Biomedical Laboratory Techniques

INSEGNAMENTO INTEGRATO: ONCOLOGY AND BLOOD DISEASES
NUMERO DI CFU: 11
SSD: MED/06, MED/15, MED/36
DOCENTE RESPONSABILE: EMILIANO FABIANI **E-MAIL:** emiliano.fabiani@unicamillus.org

MODULO: MEDICAL ONCOLOGY
NUMBER OF CFU: 5
SSD: MED/06
PROFESSOR (3 CFU) : GIUSEPPE PALMA e-mail: giuseppe.palma@unicamillus.org
PROFESSOR (2 CFU): MANUEL SCIMECA e-mail: manuel.scimeca@unicamillus.org

MODULO: BLOOD DISEASES, ONCOHEMATOLOGY:
NUMBER OF CFU: 5
SSD: MED/15
PROFESSOR: EMILIANO FABIANI e-mail: emiliano.fabiani@unicamillus.org

MODULO: DIAGNOSTIC IMAGING
NUMBER OF CFU: 1
SSD: MED/36
PROFESSOR: ERICA BASSETTI e-mail: erica.bassetti@unicamillus.org/

PREREQUISITES

The following basic concepts are needed:

- Knowledge of the general principles of medical terminology.
- Knowledge of normal and pathological human anatomy.
- Basic concepts of cell biology and primary notions on the structure and functions of nucleic acids (DNA and RNA) and proteins
- Basic knowledge of pathophysiology.
- Knowledge of the principles of biology and immunobiology of tumors, and of the cellular and molecular pathogenetic mechanisms that lead from neoplastic transformation and growth to invasion and metastasis.
- Knowledge of the principles of the physics of ionizing and non-ionizing radiation.

LEARNING OBJECTIVES

The essential objectives of the integrated course of "MEDICAL ONCOLOGY AND BLOOD DISEASES" are knowledge of the predisposing conditions and clinical characteristics of the solid and haematological neoplastic disorders, as well as, the prognostic and predictive factors of response according to the specific characteristics of both neoplasm and patient, as such as, the understanding of the haematolymphopoietic system and the pathophysiological alterations related to it.
The aim of the integrated course will also be to learn the principles of primary, secondary prevention and chemo-prevention in the field of solid and haematological tumors.
Emphasis will be placed on the role of tumor markers and molecules that can help to well define the diagnostic assessment.
It is also required to learn the main laboratory analysis systems, cell isolation and molecular

biology methods, biological sample preservation techniques and the application of biotechnology in the diagnosis and prognostic evaluation of the hematological patient. Students will have to possess the notions and principles relating to Diagnostic Imaging (including interventional radiology) to integrate the knowledge of the professional profile with those relating to diagnostic imaging technologies.
These objectives will be achieved through lectures aimed at improving students' learning capabilities in order to achieve useful skills for collaboration with multidisciplinary teams.
These objectives will be verified through intermediate and final evaluation tests.

LEARNING OUTCOMES

Knowledge and understanding
At the end of the integrated course of "MEDICAL ONCOLOGY AND BLOOD DISEASES" the student will have to demonstrate knowledge and understanding within the topics covered, as well as demonstrate autonomy in studying and understanding the research protocols and laboratory methodologies applied to them.

At the end of the course the student will be able to:

- be confidant with the main pathological conditions; appropriately use laboratory techniques and investigations to diagnose, stage and classify tumors;
- be confident with the principles of molecular biology, with modern molecular typing techniques of the main tumors, especially from an application point of view;
- be confident with modern treatment strategies and the main therapeutic tools.
- correctly analyze the medical history according to the diagnosis and treatment, with specific emphasis on the aspects that can predispose to cancer according to frailties;
- interact with medical specialists in order to share the most appropriate diagnostic-therapeutic path and in particular the diagnostic choices;
- appropriately identify the most appropriate clinical and laboratory tests for tumors;
- diagnose the main neoplasms (differential diagnosis with non-neoplastic conditions) and to share therapeutic decisions;
- identify the main elements of the hematopoietic system
- identify the main disease affecting the lymphohematopoietic system
- manipulate, amplify and store eukaryotic cells
- evaluate the human karyotype using conventional and molecular cytogenetic methods
- understand the flow cytometry data in the haematological field
- isolate nucleic acids (DNA and RNA) and proteins for haematological tests
- qualitatively and quantitatively amplify nucleic acids
- evaluate the diagnostic and prognostic role of gene mutations in oncohaematology
- understand the data achieved from the use of both old and new generation sequencing

