Oncology Websites

COMPREHENSIVE

American Cancer Society (www.cancer.org) National Cancer Institute, USA (www.cancer.gov) National Cancer Institute, Egypt (www.nci.cu.edu.eg) National Comprehensive Cancer Network (www.nccn.org) Onco Link (www.oncolink.com) PDQ: NCTs Comprehensive Cancer Database (www.cancer.gov/cancer topics/pdq) Wikipedia, the free encyclopedia (en.wikipedia.org/wiki/Cancer) A link for medical informatics (search.medscape.com) Surveillance Epidemiology & End Results "SEER" (seer.cancer.gov/statistics/)

CANCER LITERATURE

American Association for Cancer Research (AACR) (www.aacr.org) BioMed Central (includes RSS feed) (www.biomedcentral.com) Cancernews (e-mail updates) (www.cancernews.com/ Medscape RSS news feed and e-mail alerts) (www.medscape.com/ Nation Cancer Institute Publications Locator (cissecure.nci.nih.gov/ncipubs) PubMed (RSS and email updates) (www.pubmed.gov) NIH "National Library of Medicine" (www.nlm.nih.gov/medlineplus/cancers.html) (rateway nlm nih gov/gw/Cmd)

(gateway.nlm.nih.gov/gw/Cmd) (www.ncbi.nlm.nih.gov/pubmed/)

CLINICAL TRIALS

Center Watch (www.centerwatch.com) Clinical Trials (NCI) (www.cancer.gov/clinical_trials) Clinical Trials.gov (www.clinicaltrials.gov)

ORGANIZATIONS

AACR (www.aacr.org)

American Joint Committee on Cancer (www.cancertaging.org) American Society of Clinical Oncology (www.asco.org) Association of American Cancer Institutes (www.aaci-cancer.org) American Society for Therapeutic Radiology and Oncology (www.astro.org) International Union Against Cancer (www.uicc.org) Oncology Nursing Society (www.ons.org)

CANCER COOPERATIVE GROUPS

American College of Surgeons Oncology Group (www.acosog.org) Cancer and Leukemia Group B (www.calgb.org) Children's Oncology Group (www.Childrensoncologygroup.org) Coalition's Oncology Group (www.cancertrialshelp.org) Eastern Cooperative Oncology Group (www.ecog.org) Gynecologic Oncology Group (www.gog.org) National Surgical Adjuvant Breast and Bowel Project (www.nsabp.pitt.edu) North Central Cancer Treatment Group (ncctg.mayo.edu) Radiation Therapy Oncology Group (www.rtog.org)

STATISTICS

American Cancer Society statistics (www.cancer.org/docroot/stt/stt_0.asp) CANCER Modial Statistical Information System (international) (www-dep.iarc.fr) National Cancer Data Base (www.facs.org/cancer/ncdb/index.html) National Cancer for Health Statistics FastStats (www.cdc.gov/nuchs/fastats/cancer.htm) National Program of Cancer Registries (www.cdc.gov/cancer/npcr) North American Association of Central Cancer Registries (www.naaccr.org) SEER (surveillance, Epidemiology, and End Results) (seer.cancer.gov) State cancer profiles (stateconcerprofiles.cancer.gov)

EVIDENCE-BASED RESOURCES

Centre for Evidence-Based Medicine (www.cebm.net) Centre for Health Evidence (www.ccbe.net) National Guideline Clearinghouse (www.guideline.gov) Netting the Evidence (www.shef.ac.uk/scharr/ir/netting) The Cochrane Collaboration (www.cochrane.org)

SITES FOR PATIENTS

Association of Cancer Online Resources (www.acor.org) Cancer Care (includes Spanish language materials) (www.cancercare.org) Cancer Information Service (NCI) (cis.nci.nih.gov) Cancer Prevention and Control (CDC) (www.cdc.org/cancer) Cancer.Net (www.cancer.net) The Cancer Journey (www.thecancerjourney.org) Cancerfacts.com (www.cancerfacts.com) Healthfinder (www.healthfinder.gov) Hospice Education Institute (hospiceworld.org) MedlinePlus (medlineplus.gov) National Hospice and Palliative Care Organization (www.nhpco.org) WebMD (www.webmd.com)

CANCER RISK SITES

Breast Cancer Rish Assessment Tool (www.cancer.gov/bcrishtool) Cancer Awareness and Risk Program (pennstatechershey.org/web/cpog/home/ communityoutreach/risktet) Cancer Risk Quiz (www.fcc.edu/cancer/risk-quiz.html) Cancer Risk: Understanding the Puzzle (understandingrisk.cancer.gov) Cancer Risk: What the Numbers Mean (www.mayoclinic.com/health/cancer/CA00053) Lung Cancer Risk Assessment (www.mskcc.org/mskcc/html/12463.cfm) Melanoma Risk Assessment Tool (www.cancer.gov/melanomariskrool) Risk Assessment Quiz: Prostate Cancer (www.prostatecancer.ca/Prostate-Cancer/ Risk-Assessment-Quiz.aspx Women's Cancer Network Cancer Risk Assessment Survey (www.wcn.org/risK_assessment) Your Disease Risk (www.yourdiseaserisk.wustl.deu)

SPECIFIC CANCERS

Bladder

Bladder Cancer Advocacy Network (www.bcan.org) Urology Channel (www.urologychannel.com) UrologyHealth.org (www.urologyhealth.ogr)

Bone

Bone & Cancer Foundation (www.boneandcancerfoundation.org) Bonetumor.org (www.bonetumor.org)

Brain

American Brain Tumor Association (hope.abta.org) National Brain Tumor Society (www.braintumor.org) Neuro-Oncology Branch (home.ccr.cancer.gov/nob/default.asp

Breast

American Breast Cancer Foundation (www.abcf.org) Breast Cancer Online (www.bco.org) BreastCancer.org (www.breastcancer.org) FORCE: Facing Our Risk of Cancer Empowered (www.facingourrish.org) Imagines (www.imaginis.com) National Breast Cancer Coalition (www.natlbcc.org) Program on Breast Cancer and Environmental Risk Factors (envirocancer.cornell.edu) Susan G. Komen for the Cure (ww5.komen.org) Breast Cancer Network of Strength (www.networkofstrength.org)

Colorectal

American Gastroenterological Association (www.gastro.org) Colon Cancer Alliance (www.ccalliance.org) Colorectal Cancer Coalition (www.fightcolorectalcancer.org)

Eye

Eye Cancer Network (www.eyecancer.com)

Gynecologic

American College of Obstetricians and Gynecologists (www.acog.org) FORCE: Facing Our Risk of Cancer Empowered (www.facingourrisk.org) Gynecologic Cancer Foundation (www/thegcf.org) National Cervical Cancer Coalition (www.nccc-online.org) National Ovarian Cancer Coalition (www.ovarian.org) Women's Cancer Network (www.wcn.org)

Head and Neck (Including Mouth and Throat)

American Academy of Otolaryngology-Head and Neck Surgery (www.entnet.org) International Association of Laryngectomies (www.theial.com/ial) Let's Face It (www.dent.umich.edu/faceit) National Institute of Dental and Craniofacial Research (www.nidcr.nih.gov) Oral Cancer Foundation (www.oralcancerfoundation.org) Support for People with Oral and Head and Neck Cancer (www.spohnc.org)

Kidney

Kidney Cancer Association (www.curekidneycancer.org) National Kidney Foundation (www.kidney.org)

Leukemia and Lymphoma

Leukemia and Lymphoma Society (www.leukemia-lymphoma.org) LymphomaInfo.net (www.lymphomainfo.net) Lymphoma research Foundation (www.lymphoma.org

Liver

Liver Tumor (www.livertumor.org)

Lung

American Lung Association (www.lungusa.org Lung Cancer.org (www.lungcancer.org) Lung Cancer Alliance (www.lungcanceralliance.org)

Myeloma

International Myeloma Foundation (www.myeloma.org) Multiple Myeloma Research Foundation (www.multiplemyeloma.org)

Pancreatic Cancer

Hirshberg Foundation for Pancreatic Cancer (www.pancreatic.org) Pancreatic Cancer Action Network (www.pancan.org

Pediatric

Candle lighters Childhood Cancer Foundation (www.candlelighters.org) Children's Hospice International (www.chionline.org) Children's Oncology Group (www.childrensoncologygroup.org) Children's Tumor Foundation (www.ctf.org) National Children's Cancer Society (www.nationalchildrenscancersocitey.org) Osteosarcoma (wwwcancer.iu.edu/osteosarcoma)

Prostate

Prostate Cancer Education Council (www.pcaw.com) Prostate Cancer Foundation (www.prostatecancerfoundation.org) Urology Health.org (www.urologyhealth.org) Us TOO International (www.ustoo.org)

Skin

American Academy of Dermatology (www.aad.org) Melanoma Education Foundation (www.skincheck.org) Melanoma Patient's information Page (www.mpip.org) Skin Cancer Foundation (www.skincancer.org)

PATHOLOGY SITES

International Academy of pathology (iaphomepage.org) International Academy of pathology-Arab Division (www.iap-ad.org)

Journal access

(www.ovid.com)

(www.modpathol.com) (www.oup.com/us/sample chamlers)

Pathology Educational Websites

(www.cedars-sinai.edu/Patients/Programsand-Services/Pathol...) (www.us.elsevierheath.com) (www.arrazon.com) (ebooks.cambridge.org) (www.pathmax.com) (books.google.com)

General Pathology sites

(www.pathologyoutlines.com) (library.med.utah.edu/WebPath/ewbpath.html (www.pathologyatlas.ro) (www.brown.edu.Courses/Digital_path/ (www.path.uiowa.edu/virtualslideboc/ (iplab.net) (alf3.urz.unibas.ch/pathopic/e/intro.htm)

Research

(www.humpath.com) (pathweb.uchc.edu) (surgpathcriteria.stanford.edu) (www.pathmd.com) (www.pathguy.com) (www.pathmax.com) (www.siumed.edu²/index.htm (highwire.stanford.edu)

ANATOMIC PATHOLOGY SPECIALTY SITES

Autopsy and Forensics (www.forensiconline.com/generallink.htm)

Breast (www.hsc.stonybrook.edu/breast-atlas)

Dermatopathology (dermatlas.med.jhmi.edu/derm)

Gastrointestinal Pathology (www.pathology.pitt.edu/lectures/gi)

Gynecologic Pathology (www.hsc.stonybrook.edu/gyn-atlas)

Neuropathology (www.path.sunysb.edu/faculty/woz/NPERESS/ webclasstitle.htm (neuromuscular.wust.edu) (moon.ouhsc.edu/kfung/ITY1/index.htm)

Renal Pathology

(www2.us.elsevierhealth.com/ajkd/atlas) (www.uni-mainz.de/FB/Medizin/Anatomie/ workshop/EM/EMAtlas.html)

Cytology

(www.cytopathology.org) (pathology2.jhu.edu/cyto_tutorial)

Quick reference for online study and tutorials

(library.med.utah.edu/WebPath/webpath.html)
(path.upmc.edu/cases.html)
(moom.ouhsc.edu/kfung/JTYI/opaq)
(w3.ouhsc.edu/pathology/Learning_Ctr/
LearnCenter_home.asp)
(pathed.upstate.edu:8080/bm_report/tutorial/
p200/cases/cases_cv_ie.html)
(www.pathmd.com/index.htm)

CLINICAL PATHOLOGY SPECIALTY SITES

Overakk CP (www.aruplab.com/index.jsp)

Cytogenetics

(atlasgeneticsoncology.org) (www.ncbi.nlm.nih.gov/sites/entrez?db=omim) (www.genetests.org)

Hematology / Coagulation

(www.wfn.org/index.asp?lang=EN) (image.bloodline.net) (www.chronolab.com/hematology/general.htm) (www.hematologyatlas.com/principalpage.htm)

Microbiology

(pathmicro.med.sc.edu/book/welcome.htm) (pathmicro.med.sc.edu/book/welcome.htm) (www.cdc.org) (www.dpd.cdc.gov/dpdx/HTML/ImageLibrary/ body_ImageLibrary.htm)

Transfusion Medicine (www.bbguy.org)

Abbreviations

A

ACC adrenocortical carcinoma ACTH adrenocorticotrophic hormone AD autosomal dominant AFP α -fetoprotein AIHA autoimmune hemolytic anemia **AKT** a serine/threonine protein kinase ALAL acute leukemia of ambiguous lineage ALCL anaplastic large cell lymphoma ALL acute lymphoblastic leukemia **ALP** alkaline phosphatase AMKL acute megakaryoblastic leukemia AML acute myeloid leukemia AMP adenosine monophosphate ANC absolute neutrophil count AP-1 activating protein 1 **APC** adenomatous polyposis coli **APL** acute promyelocytic leukemia **APrC** antigen-presenting cell **AR** autosomal recessive ARMS alveolar rhabdomyosarcoma ASR age-standardized annual incidence AST aspartate transaminase ATM ataxia telangiectasia mutated (gene) **ATP** adenosine triphosphate ATRA all-transretinoic acid ATRT atypical teratoid rhabdoid tumor AUC area under the curve

B

BAL bronchoalveolar lavage **BCC** basal cell carcinomas BCG bacillus Calmette-Guerin
BL Burkitt lymphoma
BM bone marrow
BMA bone marrow aspiration
BMD bone mineral density
BMT bone marrow transplant
BWS Beckwith-Wiedemann Syndrome
BX biopsy

С

CAMT congenital a megakaryocytic thrombocytopenia **CDK** cyclin-dependent kinase CEA carcinoembryonic antigen CFS congenital fibrosarcoma **CGH** comparative genomic hybridization **CI** confidence interval **CIMF** chronic idiopathic myelofibrosis **CLL** chronic lymphocytic leukemia CML chronic myeloid leukemia CMML chronic myelomonocytic leukemia CMN congenital mesoblastic nephroma **CMV** cytomegalovirus **CNS** central nervous system CNSHA congenital nonspherocytic hemolytic anemia CO cobalt COX-2 cycloxygenase-2 **CP** chronic phase **CP** cyclophosphamide CPC choroid plexus carcinoma **CPP** choroid plexus papilloma **CR** complete remission **CRP** C-reactive protein CSF cerebrospinal fluid CSF colony-stimulating factor **CT** computed tomography **CTX** chemotherapy CXR chest X-ray

D

DFS disease-free survival **DI** diabetes insipidus **DIC** disseminated intravascular coagulation DJXG disseminated juvenile xanthogranuloma DLBCL diffuse large B-cell lymphoma DLCL diffuse large cell lymphoma **DLI** donor lymphocyte infusion **DLT** dose-limiting toxicity DNA deoxyribose nucleic acid **DNET** dysembryoplastic neuroepithelial tumor **DS** Down syndrome DTC differentiated thyroid cancer **DUB** dysfunctional uterine bleeding **DVT** deep vein thrombosis

Ε

EA enzyme immunoassay EBV Epstein-Barr virus EFS event-free survival EGF epidermal growth factor ELISA enzyme-linked immunosorbent assay **EM** electron microscopy ENT Ear, Nose and Throat **EOE** extraosseous Ewing sarcoma EPO erythropoietin **ERK** extracellular signaling regulator kinase **ES** Ewing sarcoma **ESR** erythrocyte sedimentation rate ET essential thrombocythemia

F

FA Fanconi anemia **FCM** flow cytometry FDA food and drug administration (USA)
FDCS follicular dendritic cell sarcoma
FFS failure-free survival
FGF fibroblast growth factor
FH favorable histology
FISH fluorescent in-situ hybridization
FL follicular lymphoma
FNA fine needle aspiration
FSH follicle-stimulating hormone
FTC follicular thyroid cancer

G

G6PH glucose-6-phosphate dehydrogenase **GBM** glioblastoma multiforme GCT germ cell tumor **GDNF** glial-derived neurotrophic factor **GDP** guanosin diphosphate GERD gastroesophageal reflux disease **GH** growth hormone **GI** gastrointestinal **GIST** gastrointestinal stromal tumor **GIT** gastrointestinal tract GMCSF granulocyte macrophage colony stimulating factor **GN** ganglioneuroma GNB ganglioneuroblastoma **GnRH** gonadotrophin releasing hormone **GTP** guanosine triphosphate **GTR** gross total resection GTV gross tumor volume **GVHD** graft-versus-host disease

Н

H&E hematoxylin & eosin
HA hypoplastic anemia
Hb hemoglobin
HB hepatoblastoma
HbS sickle cell Hb
HBsAg hepatitis B surface antigen
HC hemorrhagic cystitis
HCC hepatocellular carcinoma
HCG human chorionic gonad

otrophin HCL hairy cell leukemia HCV hepatitis C virus **HD** Hodgkin disease HGF hepatocyte growth factor HHV6 human herpes virus type 6 HL Hodgkin lymphoma HLA human leucocyte antigen HLH hemophagocytic lymphohistiocytosis HMPV human metapneumovirus HNIG human normal immunoglobulin HNPCC hereditary non polyposis colon cancer HPA hypothalamic-pituitary axis HR hormone replacement **HS** hereditary spherocytosis HS histiocytic sarcoma HSC hemopoeitic stem cells HSCT hemopoietic stem cell transplantation **HSV** herpes simplex virus HUS hemolytic-uremic syndrome HVA homovanillic acid HVOD hepatic veno-occlusive disease HZV herpes zoster virus

Ι

IBMFS inherited bone marrow failure syndrome ICH intracranial hemorrhage **ICP** intracranial pressure **ID** immunodeficiency **IDC** interdigitating dendritic cell sarcoma **IF** immunofluorescence IG immunoglobulin **IGF** insulin growth factor **IGF** insulin-like growth factor IM intramuscular **INSS** international Neuroblastoma Staging System **IST** immunosuppressive treatment ITP immune thrombocytopenic purpura **IV** intravenous

IVC inferior vena cava

J

JAK Janus kinase JXG juvenile xanthogranuloma

K

KGF keratinocyte growth factor (=FGF-7)

L

LAE late adverse effect LAF laminar air flow LAIP leukemia-associated immunophenotype LC langerhans cell LCH Langerhans cell histiocytosis LDH lactate dehydrogenase **LFT** liver function tests LH luteinizing hormone LL lymphocytic lymphoma **LOH** loss of heterozygosity LP lumbar puncture LPHD lymphocyte predominant Hodgkin disease LPL lymphoplasmocytic lymphoma LS langerhans cell sarcoma LTFU long-term follow-up LYG lymphomatoid granulomatosis

Μ

MAA moderate aplastic anemia MAB monoclonal antibody MALT mucosa-associated lymphoid tissue MAPK mitogen-activated protein kinase MBEN medulloblastoma with extensive nodularity MBL medulloblastoma MCL mantle cell lymphoma MCS mast cell sarcoma MCV mean corpuscular volume MDR multidrug resistance MDS myelodysplasia MDS myelodysplastic syndrome **MDT** multidisciplinary team MEN multiple endocrine

neoplasia MFB multifocal bone MGCT malignant germ cell tumor **MM** multiple myeloma MMP matrix metalloproteinase Mo monoclonal moAb monoclonal antibody **MOF** multi-organ failure **MPD** myeloproliferative diseases MPN myeloproliferative neoplasm **MPNST** malignant peripheral nerve sheath tumor **MPO** myeloperoxidase MPV mean platelet volume **MRA** magnetic resonance angiography MRD minimal residual disease MRI magnetic resonance imaging MS multisystem MSC mesenchymal stem cells MSD matched sibling donor **MSH** melanocyte stimulating hormone MTC medullary carcinoma of the thyroid MTX methotrexate MUD matched unrelated donor **MW** molecular weight MZL mantle zone lymphoma

Ν

NB neuroblastoma **NDI** nephrogenic diabetes insipidus NF1 neurofibromatosis type 1 **NFAT** nuclear factor of activated T-cells NF-_KB nuclear factor KB NGF nerve growth factor NHL non-Hodgkin lymphoma NK natural Killer **NPC** nasopharyngeal carcinoma NRSTSs non-rhabdo soft tissue sarcomas **NSE** neuron-specific enolase NT neurotrophins NTM non-tuberculous mycobacterial

0

OCP oral contraceptive pill OR odds ratio OS overall survival

Р

PA pernicious anemia PAS periodic acid-Schiff PBPC peripheral blood progenitor cell **PBSC** peripheral blood stem cell **PCH** paroxysmal cold hemoglobinuria **PCO** polycystic ovary PCP pneumocystis jiroveci pneumonia **PCR** polymerase chain reaction PCToma pheochromocytoma **PDGF** Platelet derived growth factor PE pulmonary embolism PET positron emission tomography **PFS** progression-free survival **PFT** pulmonary function tests Ph+ Philadelphia chromosome positive PI-3K Phospho-inositide –3 kinase PK pyruvate kinase **PKB** Protein kinase B (=AKT) **PKC** protein kinase C **PMF** primary myelofibrosis **PML** progressive multifocal leucoencepholopathy **PN** parenteral nutrition **PNET** primitive neuroectodermal tumor **PNH** paroxysmal nocturnal hemoglobinuria **PPB** pleuropulmonary blastoma **PPNET** peripheral primitive neuroectodermal tumor **PT** prothrombin time PTCL Peripheral T-cell lymphoma PTH parathyroid hormone **PTLD** post-transplant lymphoproliferative disorders **PV** polycythemia vera

R

RA refractory anemia RA retinoic acid **RAEB** refractory anemia with excess blasts **RAR** retinoic acid receptor **RARS** refractory anemia with excess ringed sideroblasts **RB** retinol binding protein Rb retinoblastoma **RC** refractory cytopenia **RD** related donor **RDD** Rosai - Dorfman disease RMS rhabdomyosarcoma **RR** relapse rate **RR** relative risk/risk ratio **RRT** regimen-related toxicity **RT** radiotherapy RTA renal tubular acidosis

S

SAA severe aplastic anemia SBB Sudan black B SCC squamous cell carcinoma SCD sickle cell disease SCF stem cell factor SCID severe combined immunodeficiency SCT stem cell transplantation **SEGA** sub-ependymal giant cell astrocytoma **SIADH** syndrome of inappropriate antidiuretic hormone secretion **SLD** sum of the largest diameter **SLE** systemic lupus erythematosus **SLL** small lymphocytic lymphoma SMN second malignant neoplasm SMR standardized mortality ratio **SMS** superior mediastinal syndrome **SMZL** splenic marginal zone lymphoma **SNP** single nucleotide polymorphism **SNS** sympathetic nervous system

SOS sinusoidal obstruction

syndrome SS single system SS synovial sarcoma SSCP single strand conformational polymorphisms STAT signal transducer and activator transcription factor STI signal transduction inhibitor STS soft tissue sarcoma SVC superior vena cava SVCS superior vena cava syndrome

Т

TBI total body irradiation
TdT terminal deoxynucleotidyl transferase
TGF-β transforming growth factor beta
TK tyrosine kinase
TLI total lymphoid irradiation
TLS tumor lysis syndrome
TNF tumor necrosis factor
TOF trachea-esophageal fistula
TS tumor suppressor
TSC tuberous sclerosis
TSH thyroid-stimulating

hormone **TT** thrombin time

U

UCB umbilical cord blood
UD unrelated donor
UH unfavourable histology
URD unrelated donors
US ultrasound
UTI urinary tract infection
UV ultraviolet

V

VCA viral capsid antigen **VEGF** vascular endothelial growth factor **VEGFR** vascular endothelial growth factor receptor VHL von Hippel-Lindau disease **VIP** vasoactive intestinal peptide VMA vanyl mandelic acid **VP** ventriculo-peritoneal **VSAA** very severe aplastic anemia VTE venous thromboembolism VZV varicella-zoster virus

VZV/HZV varicella/herpes zoster virus

W

WAGR Wilms tumor, aniridia, genitourinary abnormalities
WAS Wiskott-Aldrich syndrome
WCC white cell count
WM Waldenstrom macroglobulinemia
WT Wilms tumor

X

XIAP X inhibitor of apoptosis proteinXLP X-linked lymphoproliferative disease

Glossary of Terms

A

Acetylation: A reaction that introduces a functional acetyl groups into an organic compound. Deacetylation is the removal of the acetyl group. Acetylation is a post-translational chemical modification of histones, tubulins, and the tumor suppressor gene TP53.

Alleles: Different forms of a gene that represent the same genetic locus on homologous chromosomes.

Allograft: Tissue that is transplanted between genetically different individuals of the same species.

Antibody: A glycoprotein molecule called immunoglobulin (Ig), produced by plasma cells in response to an antigen and capable of specifically binding to that antigen.

Antibody-dependent cell-mediated cytotoxicity (ADCC): A process by which natural killer (NK) cells are targeted to IgG-coated cells, resulting in the lysis of the antibody-coated cells.

Antigen processing: The intracellular conversion of protein antigens into peptides and loading of these peptides on to major histocompatibility complex molecules for display to T lymphocytes.

Antigen: An agent that is foreign (i.e., "nonself") to an animal and that is recognized by the immune system.

Autocrine: Refers to the production of substances (i.e., growth factors or hormones) that can influence the metabolism of the cell which produces them.

Autoradiography: A technique to identify where a radioactive isotope is localized in cells or subcellular components.

Autosome: Any chromosome other than the sex chromosomes.

Β

B cell receptor (**BCR**) complex: A multiprotein of immunoglobulins expressed on the surface of B lymphocytes that recognizes antigen and transduces activating signals.

B cell: A lymphocyte that is a precursor for antibody-producing plasma cells, and that expresses an antibody molecule on its cell surface.

Bisulfite sequencing: The bisulfite treatment of DNA in order to determine its pattern of methylation. Treatment of DNA with bisulfite converts cytosine residues to uracil but leaves 5-methylcytosine residues unaffected.

С

Caretaker genes: These are tumor suppressor genes that protect the integrity of the genome (e.g. DNA repair genes).

cDNA: A DNA complementary to mRNA sequences transcribed from a given gene or genes. cDNA therefore will hybridize with these genes and, if radio-labeled will allow their detection in chromosomes "in situ hybridization".

Cellular Immunity: Immunological defense against foreign agents that is mediated by cells (e.g., various types of lymphocytes) rather than by antibodies.

Chromatin: The complex of DNA and protein that composes chromosomes. Chromatin packages DNA into a volume that fits into the nucleus, allows mitosis and meiosis, and controls gene expression. Changes in chromatin structure are affected by DNA methylation and histone modifications.

Chromosome: The structural unit containing the genetic material (DNA) within a cell. Human cells usually have 46 chromosomes consisting of 22 pairs of autosomes plus the sex chromosomes

(XX in females, XY in males).

Chromothripsis: A new phenomenon of multiple gene rearrangecuent observed in osteosarcoma and chordoma, resulting from 10-100 chromosomal breaks followed by their random fusion.

Clone: A family of cells all derived from one parent cell. A clonal marker (e.g., an abnormal chromosome or protein product) may identify all of the cells within a given clone. Most human tumors appear to arise from a single cell and hence are monoclonal.

Cloned Gene: A gene that has been isolated and inserted into a "vector," usually a plasmid or bacterial virus. The vector containing the gene can be produced in large amounts, thereby providing many copies of the gene suitable for assays and studies of its function. Cloned genes can be used to produce large quantities of pure protein products of cells (e.g., insulin, interferons).

Coding Region: The coding region is that part of the DNA that actually codes for a protein. The part of the DNA molecule that is initially transcribed into messenger RNA (mRNA) contains both introns and exons.

Codon: A group of three DNA or mRNA bases that code for a given amino acid. Codons thus form the "alphabet" of the genetic code.

Complement: A system of serum and cell surface proteins that interact with one another and with other molecules of the immune system to generate important effectors of innate and adaptive immune responses (e.g. ADCC).

CpG islands: Regions in DNA that contain many adjacent cytosine and guanine nucleotides. The "P" in CpG refers to the phosphodiester bond between the cytosine and the guanine. These islands occur in approximately 40% of the promoters of human genes.

D

Dedifferentiation: Progression of a low-grade malignant tumor to a higher grade, usually involving a geographic area of the initial tumor.

Deletion: Loss of DNA. Deletions can be

small, Affecting only a small part of a single gene, or large, for example, a chromosomal deletion involving many genes.

Determination: The irreversible commitment of a cell to follow a specific developmental pathway.

Differentiation: The development by cells of specific characteristics that allow the normal function of tissues. Tumors may show varying degrees of differentiation depending on their similarity to the structure of the organ from which the tumor was derived. Also defined as the overall process by which stem/progenitor cells are activated to become more specialized cell types.

DNA methylation: The addition of a methyl group to DNA at the 5-carbon of the cytosine pyrimidine ring that precedes a guanine.

DNA Methyltransferases: Family of enzymes that catalyze the transfer of a methyl group to DNA, using S-adenosyl- methionine as the methyl donor.

Doubling Time: The time taken for an exponentially growing tumor (or cell population) to double its volume (or number of cells).

Ε

Enhancer: A DNA sequence that increases the activity of promotor sequences that are initiators of transcription (i.e., production of mRNA). Enhancers can be located anywhere in the noncoding regions of a gene.

Epigenetic: The regulation of gene expression without alteration of genetic structure. This is accomplished by interfering with the process of transcription rather than DNA base sequence.

Epigenome: The overall epigenetic state of a cell. It represents DNA which is not transcribed to mRNA and constitutes 90% of the human genome.

Episome: A circular form of DNA that replicates in cells independent of the chromosomes. Viral DNA may form episomes in cells. Plasmids used for gene cloning grow as episomes in bacteria.

Exons: The regions of a gene that contain the DNA sequences necessary to direct translation of the polypeptide gene product. These sequences are preserved in the processed mRNA.

G

Gatekeeper genes: These are tumor suppressor genes that control cell division and survival (e.g. Rb and P53).

Gene: A sequence of DNA that codes for a single polypeptide. This sequence includes coding and noncoding regions as well as regulatory regions.

Genomic imprinting: The epigenetic marking of a locus on the basis of parental origin, which results in monoallelic gene expression.

Germline mutation: An inherited mutation in one of tumor suppressor gene alleles, resulting into a heterozygous state of increased cancer risk.

Granzyne: A serine protease enzyme found in the granules of cytotoxic T lymphocytes and natural killer cells that is released by exocytosis, enters target cells through perforin-created holes in cell membrane and activates caspases to induce apoptosis.

Η

Hedgehog signaling: Promotes the proliferation of adult stem cells, expressed in embryonal cells and several cancers.

Histone deacetylase: A class of enzymes that remove acetyl groups from an N-acetyl-lysine amino acid on a histone.

Histone: The main protein components of chromatin. The core histones-H2A, H2B, H3, and H4assemble to form the nucleosome; each nucleosome winds around 146 base pairs of DNA. The liker histone H1 locks the DNA into place and allows the formation of a higher-order structure.

Homozygosity (Homozygous): The two alleles of a gene on chromosomes are identical.

Humoral Immunity: Immunological defenses that are determined by antibodies.

Hybridization: (a) The fusion of two somatic cells to form a single cell, (b) The binding of complementary (homologous) sequences of DNA or RNA.

Hybridoma: The term is most commonly used to describe a population of hybrid cells that produces monoclonal antibodies. Such a cell is produced by fusing an antibody-secreting myeloma tumor cell.

Ι

Idiotope: A unique determinant on an antibody or T cell receptor molecule, usually formed by one or more of the hypervariable regions. Idiotopes may be recognized as foreign.

Immune Surveillance: A proposed mechanism whereby the immune response recognizes the development of malignant cells at an early stage and inactivates them before they can develop into tumors.

Immunoglobulin: An antibody molecule.

Initiation: The first stage in the process of carcinogenesis. It involves interaction of the carcinogen with the DNA of the target cells to produce, after DNA replication, a permanent lesion.

Integration: The process by which viral DNA, or DNA copies of the RNA of a retrovirus, are incorporated into the chromosomal DNA of a cell.

Integrins: cell surface proteins which functions as adhesive molecules to endothelial cells and extracellular matrix proteins.

Interferon-\alpha (IFN-\alpha): a cytokine produced by T lymphocytes and natural killer cells whose principal function is to activate macrophages in their immune responses.

Interferon: A protein produced by cells in response to viral infection. Several types of interferon have been identified and they have multiple effects on the host immune response, as well as more general effects on cell growth and differentiation. Interferons are examples of biological response modifiers.

Interleukin: A cytokine that acts on leukocytes

(originally used to describe a cytokine made by leukocytes).

Intron: A noncoding region of a gene. These regions are spliced out during processing of the initial mRNA transcript.

Isotype: A type of antibody determined by which of the 5 different forms of heavy chain is present. Antibody isotypes include: IgM, IgD, IgG, IgA and IgE.

Isozyme (Isoenzyme): One of several chemical forms of an enzyme that have the same biological function. Tumors often produce one particular isozyme, frequently that which is associated with fetal tissue.

K

Karyotype: The chromosome content of a particular cell. The karyotype is usually displayed by photographing the chromosomes in a metaphase cell, cutting the individual chromosomes out of the photograph and ordering them according to a standard notation.

Kinase (protein kinase): An enzyme that adds phosphate groups to proteins leading to their activation. They are involved in signal transduction and the activation of transcription factors.

L

Labeling Index: The proportion of cells in any tissue that are synthesizing DNA.

Langerhans cells: Immature dendritic cells mainly formed in the epidermis of skin. Their major function is to trap and transport protein antigens to draining lymph nodes.

Loss of heterozygosity (LOH): A mechanism that explains the genesis of hereditary forms of cancer based on loss of tumor suppressor gene (TSG) function through two mutational nits: The first germline and second a somatic mutation.

Lymphokine: A substance usually produced by lymphocytes (or monocytes) having an effect of other lymphocytes. An example is interleukin 2 (IL -2) also known as T-cell growth factor, which is required for the growth of T lymphocytes. Lymphokines are examples of biological response modifiers. Lymphotoxin (LT, TNF- β): A cytokine produced by T cells, which is homologous to, and binds to the same receptors as these for tumor necrosis factor (TNF). It has proinflammatory effects.

Μ

Micro-RNA (miRNA): Small RNA strands (about 22 nucleotides only) that combines with m-RNA causing its inhibition with arrest of protein supthesis (post-transcriptional gene silencing).

Mitogen-activated protein (MAP) kinase cascade: A signal transduction cascade initiated by the active form of Ras protein.

Mitotic Index: The proportion of cells in a tissue that are in mitosis at any given time.

Monoclonal Antibody: An antibody of a single defined specificity, most commonly obtained from a single clone of antibody-producing cells or from a hybridoma.

Multipotent stem cells: Cells that self-renew and differentiate into several different specialized cell types, often within a tissue (e.g. hematopoietic stem cells).

Mutation: A change in one or more of the DNA bases in a gene. Changes can include insertion of extra bases or deletion of a base (s). Mutations in coding exons lead to altered protein products; mutations in noncoding regions can lead to altered amounts of protein.

Ν

Natural killer (NK) cells: A subset of lymphocytes that function in innate (nonspecific) immunity (without previous sensitization) .

Northern Blot Analysis: A technique for determining the presence of specific mRNA sequences in cells. Messenger RNA molecules are separated by electrophoresis and then blotted onto nitrocellulose paper. A radiolabeled probe containing DNA sequences (cDNA) complementary to the RNA that is to be detected is applied to the blot and allowed to hybridize. The labeled xDNA is then detected by autoradiography.

Notch: transmembrane receptor which promotes

proliferation of stem cells and inhibits differentiation. Overexpressed in embryonic cells and several cancers.

Nuclear factor-kappa B (NF-кB): A family of transcription factors involved in many genes of the immune responses, as well as, up regulates genes of proliferation, invasion and angiogenesis. It plays a role in the genesis of Hodgkin lymphoma.

Nude Mouse: A mouse that congenitally lacks a thymus and hence mature T cells. Xenografts of human tumors will often grow in such animals.

0

Oncofetal Antigen: A protein produced by fetal tissue that is usually present at very low levels in the adult. Many tumors produce oncofetal antigens (e.g., carcinoembryonic antigen) that have been used as markers of tumor bulk.

Oncogene: A gene whose protein product may be involved in processes leading to transformation of a normal cell to a malignant state.

Р

Paraneoplastic Syndrome: Signs or symptoms that may occur in a patients with cancer but that are not due directly to the local effects of the tumor cells.

Perforin: A pore-forming protein produced by cytotoxic T lymphocytes (CTL) and natural kidder (NK) cells. The pores formed in cell membrane serve as channels for the influx of cytotoxic enzymes (e.g. granzyme) into target cells.

Phenotype: Characteristics of a cell or tissue resulting from the expression of specific genes.

Plasmid: A circular piece of DNA that may reproduce separately from chromosomal DNA within cells, bacteria, or other organisms.

Plasticity: The ability of an <u>adulk stem</u> cell from one tissue to develop into differentiated cell types from a different tissue: this remains largely unproven as an in vivo physiological process, but can be done under laboratory conditions in vitro.

Pluripotent stem cells: Cells capable of selfrenewing and differentiating into any of the three germ layers (endoderm, ectoderm, and mesoderm): unlike totipotent cells, they do not give rise to embryonic components of the trophoblast and placenta.

Polymerase Chain Reaction (PCR): A method by which a given segment of DNA is amplified multiple times by the continued synthesis of complementary strands.

Potential: Term that describes what cells are able become.

Probe: A cloned gene or fragment of a cloned gene that can be made radioactive and used to detect homologous DNA (Southern blot or in situ hybridization) or RNA (northern blot).

Progenitor cell: An undifferentiated precursor cell with the capacity to undergo differentiation into specialized cell types: unlike putative stem cells, they do not retain the capacity for self-renewal.

Progression: The tendency of tumors to become more malignant as they grow.

Promoter (or Promotor): (a) A compound that may not itself be carcinogenic but that stimulates the proliferation of initiated cells to form a cancer.

Protein Kinase: An enzyme that catalyzes the phosphorylations of proteins. Phosphorylation and dephosphorylation of proteins appear to be major mechanisms that control their function. Many on-cogenes code for protein kinases.

Proto-oncogene: A gene, in a normal cell, homologous to a viral transforming gene. Some protooncogenes encode proteins that influence the control of cellular proliferation and differentiation. Mutations, amplifications, rearrangements, etc., of proto-oncogenes may allow them to function as oncogenes,

Provirus: The DNA copy of the RNA of a retrovirus that is integrated into the chromosomal DNA of a cell.

R

Rearrangement: Changes in the sequence of genes or of DNA sequences within genes that lead to alteration in their protein products. Rear-

rangement of genes is important in such processes as the generation of diversity of antibody molecules. Abnormal rearrangements between different genes (mutations) appear to be important in malignant transformation.

Restriction Enzymes: Enzymes obtained from bacteria that make cuts at specific sequences of 4-8 bases in double-stranded DNA.

Restriction-Fragment-Length Polymorphism (RFLP) Analysis: A method that may be used to identify unique DNA sequences within a cell.

Retrovirus: A virus in which the genome comprises RNA.

Reverse Transcriptase: An enzyme found mostly in retroviruses that catalyzes the production of a complementary DNA (cDNA) strand from an RNA strand.

S

Segregation: The process by which the chromosomes are separated during meiosis.

Self-renewal: A defining property of stem cells that allows them to undergo repeated mitotic cell divisions to create at least one daughter cell equivalent to the mother cell that retains latent capacity for differentiation.

Sequencing: Determination of the sequence of nucleotides in a piece of DNA.

Signal transduction: The transmission of signals from cell microenvironment to the nucleus resulting in differentiation, proliferation, survival or apoptosis reactions.

Somatic mutation: A mutation acquired during postnatal life.

Southern Blot Analysis: A technique used for detecting specific DNA sequences in cells.

Stem Cell: A cell that has the capacity to repopulate cells within a tissue. Through differentiation and at the same time has the capacity of self-renewal, hence immortality.

Synchronized Cells: A population of cells in

which most of them are at a given stage of the growth cycle at any one time and move through the cell cycle as a cohort.

Synergy: An interaction between two agents that is greater than would be predicted from the activity of either alone.

Т

Tolerance: A term used in immunology to indicate the process whereby specific antigens fail to elicit an immunological response.

Topoisomerases: Enzymes that allow breakage of one or both DNA strands, unwinding of DNA, and resealing of the strands. The enzymes are required for DNA and RNA synthesis and are important for the action of some anticancer drugs.

Totipotent stem cells: Cells derived from the first few divisions of the fertilized egg: these cells have the potential to give rise to all the differentiated cells of the fully developed organism.

Transfection: The direct transfer of DNA molecules into a cell.

Transgenic Mice: Mice produced from germ line cells into which a specific gene has been introduced. All cells of the mice carry this gene.

Translation: The process by which mRNA directs the synthesis of protein.

Transposons: Sequences of DNA that can move around within the genome of a single cell. In this process, called transposition, the sequences can cause mutations and change the organization of DNA in the genome.

Tumor Suppressor Gene: A gene whose mutation or loss may lead to cellular transformation and to the development of cancer. Loss of both alleles are required for cancer development.

Two-hit theory (Knutson, 1960): This explains the origin of hereditary forms of cancer. The first is an inherited germline mutation of a tumor suppresser gene and the second is a somatic mutation in postnatal life (loss of heterozygosity LOH) leading to loss of tumor suppresser gene function and development of cancer.

W

Western Blot Analysis: A procedure analogous to Southern and northern blot analyses that allows the detection of specific proteins. Proteins are separated by electrophoresis and blotted on to nitrocellulose paper. They are usually identified by autoradiography.

Х

Xenograft: Tissue that is transplanted from one species of animal into another. Most commonly this refers to the transplantation of a human tumor into a nude or immune-deficient mouse.

Self Assessment MCQs

Chapter 1: The Scientific Basis of Oncology

Match the following scientists with their achievements:

- 1. Morgagni
- 2. Galileo
- 3. Halsted
- 4. Descartes
- 5. Watson & Crick
- 6. Schwann
- 7. Adolph Hanover
 - a. First to do experiments and quantitative observations.
 - b.Stated that knowledge is reached after observation not something to start with.
 - c. Invented a skeptical approach to scientific thinking.
 - d. The first surgeon to accept the concept of
 - e. performing frozen section before radical operations.
 - f. Described specific diagnostic features of malignant cells.
 - g. Launched the cell theory.
 - h. The discovery of DNA structure
 - i. Founder of gross pathology and clinicopathological correlations

8. Which of the following molecular genetic method is used for separation of double stranded DNA fragments by electrophoresis

- a. Sequencing
- b. Reverse transcriptase
- c. Southern blotting
- d. Northern blotting

9. All of the following are proteomic analysis techniques EXCEPT

a. Fluorescent flow immunocytometry

b.Bioinformatics

- c. Methylation analysis
- d. Mass spectrometry

10. The following is a chromosomal analysis method used for visualization of chromosomal aberrations using fluorescent microscope

- a. FISH
- b. Conventional karyotyping
- c. Comparative genomic hybridization

d. Flow cytometry

Chapter 2: The Epidemiology of Cancer

11. Regarding measures of epidemiology, the following is correct EXCEPT

- a. Incidence rate is expressed as the number of new cases per 100000 persons per year
- b.For comparative reasons, age-standardized incidence is used instead of crude incidence
- c. Prevalence rate is the number of persons alive with cander at a particular point of time (both new and old cases)
- d. Case fatality ratio is the ratio of mortality to survival in a given cancer

12. Concerning the global incidence of cancer, the following is correct EXCEPT

- a. The global incidence is increasing
- b.Lung cancer incidence is decreasing the developed countries and increasing in the less developed countries due to change in smoking habit prevalence in these countries
- c. Cancer cervix is prevalent in areas where HPV infection is endemic
- d. Bladder cancer is decreasing in Egypt as a result of irrigation system changes

13. The following policies are aiming at cancer prevention EXCEPT

- a. Tobacco restriction
- b. Occupational legislation
- c. Urbanization
- d. Immunization programs

14. Regarding cancer in the Western countries, the following is correct EXCEPT

- a. Caner colon is prevalent because of dietary habits
- b.Lung cancer is decreasing because of tobacco selling and smoking restriction
- c. Cancer survival is now 67% due to advancement in early diagnosis and treatment
- d. Pediatric cancer is about 8% of all cancers
- 15. Concerning regional cancer profile, the follow-

ing are true EXCEPT

- a. Breast cancer is the most common cancer in the Arab countries
- b.Liver, prostate, lymphomas and bladder cancers are common cancers in the Arab world
- c. In Egypt, pediatric cancer is about 8.5%
- d.Cancer prostate incidence is decreasing in the last decade

Chapter 3: The Etiology and Prevention of Cancer

16. All of the following are characteristics of retinoblastoma protein Rb1 EXCEPT

- a. Binds to E2F transcription factor
- b. A central regulator for cell cycle
- c. Involved in maintaining the integrity of retina
- d.Undergoes phosphorylation during cell cycle

17. Hereditary nonpolyposis colon cancer syndrome is associated with all of the following EXCEPT

- a. Increased risk of stomach, ovarian and kidney cancers
- b.Presence of multiple polyps preceding the diagnosis of cancer colon
- c. Younger age at diagnosis than patients with sporadic colon cancers
- d. Overall incidence of 1 in 400

Match the following syndromes with the associated cancers

- 18. MEN-2 syndrome
- 19. Von-Hipple-Lindau syndrome
- 20. Xeroderma pigmentosa syndrome
- 21. Fanconi syndrome
- 22. Lynch-1 syndrome
- 23. Lynch-2 syndrome
 - a. Acute myeloid leukemia
 - b.Nephroblastoma
 - c. Skin cancers
 - d.Cancer colon, breast cancer, endometrial cancer and urothelial cancer
 - e. Thyroid medullary carcinoma
 - f. Renal cell carcinoma
 - g. Cancer colon

24. p53 protein is characterized by all of the following EXCEPT

- a. It is a DNA-binding transcription factor
- b. Is activated in response to cellular stress
- c. Mutations of p53 are common in hereditary cancer syndromes but rare in sporadic cancers
- d. Germline mutations of p53 are the cause of Li-Fraumeni syndrome

25. The following type of HPV has a strong association with cervical cancer

a. HPV-6 b. HPV-11 c. HPV-16 d. HPV-18

Chapter 4: Classifications of Tumors

26. Stem cells are characterized by all of the following EXCEPT

- a. High capacity of cell renewal
- b.Long life span and high telomerase activity
- c. Inability for mobilization or trafficking the tissues
- d. Ability to adopt a phenotype and functional properties different from original phenotype (transdifferentiation)

Match the following stem cell type with its definition

- 27. Embryonic stem cell
- 28. Fetal stem cell
- 29. Cord blood stem cell
- 30. Adult stem cell
 - a. Circulating stem cells obtained from umbilical cord following labor
 - b. Isolated from inner cell mass of blastocyte
 - c. Present in adult tissue in the (GO) phase
 - d. Obtained from aborted fetal gonadal tissue

Match the following diagnostic electron microscopic features with their tumors

- 31. Very long microvilli
- 32. Complex curved cell membrane
- 33. Birbeck granules
- 34. Numerous mitochondria
- 35. Short microvilli
 - a. Langerhans cell histiocytosis
 - b. Mesothelioma
 - c. Adenocarcinoma
 - d.Oncocytoma
 - e. Neuroendocrine tumors
 - f. Meningioma

36. Some malignant tumors are highly aggressive and lethal to 80-100% of patients despite treatment. All the following cancers belong to this lethal group EXCEPT

- a. Glioblastoma multiforme
- b.Small cell lung cancer
- c. Rhabdoid tumor
- d.Ocular melanoma
- e. Anaplastic thyroid carcinoma
- f. Pancreatic ductal carcinoma

Chapter 5: Criteria of Malignancy and Pitfall

37. Which of the following findings is considered an indirect criteria of malignancy

- a. Atypia
- b.Necrosis
- c. Increased mitotic activity
- d. Abnormal mitosis

38. Which if the following mechanisms results in abnormal mitosis

- a. Asymmetrical separation of chromosomes in anaphase due to chromosomal sticking resulting in a hypoploid and hyperploids cells
- b. Chromosomal lagging in anaphase resulting in polar chromosomes in daughter cells and hypoploidy
- c. Chromosomal bridge occurs when two chromosomes break and heal by translocation forming a dicentric chromosome
- d. All of the above

39. All of the following is considered population changes in malignancy criteria EXCEPT

- a. Hypercellularity
- b. Abnormal mitosis
- c. Invasion
- d. Disorganized pattern

40. The following is a biochemical change associated with cancer

- a. Shift in glucose metabolism from aerobic to anaerobic
- b.Increase of lytic enzymes with matrix invasion
- c. Oncofetal proteins production
- d. All of the above

Chapter 6: Molecular Oncogenesis

41. All of the following is true regarding genetic mutations in cancer EXCEPT:

- a. Oncogenes are generally dominant at cellular level.
- b. Tumor repressor genes are generally recessive at cellular level
- c. One percent of total number of genes may contribute to some form of cancers
- d.90% of germline mutations in familial cancer syndromes are in tumor suppressor genes

42. Which of the following proteins has an inhibitory activity on the cell cycle

- a. Cyclin D1
- b.E2F
- c.p16INK4a
- d. cyclin-dependent kinase 4

43. All of the following represent epigenetic mechanisms EXCEPT

- a. Histone de-acylation
- b. Hypermethylation
- c. Gene amplification
- d. Hypomethylation

44. Which of the following is example of gene amplification

- a. N-myc in neuroblastoma
- b.C-myc in small cell lung cancer
- c. Her-2/neu in breast cancer
- d. All of the above

45. All of the following are examples for DNA repair defects except

- a. Von Hippel-Lindau syndrome
- b. Xeroderma pigmentosa
- c. Hereditary nonpolyposis colon cancer
- d. Hereditary breast cancer

46. All of the following are primary angiogenic factors except

- a. Granulocyte-colony stimulating factor
- b. Notch-signaling receptors
- c. VEGF
- d. Angiopoietins
- 47. DNA damage activates and stabilizes
 a. p53
 b. pRb
 c. CDK4 and CDK6
 d. APC/C

48. All of the following represent targeted therapies EXCEPT

- a. Glevec
- b.Rituxan
- c. Herceptin
- d. Vincristine

49. Osteoblastic bone metastases are characteristic of which type of cancer

- a. Breast
- b. Prostate
- c. Lung
- d. Renal

50. All of the following are characteristics of oncogenes EXCEPT

- a. They are normal present
- b. They are dominant genes
- c. They keep E2f protein in bounded form
- d. They inhibit tumor cell apoptosis

Chapter 7: Growth and Spread of Cancer

51. All of the following are positive regulators of cell cycle EXCEPT

- a. β-catenin b.RAS c. p53
- d.c-myc

Match the following method of measurement with their corresponding growth parameters

52. DNA flow

- 53. MIB-1
- 54. Cyclin A
- 55. Cyclin D
- 56. Cyclin D1
- 57. Thymidine labeling
- 58. PCNA
 - a. Growth fraction
 - b.S-phase and growth fraction
 - c. G1-phase
 - d.M-phase
 - e. Volume doubling time
 - f. S-phase

59. All of the following is correct regarding angiogenesis EXCEPT

a. Newly formed vessels can be assessed by manual or automated microscopic count using immunohistochemical techniques.

- b.Vascular density is directly proportional to level of VEGF
- c. High vascular density is considered a low risk factor
- d. All of the above

60. Tumor turn over index requires all of the following EXCEPT

- a. Proportion of tumor necrosis
- b. Mean vascular density
- c. Proliferation index
- d. Proportion of tumor apoptosis

Chapter 8: Tumor Host Relation

61. All of the following are oncologic emergencies

- of tumor metabolic effect EXCEPT
 - a. Tumor lysis syndrome
 - b. Superior vena cava syndrome
 - c. Hemolytic uremic syndrome
 - d. Hyponatremia

Match the following paraneoplastic syndrome with their associated cancers

- 62. Polycythemia
- 63. Cushing syndrome
- 64. Acanthosis nigricans
- 65. Precocious puberty
 - a. Small cell lung cancer
 - b. Renal cell carcinoma
 - c. Hepatoblastoma
 - d.Gastric cancer

Match the following cell surface receptor with their corresponding immune cells 66. FC receptor

- 67. MHC-I
- 68. TCR

a. Langerhans/dendritic cells b. Follicular dendritic cells c. Cytotoxic T lymphocyte

69. all of the following are approved monoclonal antibodies used in targeted therapy of cancer EXCEPT

a. Rituximab b. