



**Karolinska  
Institutet**

Course syllabus for

## **The Healthy Human 2, 30 credits**

Den friska människan 2, 30 hp

This course has been cancelled, for further information see Transitional provisions in the last version of the syllabus.

Please note that the course syllabus is available in the following versions:

Spring2008 , Autumn2008 , Spring2009 , Autumn2009 , Spring2010 , Autumn2011 , Spring2013 , Autumn2013 , Autumn2014 , Spring2015 , Autumn2015 , Spring2016 , Autumn2016 , Autumn2017 , Spring2018 , Autumn2019 , Spring2020 , Autumn2020 , Autumn2021

Course code	2LK002
Course name	The Healthy Human 2
Credits	30 credits
Form of Education	Higher Education, study regulation 2007
Main field of study	Medicine
Level	G1 - First cycle 1
Grading scale	Pass, Fail
Department	Department of Physiology and Pharmacology
Participating institutions	<ul style="list-style-type: none"><li>• Department of Microbiology, Tumor and Cell Biology</li><li>• Department of Medical Biochemistry and Biophysics</li><li>• Department of Neuroscience</li><li>• Department of Molecular Medicine and Surgery</li></ul>
Decided by	Pn för läkarprogrammet
Decision date	2007-03-13
Revised by	Programnämnd 2
Last revision	2013-04-23
Course syllabus valid from	Autumn 2013

## **Specific entry requirements**

12 HE credits from semester 1 on the Study Programme in Medicine. A student failing due to shortcoming in knowledge skills or attitudes, thus jeopardizing patient security and/or trust in medical care, could be assigned for a new clinical rotation only after having completed the individual plan.

## **Objectives**

The aims relate to the general learning outcomes of the whole Study Programme in Medicine. Aims concerning knowledge and understanding are structured according to the SOLO taxonomy: S1) simple

(e.g. know, identify), S2) compound (e.g. account for, describe), S3) related (e.g. analyze, relate to), and S4) extended (e.g. theorize, analyze). Practical skills outcomes are tiered according to Miller's pyramid: M1) know, M2) know how to carry out, M3) be able to show, and M4) be able to carry out professionally.

The specific aims of the in the course included parts:

Part 1: Hematopoiesis, the immune system, skin, circulation, body temperature regulation and respiration

Knowledge and understanding

Man in balance:

The student should be able to

- account for the blood circulation, the temperature regulation, the respiration, the hematopoiesis, the skin and the immune system regarding structure and function from cell- to organ system level (S2).
- be familiar with individual differences and differences related to sex and age in the structure and function of these systems (S1).
- account and analyse how the different systems interact in the control of the internal environment of the body (S3)
- be familiar with different ways to study morphology and function (S1).

Man in imbalance:  
The student should be able to predict, understand and account for how changed structure and function in these systems can lead to disease (S2-3).

Skills

The student should

- know to how one carries out ECG registration, orthostatic test, static and dynamic spirometry and blood gas analysis (M1).
- be able to measure and register pulse and blood pressure (M3).
- be able to identify respiratory sounds and heartbeats (M3).
- be able to demonstrate anatomical structures in dissected organs, in plastic models and in radiological images, and be able to identify tissues in histological preparations (M2).

Attitude

The student should

- know how knowledge of current body and function systems has been received and be able to separate scientifically based knowledge from best practice (S2).
- be able to sum up detailed knowledge concerning hematopoiesis, immune system, circulation and respiration to an overall picture (S3).

Part 2: The urinary organs, the body fluids, the endocrine system and reproduction

Knowledge and understanding

Man in balance:

The student should be able to

- account for the urinary organs, endocrine the structure and function of the bodies and the reproductive organs from cell- to organ system level (S2)
- account for how the urinary organs and endocrine system in collaboration with others factors participate in urine production, fluid balance and acid/base balance (S2-3).
- account for individual-, sex- and age related differences in structure and function concerning the urinary organs (S1-2) and be able to account for equivalent respect endocrine the system and the reproductive organs (S2).
- describe the above systems interact in the control of the internal environment of the body (S3).
- be familiar with different ways to study the morphology and function of the different systems (S1) .

Man in imbalance:

The student should be able to predict, understand and explain how changed structure and function can lead to disease (S2-3).

Skills

The student should

- know how one carries out renal clearance measurements and dehydration tests (M1).

