PROGRAM OF COURSE

Discipline/Course: Structure-functions of ion channels
Number of credits: 02

Professors

- Prof. Romain Guinamard - France – PVB/CAPES-PRINT
- Prof. Fátima Regina Mena Barreto Silva – Federal University of Santa Catarina, Brazil.
- Fernanda Carvalho Cavalari (Pos-Doc – Pharmacy Postgraduate Program)/CNPq.
- Prof. Daniela Ota Hisayasu Suzuki - Federal University of Santa Catarina, Brazil.
- PhD Student - Guilherme Brasil Pintarelli - Federal University of Santa Catarina, Brazil.

Semester / Year: 2019.02

Period: From 9 to 24 November - For PhD and Master Students.
Maximum of 5 regular students and 3 pos-doc who have electrophysiology as an approach to develop part of their graduate project. An interview will be part of the selection of student in order to priories the projects related.

Total Schedule: 30 h

Aims: The course addresses the basic understanding of cellular electrophysiology, comprising first the physiological aspects of cells, the main recording techniques to evaluate cell bioelectricity and practical classes on patch clamp single channels.

Content

- Prof. Fátima RMB Silva and Prof. Romain Guinamard: Course presentation and introduction.

- Prof. Daniela Ota Hisayasu Suzuki and Guilherme Brasil Pintarelli (PhD Student):
  - Basic electricity and electrical measurements applied to electrophysiology studies (Electric potential/Voltage; Electrical current; Ionic currents; Electrical components, e.g. resistance and capacitance; Electrical properties of the cell membrane);
  - Introduction to instrumentation and patch clamping equipment (System mechanics and electronics; Signal conditioning; Pulse protocols; Artefacts);
  - Other electrical information (Electrical safety; Earthing; General precautions).

- Prof. Romain Guinamard and Pos-doc Fernanda Cavalari: Theoretical classes: Physiological principles of cellular bioelectricity: ionic distribution, plasma membrane, ion channels, resting potential in non-

excitable and excitable cells, action potential and electrical potentials recording techniques.

- Prof. Romain Guinamard: Theoretical classes: Basis for electrophysiological recordings: extracellular macroelectrodes, intracellular microelectrodes, patch-clamp, Analysis of ion channel recordings: single channel and whole-cell recordings analysis, conductance, ion selectivity and regulation. Structure-function of ion channels: molecular structure, pore architecture, selectivity filter, voltage sensor. Practical classes: Training in single channel recordings (five days) and Seminar in the lab and for PPG-BQA Seminars Program on the Prof. Romain Research: Roles of the TRPM4 channel in cardiac electrical activity and its perturbations, Ion channels at the onset of heart rhythm.

Programmatic Content and Schedule: Class hours will be distributed as follows: 2 credits, equivalent to 30 hours (3 hours per day in 10 days) corresponding to the participation in the discipline (from 9 to 24 November).

Bibliography

1) Patch Clamping - An Introductory Guide to Patch Clamp Electrophysiology, Areles Molleman.
2) Introduction to Electrophysiological Methods and Instrumentation Franklin Bretschneider and Jan R. de Weille
3) Bioimpedance and Bioelectricity Basics, Sverre Grimnes and Ørjan G Martinsen
4) Dee Unglaub Silverthorn. **Fisiologia humana**: Uma abordagem integrada. 7. ed. Porto Alegre: Artmed, 2017.
5) Margarida de Mello Aires. **Fisiologia**. 5° edição. Editora: Guanabara Koogan, 2018.
6) William F. Ganong. **Review of Medical Physiology**. 24st edition. Mcgraw-Hill, 2014.
7) Narahashi T. Principles of electrophysiology: an overview. Curr Protoc Toxicol. 2003; Chapter 11: Unit11.10. doi: 10.1002/0471140856.tx1110s17
8) Keller AF, Bouteiller JC, Berger TW. Development of a Computational Approach/Model to Explore NMDA Receptors Functions. Methods Mol Biol. 2017;1677:291-306. doi: 10.1007/978-1-4939-7321-7.17.

Papers related to the topics studied

Demion M, Guinamard R, Chemaly AE, Rahmati M and Bois P. An outwardly rectifying chloride channel in human atrial cardiomyocytes. Journal Cardiovascular Electrophysiology 17, 60-68, 2006. DOI: 10.1111/j.1540-8167.2005.00255.x

Guinamard R, Akabas MH. Arg352 is a major determinant of charge selectivity in the cystic fibrosis transmembrane conductance regulator chloride channel. Biochemistry 38, 5528-5537, 1999.

1) Schedule for 2019.2 Structure-functions of ion channels

SCHEDULE November/2019	ACTIVITY	CONFERENCIST
11 (Monday) 15 h – 17 h Classroom SIPG 01	Presentation and Introduction Theoretical Class: Cellular Bioelectricity I	Prof. Fátima RMB Silva Prof. Daniela OH Suzuki Guilherme Brasil Pintarelli
12 (Tuesday) 14 h –17h Classroom SIPG 01	Theoretical Class: Cellular Bioelectricity I	Dr. Fernanda Cavalari Prof. Romain Guinamard
13 (Wednesday) 14h – 17h Classroom SIPG 01	Theoretical Class: Cellular Bioelectricity II	Dr. Fernanda Cavalari Prof. Romain Guinamard
14 (Thursday) 9h – 12h Classroom SIPG 01	Practical class :Training in single channel recordings	Prof. Romain Guinamard Dr. Fernanda Cavalari Prof. Fátima RMB Silva
15 (Friday) FERIADO	Practical class :Training in single channel recordings	Prof. Romain Guinamard Dr. Fernanda Cavalari Prof. Fátima RMB Silva
18 (Monday) 9h – 12h Classroom SIPG 01	Practical class :Training in single channel recordings	Prof. Romain Guinamard Dr. Fernanda Cavalari Prof. Fátima RMB Silva
19 (Tuesday) 14 h – 17h Classroom SIPG 01	Role of the TRPM4 channel in cardiac electrical activity and it's perturbations	Dr. Romain Guinamard Dr. Fernanda Cavalari Prof. Fátima RMB Silva
20 (Wednesday) 14 h – 17 h Electrophysiology & Patch Clamp Laboratory	Practical class :Training in single channel recordings	Dr. Romain Guinamard Dr. Fernanda Cavalari Prof. Fátima RMB Silva
21 (Thursday) 9 h – 12 h Electrophysiology & Patch Clamp Laboratory	Practical class :Training in single channel recordings	Dr. Romain Guinamard Prof. Fátima RMB Silva
22 (Friday) 14 h – 17 h Electrophysiology & Patch Clamp Laboratory	Practical class :Training in single channel recordings and departure	Dr. Romain Guinamard Prof. Fátima RMB Silva