptors mGlu5 in inflammatory pain using photopharmacology, Laura Tournois [et al.]	172
Towards Therapeutic Innovation in Temporal Lobe Epilepsy: Spatially Selective and Closed-loop Adenosinergic Modulation of Dentate Gyrus Excitability through Photopharmacology, Marijke Vergaelen [et al.]	173
Bioorthogonal Chemistry of Water-Soluble Blue Fluorescent Coumarin-Substituted Azole Derivatives for Bioimaging and Bioconjugation Applications, Ilavarasan Vickraman [et al.]	175
Chromocontrol: Ideal Efficacy Photoswitching for Photopharmacology in vivo, Alexander Jimmy Wiegand [et al.]	176
Construction of Drug-Active Acylhydrazone Photoswitches for Photopharmacology, Zhiwei Zhang [et al.]	177
List of participants	177
List of sponsors	182

Photocontrol of muscarinic receptor activity in the mouse somatosensory cortex monitored by two-photon calcium imaging

Víctor Cilleros-Mañé ^{*† 1,2}, Nayeli Fernanda Pérez ^{1,2,3}, Ekin Opar ^{1,2,3},
Thomas Schidelko ⁴, Núria Camarero Palao ^{1,2}, Santiago Milla Navarro ^{1,5,6},
Joaquín Martínez Tambella ^{1,2,3}, Rosalba Sortino ^{1,2}, Hubert Gerwe ⁴, Carlo Matera ⁷,
Fabio Riefolo ^{1,2,3}, Galyna Maleeva ^{1,2}, Silvia Pittolo ^{1,2}, Michael Decker ⁴, Pau Gorostiza ^{1,2,8}

¹ Institute for Bioengineering of Catalonia [Barcelona] (IBEC) – Parc Científic de Barcelona
(PCB) Edifici Clúster c/ Baldri Reixac 10-1208028 Barcelona, Spain

² Centro Investigación Biomedica en Red Bioingeniería, Biomateriales y Nanomedicina - CIBER-BBN
(SPAIN) – Spain

³ Universitat de Barcelona - Doctorate Program (UB) – Spain

⁴ Julius Maximilian University of Würzburg, Institute for Pharmacy and Food Chemistry,
Pharmaceutical and Medicinal Chemistry – Germany

⁵ Universidad de Alcalá (UAH) – Pza. San Diego, s/n, 28801 - Alcalá de Henares (Madrid), Spain

⁶ Instituto Ramon y Cajal de Investigación Sanitaria [Madrid, Spain] (IRYCIS) – Ctra. de Colmenar
Viejo, Km. 9,100 Planta -2 derecha (Investigación) 28034 Madrid, Spain

⁷ Department of Pharmaceutical Sciences, University of Milan, 20133 Milan, Italy – Italy

⁸ ICREA, Catalan Institute for Research and Advanced Studies – Spain

Muscarinic acetylcholine receptors (mAChRs) contribute to both the facilitation and inhibition of cortical activity, with a role in attention, wakefulness and sleep states regulation. Acetylcholine is sensed by extrasynaptic mAChRs, which are present in all cortical layers where they modulate the excitability of pyramidal cells. Current pharmacological tools that regulate neural activity lack tissue selectivity and affect the entire nervous system and thus cannot be used to activate or inhibit selective regions on demand. On the other hand, photostimulation with optogenetics requires gene manipulation, which poses hurdles for clinical translation. Photopharmacology, the development of molecules with photoswitchable moieties that can be activated and deactivated with illumination, allows focalized switching, reduce adverse effects and enhances efficacy. Here we characterise a photoswitchable muscarinic activator derivative that is inactive in the dark and activates mAChRs when they are illuminated with tissue-penetrating amber light (590 nm). We combined the use of this light-responsive effector with two-photon calcium imaging to optically control neuron activity of the somatosensory cortex layer II/III. We demonstrate that a photoswitchable molecule and the application of patterns of light can be used to control drug activity on demand. Muscarinic activation with 590 nm light produced a clear difference in activity, whereas no changes in calcium activity were observed in the control group for the same illumination cycles. All mice recovered without behaviour impairments, which demonstrates that this compound does not produce acute toxicity. This photoswitchable

^{*}Speaker

[†]Corresponding author: vcilleros@ibecbarcelona.eu

drug is thus a unique tool to optically control muscarinic endogenous receptors in brain tissue *in vivo* and without genetic manipulation.

Keywords: Muscarinic, two photon, calcium imaging, in vivo, brain, mouse