



## CURSO DE POSTGRADO

### *Basic Concepts in Cell Signaling*

Nombre Curso

SEMESTRE

1º

AÑO

2017

PROF. ENCARGADO

Andrew Quest  
Sergio Lavandero

14.672.243-1  
06.770.894-6

Nombre Completo

Cédula Identidad

**Advanced Center for Chronic Diseases (ACCDiS), Center for Molecular Studies of the Cell (CEMC) & Instituto de Ciencias Biomédicas, Facultad de Medicina, Universidad de Chile**

UNIDAD ACADÉMICA

TELÉFONO

+562 2978 6849  
+562 2978 2919

E-MAIL

[aquest@med.uchile.cl](mailto:aquest@med.uchile.cl)  
[slavander@uchile.cl](mailto:slavander@uchile.cl)

TIPO DE CURSO

Avanzado

(Básico, Avanzado, Complementario, Seminarios Bibliográficos, Formación General)

|                          |       |
|--------------------------|-------|
| CLASES                   | 30 H  |
| SEMINARIOS               | 27 H  |
| PRUEBAS                  | 3 H   |
| TRABAJOS                 | 20 H  |
| Nº HORAS PRESENCIALES    | 60 H  |
| Nº HORAS NO PRESENCIALES | 90 H  |
| Nº HORAS TOTALES         | 150 H |

CRÉDITOS

5

(1 Crédito Equivale a 30 Horas Semestrales)

CUPO ALUMNOS

5

(Nº mínimo)

25

(Nº máximo)

PRE-REQUISITOS

A reasonable understanding of cell and molecular biology. Ability to read and understand papers in English. Successful completion of this course will be considered an obligatory prerequisite to subsequent participation in signaling courses that may be offered later (for instance "Cell Signaling in Biomedicine")

INICIO

28 de Marzo 2017

TERMINO

06 de Junio 2017

DIA/HORARIO  
POR SESION

Martes 14:00 a 17:30 hrs.

DIA / HORARIO  
POR SESION

Miércoles 09:00 a 12:30 hrs.

LUGAR

**AUDITORIO CEMC, 1er piso, Block B, Programa de Fisiopatología. Facultad Medicina, Universidad de Chile**

Escuela De Postgrado (Sala a determinar) u otro lugar

## METODOLOGÍA

The course will last 9 weeks and consist of 1-2 lectures one day (Wednesday) followed by a discussion of 2 papers dealing with the respective topics the following week (Tuesday)

## EVALUACIÓN (INDICAR % DE CADA EVALUACION)

Students will be evaluated in 3 ways:

- Oral participation in discussion of papers every week (40%)
- Answer in writing to questions during the semester (20%)
- Final oral exam (40%).

Grades from these activities will be averaged taking into account the percentiles indicated to generate the final grade for the course

## PROFESORES PARTICIPANTES (INDICAR UNIDADES ACADEMICAS)

- Molecular & Cell Biology Program, ICBM: Lisette Leyton Ph.D (Professor), Andrew Quest Ph.D. (Professor) and Sergio Lavandero Ph.D (Professor).
- Department of Biochemistry & Molecular Biology, Faculty of Chemical and Pharmaceutical Sciences: Mario Chiong Ph.D (Associate Professor) and Sergio Lavandero Ph.D (Professor).

## DESCRIPCIÓN

In this course basic to advanced knowledge in a number of signaling pathways relevant to the development of human diseases will be discussed. The importance of protein targeting, supramolecular complex formation and subcompartmentalisation of signaling molecules will be emphasized.

## OBJETIVOS

**Main objective:** Understand mechanisms of signal transduction and underlying principles.

## CONTENIDOS/TEMAS

**Specific aims:** Advanced lectures on signaling pathways involving receptors (Tyrosine kinases, G-protein-coupled, cytokine, nuclear) the universal second messengers (Calcium, cyclic AMP and cyclic GMP, lipid second messengers, etc), protein kinases (src, raf-MAPK, PKC, etc.), phosphatases, proteases, downstream effector molecules, as well as a discussion of the relevant literature.

## BIBLIOGRAFIA BASICA

- Molecular Cell Biology, Second Edition, Scientific American Books. Authors: James Darnell, Harvey Lodish, David Baltimore.
- Chapter of the book (12): Cell Structure and Function (490-491).
- Chapter of the book (19): Cell-to-Cell Signaling: Hormones and Receptors (709-762).