- be familiar with basic principles of different methods to decide hormone level, as well as of some function tests of hormonal systems (M1).
- be familiar with basic methods in fertility investigations (M1).
- know principles for the interpretation of acid/base status (M2).
- be able to demonstrate anatomical structures in dissected organs, in plastic models and in radiological images, and be able to identify tissues in histological preparations (M2).

#### Attitude

The student should

- know to how knowledge of current body and function systems has been received (S1) and be able to separate scientifically based knowledge from best practice (S2).
- be able to sum up detailed knowledge of the structure and function to an overall picture of the urinary organs, the reproductive organs and the endocrine system (S3) .

#### Part 3: Human in motion

##### Knowledge and understanding

Man in balance:

The student should be able to

- account for the structure and function of the musculoskeletal system from cellular level to organ system level (S2)
- analyse the relationship between the anatomic preconditions of the musculoskeletal system and functional capacity (S3).
- account for how the musculoskeletal system changes during growth as well as aging, and be able to explain the beneficial effect of physical activity and training (S2).
- be familiar with individual and gender specific differences in the structure and function (S1) of the musculoskeletal system.

Man in imbalance:

The student should be able to predict, how changed structure and function in the musculoskeletal system can lead to disease and be able to give examples of both common hereditary variations and common abnormalities (S2-3).

#### Skills

The student should

- be able to show the musculoskeletal system anatomic structures on dissected bodies on plastic models and in radiological images and be able to identify current tissues in histological preparations (M3).
- be able to make a basic physical examination including being able to carry out function tests of joints and musculature (M3).
- know how to carry out work tests and electromyography (M2).

#### Attitude

The student should be able to

- add up detailed knowledge about the anatomy of the musculoskeletal system and function to an overall picture (S3).
- combine scientific source material and survey papers of the musculoskeletal system to be able to analyse the relationships between structure and function (S3).
- describe how the cooperation between the musculoskeletal system and other organ systems affect the individual's movements and physical capacity (S3).

#### Overall aims of scientific development (VetU)

##### Knowledge and understanding

The student should

- be able to account for basic scholarly concepts (S2) and be familiar with methods within medical basic research (S1).
- know various types of scholarly argumentation with relevance for both hypothesis generation and arguments in support of the reliability of results (S1).
- know The Helsinki Declaration and the historical account around the emergence of different research-ethical guidelines, also such that concern definitions of fraud in the research process (S1).

#### Skills

The student should

- be able to reflect on what scholarship is and be oriented how a scholarly environment functions (M2).
- be able to identify and characterise different scientific theoretical positions (M2).

Attitude

The student should be able to

- reflect over the importance of a scholarly and ethical attitude (S2).

Overall aims of professional development (PD).

Knowledge and understanding

The student should be able to

- define essential ethical concepts (S2).
- define basic concepts within medical psychology (S2).
- account for professional ethical rules and for different ethical systems that have relevance for medical ethics (S3)

Skills

The student should be able to

- distinguish ethical problems and also be able to analyse and argue rational around them (M4).
- distinguish psychological issues (M2).
- be able to bring a talk with patients in a patient-centered way (M2).

Attitude

The student should be able to

- counter both patients and close and colleagues and other concerned in a respectful way and be able to reflect on different interests that can stand on games (S3, M3).

## Content

The course is organised in four main parts and a completing fifth part. The fifth part consists of a written final examination that can be preceded by integrating and summarising elements. Primary care, professional development and scholarly development are integrated in the first three parts of the course, but implementing and achieving of aim for these activities are documented in the fourth part of the course.

Part 1: Hematopoiesis, the immune system, skin, circulation, temperature regulation and respiration 7,0 higher education credits

This part is divided in three sections. Both basic scientific and clinically active teachers participate in the teaching. The topic-specific core consists of the basic scientific disciplines macro and microscopical anatomy, physiology, medical biochemistry and immunology.

- Hematopoiesis, skin and the immune system: The blood components and properties. The importance of the blood for respiration, circulation, hemostasis, communication and transport. The histological structure of the skin and functions. The molecular, cellular and histological structure of the immune system and the normal functions of the system.
- Circulation: The basic morphology and characteristics of heart musculature. The anatomy, histology and normal functions and regulation of the heart and the blood vessels.
- Respiration: The anatomy and histology and normal functions and regulation of the lungs and the upper and lower airways.

In connection with the teaching of respective function area voluntary practical parts (laboratory sessions) that focuses on clinical examination methods are offered. Basic science and clinic are integrated in each function area, with examples drawn from pathophysiology and with illustrations from the primary care placement.