Applying knowledge and understanding
At the end of the integrated course of "MEDICAL ONCOLOGY AND BLOOD DISEASES" the student will be able to:

- use the knowledge acquired to evaluate the most appropriate methodological approach to obtain the results required for the correct diagnostic and prognostic classification of the hematological and oncological patients.
- apply and develop new methodologies useful in the disciplinary context
- discuss and resolve, in collaboration with Colleagues, problems that arise during work procedures and experimental protocols.

- use the knowledge acquired for the independent study of aspects relating to the specific field to which the student will dedicate himself as part of his professional activity

Therefore, the course aims to promote in the student the ability to carry out precise and documented observations and to carry out a correct critical analysis with the aim of drawing verifiable generalizations.

Communication skills
At the end of the integrated course of "MEDICAL ONCOLOGY AND BLOOD DISEASES" students must be able to adequately describe the disorders studied and the specific technologies applicable to them, demonstrating that they have learned an appropriate scientific language for the purposes of correct and rigorous communication, in an interdisciplinary mediation perspective.

Making judgements
At the end of the course, the student will be able to independently develop the logical procedures and methodological strategies that allow to obtain, analyze and correctly interpret the experimental data required in the hematology and oncology fields. This autonomy will have to be reflected not only in the scientific field, but also in the ethical/social field.

Learning ability:
At the end of the course, the student will have acquired skills and learning methods suitable for deepening and improving their skills within the topics studied, also by consulting the available scientific literature.

COURSE SYLLABUS

MEDICAL ONCOLOGY (Professor Giuseppe Palma)

- General concepts of oncology
- Epidemiology of tumors and risk factors
- Hereditary tumors
- Cancer prevention
- Oncological diagnosis and tumor markers
- Tumor staging and prognostic factors
- Principles of anticancer therapy and integrated treatments, Integrated therapeutic strategies: adjuvant and neo-adjuvant therapy; palliative therapy and paraneoplastic syndromes.
- Medical therapy (chemotherapy, hormone therapy, immunotherapy)
- Toxicity of medical therapy, cancer cachexia and nutritional therapy
- Signs, symptoms and treatment of the most frequent cancers: lung cancer, gastrointestinal cancer, breast cancer, urogynecological cancer and skin cancers.

MEDICAL ONCOLOGY (Professor Manuel Scimeca)

- Carcinogenesis, Cell Growth and Proliferation.
- Immune Tolerance
- Molecular Biomarkers
- Novel Techniques for Oncological Marker Investigation
- Liquid Biopsy
- Tumor Tissue: Preservation, Diagnosis, and Biomarkers

- Principles of Personalized Medicine Applied to Oncology
- Preclinical Testing and the Future of Oncology
- Impact of Environmental Pollution on the Incidence of Major Human Cancers

BLOOD DISEASES AND ONCOHEMATOLOGY (Professor Emiliano Fabiani)

- Bone marrow nice
- Haematopoietic stem cell
- Haematopoiesis
- Anemia
- Clonal haematopoiesis
- Myelodysplastic syndrome
- Acute myeloid leukaemia
- Acute lymphoblastic leukaemia
- Myeloproliferative disorders
- Chronic myeloid leukaemia
- Lymphoma
- Peripheral blood sampling and bone marrow aspirate
- Haematological cell culture technics
- Peripheral blood and bone marrow smear
- Isolation of mono and polymorphonuclear cells
- Stem cell isolation: culture, amplification and cryopreservation
- Cytofluorimetry
- Karyotype aberrations: conventional and molecular cytogenetics (FISH)
- Diagnostic and prognostic role of molecular biology in oncohaematology
- Extraction and storage of nucleic acids (DNA and RNA) for haematological tests
- Basic techniques in molecular biology: nucleic acids amplification
- Qualitative analysis (PCR and RT-PCR), diagnostic approach
- Minimal residual disease
- Qualitative analysis (PCR and RT-PCR), prognostic approach
- Gene mutations
- Sanger sequencing
- New generation sequencing and personalized medicine: applications, progress, costs and benefits

