

(Medical Biotechnologies 2015-2016)

EXPERIMENTAL ONCOLOGY (7 CFU) 28 h

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What you will (and you MUST) learn (yellow-highlighted are the parts for the ADVANCED level):

1. the epidemiologic relevance of Cancer; the influence of the environment and of the life style
2. the main histopathologic characteristics of the tumours and their classification
3. the molecular alterations responsible for the malignant behaviour of tumour cells (loss of proliferative control; resistance to apoptosis; invasiveness; altered metabolism of glucose, aminoacids and fatty acids; altered proteome homeostasis); the role of autophagy and of cell death in cancer
4. the role of genetics and epigenetics in cancer development and progression; the genetic defects that predispose to cancer
5. the origin and phenotypic characteristics of Cancer Stem Cells; the genetic and metabolic re-programming leading to cancer
6. the mechanisms of metastasis formation
7. the inter-relationship between tumour cells and the tumour stroma, with particular regard to the role of cancer associated fibroblasts and of immune cells;
8. the molecular and patho-physiological mechanisms responsible for the cachexia syndrome.
9. the current techniques for Diagnosis (imaging, biomarkers) and the therapeutic treatments available (traditional chemotherapy, molecular therapy).
10. Novel therapeutic approach (epigenetics); novel paradigms for carcinogenesis (microbioma);

#### **Lesson 1 (2h)**

Introduction to Cancer: Definition, Epidemiology, Origin of cancer (multistage carcinogenesis, genetic and epigenetic clonal expansion; mutations, risk factors)

#### **Lesson 2 (2h)**

Nomenclature, Histopathology. Classification, Staging, Grading.

#### **Lesson 3 (2 h)**

Aetiology; Gene – environment interaction; chemical carcinogenesis; radiation and carcinogenesis; virus and carcinogenesis. Life style and Cancer (smoke, diet).

#### **Lesson 4 (2h)**

Genetic and chromosome instability. DNA repair. Genetic predisposition syndromes.

#### **Lesson 5 (2h)**

Cancer cell biology. Control of cell proliferation and cell differentiation: cell cycle; cell signalling.

#### **Lesson 6 (2h)**

Cancer cell biology 2: Control of cell homeostasis; control of macromolecular turnover; Autophagy;

#### **Lesson 7 (2h)**

Control of Cell death (Apoptosis, Necrosis, Autophagic cell death).

#### **Lesson 8 (2h)**

Molecular Oncology 1: Oncogenes. Main Oncogenes: c-MYC, RAS, others. Oncogene addiction

**Lesson 9 (2h)**

Molecular Oncology 2: Tumour Suppressors. Main Tumour Suppressor genes: TP53, PTEN, BECLIN1, TSC, others.

**Lesson 10 (2h)**

Tumour cell metabolism: Warburg effect, glutamine, glucose. Oncogenes and oncosuppressors and cancer cell metabolism. Papers' discussion.

**Lesson 10 (1h)**

Dormancy, Senescence, Telomerases, Cancer Stem Cells. Papers' discussion.

**Lesson 11 (1h)**

Epigenetics and Cancer. DNMT, HDAC, microRNAs. Oncosuppressor Imprinting (ARH-1/DIRAS3). Papers' discussion.

**Lesson 12 (1h)**

Tumour stroma. Cancer associated fibroblasts. Cancer inflammation. Papers' discussion.

**Lesson 13 (1h)**

Cell adhesion. Invasion and Metastasis. Angiogenesis.

**Lesson 14 (1h)**

Tumour immunity. Cachexia

**Lesson 15 (1h)**

Cancer diagnosis, cancer therapy. Specific cancers: Colon, Breast, Lung, Prostate, Ovary, Melanomas and Skin cancers.

**Lesson 16 (2h)**

Diet and cancer; anticancer properties of phytochemicals, vitamins, natural products.  
Microbioma and Cancer