Disturbances in 'functional systems' that may be used and with integrating assignments constitute starting point for the learning:

- Hematopoiesis, skin and the immune system: Paleness, hemorrhagic disorder, fever, enlarged lymph nodes, lump in the groin, lump in the throat

- Circulation: Chest pain, heart murmurs, heart arrests, high blood pressure, low blood pressure, abnormal heart activity, faint/collapse, swelling in extremity, oedemas.
- Respiration: Dyspnea, respiratory sounds, respiration difficulties, cyanosis, cough unconsciousness/coma.

## Part 2: The urinary organs, the body fluids, the endocrine system and reproduction, 7,5 credits

This part is divided in three sections. Both basic scientific and clinically active teachers participate in the teaching. The subject-specific essence consists of the basic scientific disciplines macro- and microscopic anatomy, physiology and medical biochemistry and the clinical disciplines endocrinology, pediatrics, andrology, obstetrics and gynaecology.

- The urinary organs: The anatomy, histology and function of the kidneys and the urinary tract. Regulation of fluid, electrolyte and acid/base balance.
- Endocrinology: Hormone-producing cells, tissues and the histology and anatomy of the glands. The chemistry, production and effects of hormones, and the regulation of hormonal systems.
- Reproduction: The development, histology and anatomy of female and male external and internal genital organ. The structure of the pelvis and birth canal. Sex differentiation. The morphology and function of germ cells. The effects and regulation of gonadal hormones. Fertilisation. Pregnancy.

Basic science and clinical aspects are integrated in each 'functional system', with examples drawn from pathophysiology and with illustrations from the primary care placement.

Disturbances in 'functional systems' that may be used and integrating assignments as starting point for the learning:

- The urinary organs: Blood in urine, pain in urination, thick urethral strictures, urinary incontinence, large and small amount of urine, increased thirst, high blood pressure, abnormal heart activity, increased sweating.
- Metabolism and the endocrine system: tiredness, dizziness, head-ache, swelling, arrhythmia, high blood pressure, low vision, depression, sleep disorders, diarrhea, constipation, muscle weakness, weight loss, weight gain/overweight, increased hair growth, increased sweating, increased thirst.
- Reproduction: Pregnancy and labour, infertility and sexual dysfunction, abnormal vaginal bleeding, swelling in testicle and scrotum.

## Part 3: The human in motion (The musculoskeletal system and exercise), 5,5 credits

The part consists of 3 sections, which are provided by basic scientific and clinically active teachers. The topic-specific core of the part consists of the basic scientific disciplines macro and microscopical anatomy and physiology. The placement in the primary care is integrated with basic scientific teaching.

- Cell and tissue theory. Cell biology-related properties and the cell types. Bone, cartilage, tendon and muscle tissue morphology and the physiology of muscle fibres. The structure and internal organisation with muscle fibres and motor units. Innervation of both motor units, and of the sensory system of skeletal musculature, tendons and joints. Basic kinesiology (motion theory), that is general principles of joints and motion axes and the impact of muscles on the joints.
- The anatomy of the musculoskeletal system. The bases concerning the physical status of joints, muscles, in other words, the manual study of the musculoskeletal system. Radiological reproduction of the musculoskeletal system.
- Normal variations and development defect. Adaptation to physical work. Effects of physical training. Effects of aging. Certain basic disease concepts in the musculoskeletal system, inter alia those that are secondary to endocrine disorders.

Disturbances in 'functional systems' that may be used and thoroughly integrating assignments as starting point for the learning:

Asthenia, abnormal and unsteady gait, dyskinesia and tremor; pain in neck, shoulder and back, trauma and injury, and learning disability.

## Part 4: Scientific and professional development, 2,5 credits

The learning activities in scientific and professional development respectively, and primary care are performed during parts 1-3 but are formally documented in this separate part.

## Part 5: Integration and exam, 7,5 credits

The course is completed with a summary and integration of parts 1-3 and a final integrating written examination.

## **Blood, the Immune System, the Skin, Circulation, tempera..., 7.0 hp**

Grading scale: GU

## **Urogenital organs, Body Fluids, the Endocrine System, Rep..., 7.5 hp**

Grading scale: GU

## **The Musculoskeletal System and Exercise, 5.5 hp**

Grading scale: GU

## **Scientific and Professional Development, 2.5 hp**

Grading scale: GU

## **Integration and Examination, 7.5 hp**

Grading scale: GU

## **Teaching methods**

Part 1: Hematopoiesis, skin, the immune system, circulation and respiration

Hematopoiesis. skin and the immune system is light up with lectures, project work in groups about hematopoiesis, microscopy of blood, skin and lymphoid bodies and seminar in groups about the immune system. Exercise questions and self-assessment quiz are available for this section.

Learning goals regarding circulation, temperature regulation and respiration are achieved according to the principles of 'team-based learning' (TBL). Each subdivision of this section follow a process that amounts to

- The students prepare themselves through for example text material, laboratory and other practical sessions
- An individual diagnostic 'readiness' test which is handed in
- A diagnostic group test and a given account of the joint result
- One or more application problems which are carried out in groups and presented or discussed with teachers and other student groups.

Examples of preparatory activities, except text material, include microscopy of heart muscle, blood vessel, upper and lower airways and self-study in anatomy and demonstration of the anatomy of the chest. Furthermore, laboratory sessions about ECG, blood pressure measurement, auscultation of the heart sounds, static and dynamic spirometry, re-breathing of carbon dioxide are available.

Compulsory parts: presentation project work blood, presentation seminar the immune system, individual diagnostic tests regarding circulation, temperature regulation and respiration

Part 2: The urinary organs, the body fluids, the endocrine system and reproduction

Learning goals regarding the urinary organs and body fluids are achieved according to the principles of 'team-based learning' (TBL). Each subdivision of this section follow a process that amounts to

- The students prepare themselves through for example text material, laboratory and other practical sessions
- An individual diagnostic 'readiness' test which is handed in
- A diagnostic group test and a given account of the joint result
- One or more application problems which are carried out in groups and presented or discussed with

teachers and other student groups

Examples preparatory activities, except text material, include microscopy of urinary organ, group assignment about haemolysis, osmosis and tonicity, group assignment and seminars about acid-base balance, laboratory sessions about haemolysis, osmosis and tonicity and acid-base balance (computer-based). Applications problems involve acid-base balance and integrative problems involving all aspects of this subsection. The subsection is completed with an integrated seminar with application of knowledge in basic science in pathophysiological situations

The endocrine system and reproduction are illustrated by lectures and patient demonstrations, microscopy of endocrine and genital organs, demonstration of the anatomy the pelvic organs and a seminar in endocrinology. The subsection is completed with a diagnostic test in the form of oral examination with individual feedback. Part 2 is completed by a preparation exam with identification of anatomic and histological preparations concerning hematopoiesis skin, the immune system, circulation, respiration, urinary organs, endocrine the system and reproductive organs

Compulsory parts: Individual written diagnostic tests concerning urinary organs and body fluids , an oral test on the endocrine system and reproduction, preparation exam in anatomy and histology

#### Part 3: Human in motion

The locomotion system, musculature and exercise physiology is illustrated by lectures, seminars, microscopy of cartilage, leg, skeletal musculature, dissection of the musculoskeletal system and demonstration and practical exercises of examination technique for back, legs and arm. Furthermore is offered laboratory session in electromyography (EMG) and ergometry (exercise test on bicycle ergometer), demonstration of basic muscle functions on independent skeletal muscle fibre and seminar back function. Problem solving scholarly ability is exercised in a seminar about muscle function. The part is completed with a preparation test on the anatomy of the arm, the leg and the back and a presentation of a patient from the primary care with reduced locomotion or physical capacity.

Compulsory parts: Seminar muscle, preparation exam arm, legs and back, presentation patient with reduced ability to move or reduced physical performance

#### Part 4: Scientific and professional development

The aims of the scholarly development are clarified in lectures and group work and literature studies and individual reflections. Furthermore, group discussions of provided cases are carried out. The aims of the professional development are clarified with lectures and group work in medical ethics, lectures in medical psychology, lectures and group work around genders and diversity, and a workshop with a focus on the patient-physician relationship. In the school located teaching of the primary care, individual supervision in talks with patient (consultation) is given and one of these occasions should be video-recorded. Basic training in routine physical examination, training in auscultation of heart and lungs and blood pressure measurement and palpation of peripheral pulses, lymph nodes and thyroid gland. Sit in with physician and overview of replies from laboratory investigations. Medical history and physical examination of patient with movement restriction or reduced physical work capacity and compilation of made observations.

Compulsory parts: Lectures and group work in medical ethics, lectures and group work about gender, and workshop patient-physician relationship, four days at health care centres(primary care), video recording of patient communication and medical history and physical examination of patient with movement restriction or reduced physical capacity and compilation of made observations

#### Part 5: Integration and exam

The aims of the course are integrated mainly through self-study. Arisen questions from the course participants are answered and commented via the course web. The course is completed with a written examination where the expected learning outcomes of the basic scientific core in Part 1-3 are tested.

On occasions during the course, communication may be in English. As far as possible, the course participants are informed in advance when this takes place.

## Examination

Part 1 the "Haematopoiesis, the immune system, the skin, circulation, temperature regulation and respiration" are examined in the form of presentation of project work (blood) and seminar assignments

(immune system) and individual diagnostic tests concerning circulation, temperature regulation and respiration. The skill outcomes concerning auscultation of heart and lungs and blood pressure measurement be examined in the outpatient clinical teaching (primary care).

Part 2 the "Urinary organs, the body fluids, endocrine system and reproduction" are examined by individual diagnostic tests (urinary organs and body fluids) and one oral test (endocrine system and reproduction).

A joint examination is carried out on the anatomy and histology during the two first parts.

Part 3 the "Human body in movement" is examined by a seminar (muscle), preparation tests on the anatomy of the musculoskeletal system of the arm, the leg and the back, and in seminars presentation of patient case with movement restriction or in a different way reduced physical capacity.

For compulsory presentations of projects, group assignments and seminars and preparation tests and oral exams during part 1-3 there is one conditional pass occasion during the course. Make-up opportunities may have a form that differs from the regular session, e.g. a written examination or written assignment.

**Part 4: Scientific and professional development**

"Scientific progression" is examined through active participation in group discussions of theory of knowledge and research ethics

"Professional development" is examined through reflecting portfolio sheet. At insufficient portfolio sheets, the student must supplement according to instructions from examiner or responsible teacher for professional development. Which parts of the teaching of professional development that is compulsory be stated under working methods. In case of absence, a complementary written assignment is given.

The clinical teaching taking place within the primary care, attendance is required for passing the course. In case of absence, supplementary activities are assigned by the supervisor at the primary care centre. During the education in the primary care, certain learning and skill outcomes are examined as part of the professional development and Part 1.

**Part 5 Integration and exam**

For participation in the written exam it is required to have passed compulsory teaching parts under Part 1-3. Examination covers expected learning outcomes from the simple to the more complex where be given possibility to relate, compare, analyse and discuss different phenomena

Student who do not pass the regular examination are entitled to re-sit the examination at five more occasions. If the student has carried out six failed examinations/tests be given not any additional examination. For parts with clinical rotation applies as a rule that they can only be repeated once.

## **Transitional provisions**

If a course has been closed down or undergone major changes, at least two additional examinations (excluding regular examinations) in the previous contents are provided during a period of a year from the date of the change.

## **Other directives**

Evaluation will take place in accordance with the instructions of the Board of Education. Furthermore, evaluation will take place continuously during the course, with web-based questionnaires. Continuous dialogue with the course participants also takes place via an established course council.

The course director assesses if, and in that case, how absence from compulsory education elements can be taken again. Before the student has participated in the compulsory education elements or recovered absence in accordance with the instructions of course coordinator can not the learning outcomes final report slide. Absence from a compulsory education element can imply that the student can not recover the occasion until next time the course be given.

The examiner may with immediate effect interrupt a student's clinical rotation (VFU), or the equivalent, if the student demonstrates such serious deficiencies in knowledge, skills or attitudes that patient safety



or patient confidence in healthcare is at risk. When clinical rotation is interrupted according to this, it implies that the student fails in the current part, and that one clinical rotation opportunity is used up.

In such cases, an individual action plan should be set up for required activities and examinations, before the student is given a possibility for a new clinical rotation in the course.

## Literature and other teaching aids

*Feneis, Heinz; Dauber, Wolfgang*

### **Anatomisk bildordbok**

*Spitzer, Gerhard; Brinkman, Ingrid*

5., utökade uppl. /b [fackgranskning: Håkan Aldskogius] : Stockholm : Liber, 2006 - [4], 520 s.

ISBN:91-47-05301-1 LIBRIS-ID:10162715

URL: <http://www2.liber.se/bilder/omslag/100/4705301o.jpg>

[Library search](#)

*Moore, Keith L.; Dalley, Arthur F.; Agur, Anne M. R.*

### **Clinically oriented anatomy**

6. ed. : Philadelphia, Pa. : Wolters Kluwer Health/Lippincott Williams & Wilkins, cop. 2010 [dvs 2009] - xxix, 1134 s.

ISBN:978-1-60547-652-0 (international ed.) LIBRIS-ID:11309709

[Library search](#)

*Platzer, Werner*

### **Color atlas and textbook of human anatomy.n Vol. 1,p Locomotor system**

5. ed. : Stuttgart : Thieme, cop. 2004 - 462 s.

ISBN:3-13-533305-1 LIBRIS-ID:9212827

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*Moore, Keith L.; Agur, A. M. R.; Dalley, Arthur F.*

### **Essential clinical anatomy**

4. ed. : Philadelphia : Walters Kluwer Health/Lippincott Williams & Wilkins, cop. 2011 - xxviii, 703 s.

ISBN:978-0-7817-9915-7 LIBRIS-ID:11896498

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*Brunnström, Signe*

### **Brunnstrom's Clinical kinesiology.**

*Smith, Laura K.; Weiss, Elizabeth Lawrence; Lehmkuhl, L. Don*

5. ed. /b revised by Laura K. Smith, Elizabeth Lawrence Weiss, L. Don Lehmkuhl : Philadelphia : F.A. Davis, cop. 1996 - 468 s.

ISBN:0-8036-7916-5 LIBRIS-ID:5688170

[Library search](#)

*Snell, Richard S.; Snell, Richard S.t Clinical anatomy for medical students.*

### **Clinical anatomy**

7. ed. : Philadelphia : Lippincott Williams & Wilkins, cop. 2004 - x, 1012 s.

ISBN:0-7817-4315-X LIBRIS-ID:9023138

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### **Medical physiology : a cellular and molecular approach**

*Boron, Walter F.; Boulpaep, Emile L.*

Updated 2. ed. : Philadelphia, Pa : Saunders Elsevier, cop. 2012 - xii, 1337 s.

ISBN:978-0-8089-2449-4 (international ed.) LIBRIS-ID:12505054

[Library search](#)

*Rhoades, Rodney.; Bell, David R.*

**Medical physiology : principles for clinical medicine**

4th ed. : Philadelphia : Wolters Kluwer Health/Lippincott Williams & Wilkins, c2013. - xvi, 819 p.

ISBN:978-1 511-1039-5 LIBRIS-ID:14002815

[Library search](#)

*Rådmark och Wetterholm*

**Kompendium: Syror och baser. : Vattenlösningars egenskaper, osmos och tonicitet, elektrolyter**

2008

*Ross, Michael H.; Pawlina, Wojciech.*

**Histology : a text and atlas : with correlated cell and molecular biology**

6. ed. : Philadelphia : Wolters Kluwer/Lippincott Williams & Wilkins Health, c2011

ISBN:9781451101508 (International ed.) LIBRIS-ID:12030789

[Library search](#)

*Abbas, Abul K.; Lichtman, Andrew H.*

**Basic immunology : functions and disorders of the immune system**

3., updated ed. : Philadelphia, Pa. : Saunders, cop. 2011 - viii, 312 s.

ISBN:978-1-4160-5569-3 (inb.) LIBRIS-ID:11837232

[Library search](#)

*Brändén, Henrik; Andersson, Jan*

**Grundläggande immunologi**

*Engqvist, Jeanette; Sonesson, Johan*

3., [uppdaterade och omarb.] uppl. /b [illustrationer: Jeanette Engqvist samt Johan Sonesson] : Lund : Studentlitteratur, 2004 - 354 s.

ISBN:91-44-03073-8 LIBRIS-ID:9522851

[Library search](#)

**Immunobiology : the immune system in health and disease**

*Janeway, Charles A.*

6. ed. : New York : Garland, cop. 2005 - 823 s.

ISBN:0-8153-4101-6 (Garland) LIBRIS-ID:9293790

[Library search](#)

*Parham, Peter*

**The Immune System**

3rd ed. : New York : Garland Science, 2009

**Neuroscience**

*Purves, Dale*

5. ed. : Sunderland, Mass. : Sinauer Associates, cop. 2012 - xvi, 759 s.

ISBN:978-0-87893-695-3 (hbk.) LIBRIS-ID:12074995

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