

Master in Medical Biology of the University of Lausanne

Recommended knowledge before starting your master course

August 2024

Recommended knowledge in Cell Biology

- 1) Cell and cellular organelles (structure, function, visualization, isolation)
- 2) Methods in cell biology (Visualization, cell fractionation, isolation)
- 3) Intracellular compartments and proteintrafficking
- 4) Intracellular Vesicle traffic, secretion and endocytosis
- 5) Protein modification (phosphorylation, glycosylation, ubiquitylation)

References:

Molecular Biology of the Cell, 5th Edition, Alberts et al., 2008
or
Molecular Cell Biology, 6th edition, Lodish et al., 2008

Contact:

Olivier Staub
Tel. +41-21-692-5407
Olivier.Staub@unil.ch

Recommended knowledge in Metabolism

The following metabolic pathway should be known beforehand:

- Glycolysis
- Neoglucogenesis
- Glycogen synthesis
- Fatty acids and triglyceride synthesis
- Krebs cycle
- Protein translation

The basic regulation of receptor tyrosine kinases, G protein-coupled receptors, small GTP-binding proteins should also be known.

References

Biochemistry:
Devlin T.M, "BIOCHEMISTRY" (2010) John Wiley & Sons, Inc.

Signaling:
Handbook of Cell Signaling (Cell Biology) (Hardback) Edited by Ralph A. Bradshaw, Edited by Edward A. Dennis

Contact:

Christian Widmann
Tel. +41-21-692-5123
Christian.Widmann@unil.ch

Recommended knowledge cardiovascular diseases

PHYSIOLOGY OF THE CARDIOVASCULAR SYSTEM

Heart:

-anatomy

-electrical activity:

- the heart conduction system**
- cardiac action potential**
- electrocardiogram**
- excitation-contraction coupling**

-cardiac cycle

-cardiac output

- effect of sympathetic/parasympathetic system**
- Frank-Starling law**

Vascular system:

General concepts: pressure, resistance, Poiseuille equation

- Arteries, arterioles**
 - arterial pressure, compliance, systolic and diastolic pressure, effect of the sympathetic system**
- veins -venous pressure and blood volume, venous return**
- regulation of systemic blood pressure, baroreflexes**

References:

Medical Physiology, Boron et Boulpaep, Chapters 17-25

Contact:

Dario Diviani
Tel. +41-21-692-5404
Dario.Diviani@unil.ch

Recommended knowledge for **Immunology**

Basic concepts and topics to understand and know before starting the master course:

- 1) Function of different immune cells
- 2) Hematopoiesis and cell lineages
- 3) Lymphoid organ architecture and function
- 4) Innate immunity and inflammation
- 5) Adaptive immunity:
 - Antigen-sampling: strategies and cells
 - Antigen processing and presentation, MHC
 - Antigen recognition: strategies and receptors
 - Antigen receptors: generation, diversity, selection
 - Cellular and humoral immune response, memory
- 6) Principle of vaccination
- 7) Harmful immune responses: Allergy, autoimmunity and graft rejection

Prof. Werner Held and Prof. Sanjiv Luther

Recommended knowledge for **Cancer** biology

Basic concepts and topics to understand and know before starting the master course:

- 1) The 'nature' of cancer
- 2) Multistep tumorigenesis
- 3) Cellular oncogenes
- 4) Tumor suppressors

Prof. Nathalie Rufer and Prof. Fabio Martinon

References:

- *Janeway's Immunobiology, Kenneth Murphy et al., Garland Science, 10th edition (2022). Chapter 1 (36 pages): Basic concepts in Immunology*, downloadable as pdf from the master website (<https://cmshset.org/unil>). This textbook will also be the main reference for the immunology course in the 1st and 2nd master semester, and can be used for further reading (free online version via the UNIL library for registered students: <https://renouvaud1.primo.exlibrisgroup.com>).
- *Biological Hallmarks of Cancer, book chapter by D. Hanahan and R.A. Weinberg. p. 7-16 in 'Holland-Frei Cancer Medicine' (2017)(9 pages)*, downloadable version on the master website (<https://cmshset.org/unil>). For further reading on cancer: we recommend the Textbook "The Biology of Cancer" (Robert A. Weinberg), Garland Publishing Inc, 3rd edition 2023, that will be the main reference for the 1st and 2nd semester course (free online version via the UNIL library: <https://renouvaud1.primo.exlibrisgroup.com>). The latest and 3rd edition of it just came out in July 2023 and hopefully by spring we will have full

online access.

- 'Refresher training program' (Basic concepts in Immunology + The hallmarks of cancer) available on the master website (<http://cmshtet.org/unil>), including quiz, learning content including images/animations and downloadable pdf summaries. *For password see email.*

Prof. Julia Esser-von Bieren and Sanjiv Luther, August 2024

Recommended Knowledge in Neuroscience

- Anatomical organization of the nervous system (e.g. peripheral vs. central nervous system)
- Development of the peripheral and central nervous system
- Basic functional organization of the nervous system
- Cell types of the nervous system and their main functions (e.g. neurons, astrocytes, oligodendrocytes, microglia, neural stem cells)
- Fundamentals of electrical excitability, synaptic signalling (electrical and chemical) and neurotransmitter function
- Core concepts underlying perception and action
- Core concepts of learning and memory
- Core concepts of neurological and neuropsychiatric diseases

References

Textbooks:

Kandel et al., Principles of Neural Science – V Edition, McGraw-Hill, 2012
Squire et al., Fundamental Neuroscience – IV Edition, Elsevier Inc. 2014

Open resources:

[Foundations of Neuroscience - Open Textbook Library \(umn.edu\)](#)
[Introduction to Neuroscience - Open Textbook Library \(umn.edu\)](#)

Contact

Professor Marlen Knobloch

or

Professor Micah Murray

mastermb_neuro@unil.ch