

MOLECULAR ONCOLOGY MASTER - EDITION 2025-2026	
SUBJECT	CLASS
MOLECULAR BASIS OF CANCER	Eukaryotic cell
	The carcinogenesis process. Normal cells vs tumor cells
	The human genome: genes and genetic code
	Epigenetics and Cancer
	Regulation of gene expression
	Regulation of gene expression by nuclear receptors
	Metabolism, mitochondria and Cancer
	Genes and Cancer I. Proto-oncogenes and oncogenes: current state
	Genes and Cancer II. Suppressor genes and genetic predisposition to cancer
	Mutations and DNA repair mechanism
	Epigenetic modulation of aggressive tumours
PROTO ONCOGENES AND ONCOGENES	Main signalling pathways in Molecular Oncology
	Biological basis of treatments against growth factors and tyrosine kinase receptors. VEGF and HER receptors
	The HER/c-ERBB family. Biology and implication in breast cancer
	Oncogene RAS family, its adaptors and effectors
	Cell Cycle: retinoblastoma, cyclins, CDKs and cancer
	The MYC gene family
	Mitogen signal transduction. RET and the multiple endocrine neoplasia
	Signal transmission through JAK STAT-associated receptors
	Fusion gene BCR-ABL and other fusion oncogenes in myeloid leukemia
	Interpretation of cancer genomes
	Computational analysis of mutations in human tumours. Therapeutic implications.
TUMOR SUPPRESSOR GENES	The PI3K-PTEN-AK-mTOR pathway: survival and cell growth
	PI3K and breast cancer
	Genetic basis of hereditary breast and ovarian cancer
	TGF-beta: carcinogenesis effects
	TGF-beta and gliomas
	Hedgehog pathway and cancerogenesis
	Gene suppressor APC and the Wnt/beta-catenin pathway
	DNA repair genes. Mutator phenotype and epigenetics
	The gene TP53: structure and biological activity. The TP53-MDM2-1RF pathway
	TP53: mutations and their effects
	The Notch pathway in cancerogenesis
The Hippo pathway and cancer	
CELLULAR PROCESSES INVOLVED IN CARCINOGENESIS	Molecular basis of metastasis
	Brain Metastases
	Cell adhesion and cancer: E-cadherin. Epithelium-mesenchyme transition
	Tumor stroma
	Cell migration: Integrins, c-MET
	Microenvironment and metastasis
	Cancer immunology
	How the tumors evade the immune response?
	Inflammation and Cancer
	Apoptosis and necrosis
	Cannabinoids and cancer
Angiogenesis and tumoral lymphangiogenesis	
Mechanism of action of the antiangiogenic agents	
Cancer Stem Cells (CSC) in colorectal cancer. Organoids.	
MOLECULAR PATHOLOGY TECHNIQUES	The future of Molecular Pathology
	Introduction to molecular pathology
	Introduction to special techniques in histopathology
	Markers for immunotherapy in cancer
	Introduction : Techniques based on DNA analysis
	Introduction to new generation sequencing techniques (NGS)
	Next-generation sequencing: data analysis
	Gene expression analysis, from qPCR to spatial transcriptomics

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	MicroRNAs and ncRNAs: Increasing the possibility for Personalized Medicine in Cancer
	Cancer pharmacoepigenetics: genes and drugs
	Introduction to Proteomics
	Stratified Medicine (Biomarkers) or Personalized Medicine (Model-omics)?
	Biobanks: an old activity and a new discipline
	Discovering genetic biomarkers for personalized cancer therapy
	Flow Cytometry
	Spatial genomics
MOLECULAR PATHOLOGY IN THE CLINIC OF HEMATOLOGICAL TUMORS	Molecular classification of haematological malignancies
	Molecular pathology of lymphomas
	Monoclonal B lymphocytosis
	T-cell lymphomas
	Large B-cell lymphoma
	Cytogenetic and molecular alterations in myelodysplastic neoplasms
	Chronic leukemia
	Cytogenetic, molecular and epigenetic markers of myeloid leukaemias
	Multiple myeloma
	The future of cancer genomics
	Acute Leukemia: example of a therapy lead by the diagnosis
MOLECULAR PATHOLOGY IN THE CLINIC OF SOLID TUMOURS	<b>Gynecological tumors</b>
	Molecular stratification of breast cancer
	Molecular Pathology of ovarian cancer
	Endometrial carcinoma. Pathology and molecular genetics
	Molecular portrait of breast cancer
	<b>Sarcomas</b>
	Cytogenetic markers in solid tumours
	Sarcoma
	<b>Lung cancer</b>
	Genetic basis of lung cancer and associated new therapies
	Targeting mutant cancers: an urgent medical need
	<b>Melanoma</b>
	Molecular biology of melanoma
	Melanoma, molecular diagnosis
	Animal models and mechanisms of resistance
	<b>Colorectal cancer</b>
	Colorectal Cancer: towards a molecular classification
	<b>Bladder cancer</b>
	Molecular pathology of urothelial bladder cancer
	<b>Renal cancer</b>
	Relationship between VHL, hypoxia and renal cancer
	Genomics of renal cancer: intratumoral heterogeneity and therapeutic implications
	<b>Central nervous system</b>
	CNS: glial tumours
	Paediatric high-grade gliomas in the era of histomolecular diagnosis
	<b>Endocrine tumors</b>
	Molecular pathology of endocrine and neuroendocrine tumours: thyroid cancer as a model for study
	<b>Neuroendocrine tumors</b>
	Merkel carcinoma: molecular approach and therapeutic implications
	<b>Pancreas cancer</b>
	Short update in pancreatic cancer
	Genetic characterisation of human cancer: applications in diagnosis and therapy
Challenges and opportunities in the integration of omics data in epidemiological studies	
Pancreatic ductal adenocarcinoma	
METHODOLOGY IN CLINICAL RESEARCH IN	Epidemiological method
	Scientific information and documentation
	Measures of disease frequency
	Basic statistics for clinical research
	Hypothesis testing and significance testing
	Biostatistics applied to clinical trial design

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ONCOLOGY	Principles and foundations for research ethics
	Informed consent
	Standards of good clinical practice in clinical trials
	Clinical Trials in Oncology - Case Studies
	Use of biological material in clinical protocols. Creation of diagnostic kits
RISK FACTORS IN NEOPLASIAS	Cancer epidemiology
	Carcinogenic risk factors. Diet and Tobacco.
	Alcohol and carcinogenesis. Molecular Mechanisms
	Ionizing Radiation. Effect of Low Doses. Modifying factors.
	Virus and other infectious agents, and Cancer
	Human exposition to endocrine disruptors and cancer
	Mechanism of estrogen action
	Occupational factors and cancer
	Carcinogens: disruption of DNA tuning
	Introduction to familial cancer. Entities with demonstrated mendelian inheritance
	Molecular Diagnosis. Diagnostic strategies.
	Genetic counseling in familial cancer. Diagnostic problems
	Practical management of family cancer in an oncology practice
	Obesity and cancer. Current epidemiological data.
	Cancer prevention
Microbiota and cancer	
Cachexia, sarcopenia and cancer. Nutrition in surgical and oncological patients	
PHARMACOLOGY AND ANTI-TUMOUR AGENTS	Introduction to drug discovery and development
	Current state of lung cancer treatment: Conventional chemotherapies vs new targeted therapies
	Treatment with immunostimulatory antibodies
	Genetic Therapy: antitumoral virotherapy in the clinic
	New concepts for the design of antitumoral inhibitors of the Ras-ERK pathway
	Approach to tumours of the endocrine system from molecular alterations to treatment selection
	Potential of the cell cycle regulators in the design of therapeutic drugs
	Molecular evolution and clinical implications of prostate cancer
	TP73 as a therapeutic target
	Anti-tumor strategies based on the redirection of immune system effector cells
	Cancer-Associated Fibroblasts (CAFs) as a potential anti-tumour target
	Lipid metabolism as a therapeutic target in cancer. Role of therapeutic nutritional supplements as metabolic modulators.
	Role of the antiangiogenic therapy in tumoral progression and metastasis
Histopathological and pharmacodynamic alterations in patients treated with molecularly engineered agents	
Antibody engineering for therapeutic use	
NEW MOLECULAR THERAPIES	Oncology in the 21st Century: From Precision Medicine to Immunotherapy
	Anti-tumor treatment with transgenic CRT
	Vitamin D and Cancer: Mechanism and Possibility of clinical use
	Selective metastatic CXCR4+ stem cell removal for the prevention of metastasis in human colorectal cancer
	Cellular senescence and cancer
	Analysis of the extracellular genetic material circulating in the blood
	Molecular biology behind the modulation of cellular radiosensitivity
	Drug design: drugs that block oncogenic stimulation
	Apoptosis regulation in chronic lymphatic leukemia. New therapeutic targets.
	Extracellular matrix as a mediator of tumour development. Possible new tumour target.
	New molecular therapies in pancreatic cancer
	Discover, validate and transfer to the clinic therapeutic targets in sarcomas
	Energy protein metabolism: Rising targets in antitumoral therapy
CART immunotherapy in solid tumours	
Biomarkers in cancer immunotherapy	

Note: The academic content is preliminary and can be subject to changes