## BIBLIOGRAFIA RECOMENDADA

- Invited Commentary How To Write A Scientific Article. Barbara J. Hoogenboom, Robert C. Manske. The International Journal of Sports Physical Therapy | Volume 7, Number 5 | October 2012 | Page 512-517
- The structure and function of G-protein-coupled receptors. Daniel M. Rosenbaum, Søren G. F. Rasmussen & Brian K. Kobilka. Insight Review Nature|Vol 459|21 May 2009. Page 356-363.
- The Arrestins: Multifunctional Regulators of G Protein-coupled Receptors. Jeffrey S. Smith and Sudarshan Rajagopal. The Journal Of Biological Chemistry Vol. 291, No. 17, Pp. 8969–8977, April 22, 2016.
- Csk Can Discriminate Between. Tail-Phosphorylated and Unphosphorylated c-Src. Brown and Cooper. Cell 134, Page 124-134, July 2008.
- Cell signaling by receptor tyrosine kinases. Mark A. Lemmon and Joseph Schlessinger. Cell 141, Page 1117- 1134 June 25, 2010.
- The Src, Syk, and Tec family kinases: Distinct types of molecular switches. J. Michael Bradshaw. Cellular Signalling 22 (2010) Page 1175–1184.
- The versatility and universality of calcium signalling. Michael J. Berridge, Peter Lipp and Martin D. Bootman. Nature Reviews | Molecular Cell Biology Volume 1 | October 2000 | Page 11-21.
- Why calcium? How calcium became the best communicator. Ernesto Carafoli and Joachim Krebs. The Journal Of Biological Chemistry Vol. 291, NO. 40, Page 20849–20857, September 30, 2016.
- Structure, mechanism, and regulation of soluble adenylyl cyclases — similarities and differences to transmembrane adenylyl cyclases. Clemens Steegborn . Biochimica et Biophysica Acta 1842 (2014) Page, 2535–2547.
- Cyclic nucleotide research — still expanding after half a century. Joseph A. Beavo and Laurence L. Brunton. Nature | SEPTEMBER 2002 | VOLUME 3, Page 710.
- The phospholipid code: a key component of dying cell recognition, tumor progression and host–microbe interactions. AA Baxter, MD Hulett, and IKH Poon. Cell Death and Differentiation (2015) 22, Page 1893–1905.
- Many Ceramides. Yusuf A. Hannun and Lina M. Obeid. The Journal Of Biological Chemistry

Vol. 286, NO. 32, Page 27855–27862, August 12, 2011.

- Coordinating Erk/Mapk Signalling Through-Scaffolds And Inhibitors. Walter Kolch. Nature Reviews | Molecular Cell Biology Volume 6 | November 2005 | Page 827-837.
- Protein kinase C and other diacylglycerol effectors in cancer. Erin M. Griner and Marcelo G. Kazanietz. Nature Reviews | Cancer Volume 7 | April 2007 | Page 281-294.
- PI3K signalling: the path to discovery and understanding. Bart Vanhaesebroeck, Len Stephens and Phillip Hawkins. Nature Reviews | Molecular Cell Biology Volume 13 | March 2012 | Page 195-203.
- The Protein Kinase Complement of the Human Genome. G. Manning, D. B. Whyte, R. Martinez, T. Hunter, S. Sudarsanam. Science VOL 298, (2002); Page 1912-1934.
- Making new contacts: the mTOR network in metabolism and signalling crosstalk. Mitsugu Shimobayashi and Michael N. Hall. Nature Reviews | Molecular Cell Biology Volume 15 | March 2014 | Page 155-162.
- Emerging roles of nuclear protein phosphatases. Greg B. G. Moorhead, Laura Trinkle-Mulcahy and Annegret Ulke-Lemée. Nature Reviews | Molecular Cell Biology Volume 8 | March 2007 | Page 234-244.
- Protein tyrosine phosphatases: from genes, to function, to disease. Nicholas K. Tonks. Nature Reviews | Molecular Cell Biology Volume 7 | November 2006 | Page 833-846.
- Proteolysis: from the lysosome to ubiquitin and the proteasome. Aaron Ciechanover. Nature Reviews | Molecular Cell Biology Volume 6 | January 2005 | Page 79-86.
- Proteasomes and their kin: Proteases in the machine age. Cecile M. Pickart\* and Robert E. Cohen. Nature Reviews | Molecular Cell Biology Volume 5 | March 2004 | Page 177-187.
- Structural perspective of cooperative transcription factor binding. Ekaterina Morgunova and Jussi Taipale. Current Opinion in Structural Biology 2017, 47: Page 1–8.
- Transcription factor–DNA binding: beyond binding site motifs. Sachi Inukai, Kian Hong Kock and Martha L Bulyk. Current Opinion in Genetics & Development 2017, 43: Page 110–119.
- Lattices, rafts, and scaffolds: domain regulation of receptor signaling at the plasma membrane. Patrick Lajoie, Jacky G. Goetz, James W. Dennis, and Ivan R. Nabi. J. Cell Biol. Vol. 185 No. 3 Page 381–385.
- Lipid Rafts As a Membrane-Organizing Principle. Daniel Lingwood and Kai Simons. Science VOL 327, (2009); Page 46-50.

**Calendario de actividades  
BASIC CONCEPTS CELL SIGNALING 2017**

|    |           | FECHA           | HORAS PRESENCIALES | HORAS PRESENCIALES | DESCRIPCION ACTIVIDAD  | PROFESOR                   |
|----|-----------|-----------------|--------------------|--------------------|--|----------------------------|
| 1  | Tuesday   | 28 March        | 14.00 - 15.30      | 1.5                | General Introduction Part A. How to write and analyze a research grant | A Quest                    |
|    |           | 28 March        | 16.00 - 17.30      | 1.5                | General Introduction Part B. How to write and analyze a paper          | S Lavandero                |
|    | Wednesday | 29 March        | 09.00 - 12.30      | 3                  | Journal Club-1   | S Lavandero<br>A Quest     |
| 2  | Tuesday   | 04 April        | 14.00 - 17.30      | 3                  | First messengers<br>G protein coupled receptors                        | S Lavandero                |
|    | Wednesday | 05 April        | 09.00 - 10.30      | 1.5                | Tyrosine kinases   | L Leyton                   |
|    |           | 05 April        | 11.00 - 12:30      | 1.5                | Non-receptor tyrosine kinases  | L Leyton                   |
| 3  | Tuesday   | 11 April        | 14.00 - 17.30      | 3                  | Journal Club-2   | S Lavandero<br>L. Leyton   |
|    | Wednesday | 12 April        | 9:00 - 12:30       | 3                  | Non-lipid second messengers  | S. Lavandero               |
|    |           | <b>19 April</b> | <b>CENSO</b>       |                    |  |                            |
|    | Wednesday | 18 April        | 09.00 - 12.30      | 3                  | Lipid second messengers  | A. Quest                   |
| 4  | Tuesday   | 25 April        | 14.00 - 17:30      | 3                  | <b>Journal Club -3 y 4</b>   | A. Quest -<br>S. Lavandero |
|    | Wednesday | 26 April        | 09.00 - 12.30      | 3                  | Kinases I: PKC, PI3K, MAPKs  | A. Quest                   |
| 5  | Tuesday   | 02 May          | 14.00 - 17.30      | 3                  | Journal Club-5   | A. Quest                   |
|    | Wednesday | 03 May          | 09.00 - 12.30      | 3                  | Kinases II: AMPK -mTOR-big MAPK  | M. Chiong                  |
| 6  | Tuesday   | 09 May          | 14.00 - 17.30      | 3                  | Journal Club 6   | M. Chiong                  |
|    | Wednesday | 10 May          | 09.00 - 12.30      | 3                  | Phosphatases, Proteases  | A. Quest                   |
| 7  | Tuesday   | 16 May          | 14:00 - 17:30      | 3                  | Journal Club-7   | A. Quest                   |
|    | Wednesday | 17 May          | 09:00-12:30        | 3                  | Transcription Factors  | M. Chiong                  |
| 89 | Tuesday   | 23 May          | 14.00 - 17.30      | 3                  | Journal Club-8   | M. Chiong                  |
|    | Wednesday | 24 May          | 09:00 - 12.30      | 3                  | Signaling organization & compartmentalization                          | A. Quest                   |
| 09 | Tuesday   | 30 May          | 14.00 - 17.30      | 3                  | Journal Club-9   | A. Quest                   |
|    | Wednesday | 31 May          | 09.00-12.30        | 3                  | Summary discussion   | A. Quest                   |
| 10 | Tuesday   | 06 June         | 14.00 - 17.30      | 20                 | Oral exam  | All                        |