DIAGNOSTIC IMAGING (Professor Erica Bassetti)

- General principles of ionizing and non-ionizing radiation
- Diagnostic imaging equipment
- Conventional radiology equipment overview of the equipment and their use
- Computed Tomography equipment overview of the equipment and their use
- Radiology equipment for panoramic interventional radiology applications of equipment and their use
- Radiology equipment for panoramic radiotherapy applications of equipment and their use

- Evaluations on the dose to be administered to the patient
- Targeted choice of the exam to be carried out based on the clinical problem
- Dose / benefit ratio
- Elements of multidisciplinary radiological anatomy

COURSE STRUCTURE

The integrated course of "MEDICAL ONCOLOGY AND BLOOD DISEASES" is divided into 110 hours of frontal and interactive lessons (50 hours of Medical Oncology, 50 hours of Blood Diseases and Onco-hematology and 10 hours of Diagnostic Imaging) carried out using teaching tools such as presentations organized in "Powerpoint" files with explanatory diagrams, graphs, illustrations and images designed to facilitate understanding of the topics covered.
The students' preparation and learning status will be continuously monitored during the lessons. Journal club and clinical case discussion will be used to demonstrate the practical application of what has been learned.
Ongoing tests are planned to evaluate the level of understanding of the topics covered. Attendance is mandatory.

MODALITÀ DI VERIFICA DELL'APPRENDIMENTO/COURSE GRADE DETERMINATION

The exam includes a written test in Medical Oncology which will be averaged with the oral test of the Medical Oncology module only.
The written test consists of multiple choice questions, with only one correct answer, on topics covered in class.
To access the oral test in Medical Oncology the student must have achieved at least 18/30 in the written test.
In the oral tests of "Medical Oncology", "Blood Diseases and Onco-hematology" and "Diagnostic Imaging" the student will have the opportunity to demonstrate his preparation by discussing the topics of the course and the problems inherent to the topics covered, demonstrating that he has acquired the ability to express his opinion in an appropriate scientific language. The final evaluation will be the result of a weighted average of the results of the 3 modules, calculated in relation to the number of credits associated with each module (Medical Oncology 5 CFU, Blood Diseases and Onco-Hematology 5 CFU and Diagnostic Imaging 1 CFU) .
The result will be communicated to the student after the collegial judgment of the integrated course, established according to the following criteria:

Not suitability: important shortcomings and/or inaccuracy in the knowledge and understanding of the topics; limited analysis and synthesis skills, frequent generalizations.
18-20: Knowledge and understanding of the topics is just sufficient.
21-23: Discreet Knowledge and understanding of the topics.
24-26: Good knowledge and understanding of the topics.
27-29: Full knowledge and understanding of the topics.
30-30L: Excellent level of knowledge and understanding of the topics.

READING MATERIALS

MEDICAL ONCOLOGY

- Chmielowski B., Territo M.C. Manual of Clinical Oncology. Ed: Lippincott Williams and Wilkins. ISBN 9781496349576
- Bianco, De Placido, Tortora & Conte, Core curriculum di Oncologia Clinica 2/ed Mc Graw Hill Education (Italy)
- Harrison, Principi di Medicina Interna, Ed CEA 2016- capitoli dedicati alle malattie neoplastiche
- The slides and the articles shown during the course will be made available to the student and will constitute the reading material for the course of Medical Oncology

Testi MALATTIE DEL SANGUE E ONCOEMATOLOGIA/ BLOOD DISEASES, ONCOHEMATOLOGY

- Hematology: pathophysiology, diagnosis and treatment. Sante Tura, Michele Cavo e Pier Luigi Zinzani. Casa editrice Esculapio.
- Corso di Malattie del Sangue e degli Organi Emolinfopoietici. Sante Tura, Michele Cavo e Pier Luigi Zinzani. Società editrice Esculapio.
- The slides shown during the course will be made available to the student and will constitute the reading material for the haematological diagnostic techniques.

Testi DIAGNOSTICA PER IMMAGINI/DIAGNOSTIC IMAGING

- Compendio di Radiologia R. Passariello, G. Simonetti.
- The slides and the articles shown during the course will be made available to the student and will constitute the reading material for the course of Diagnostic Imaging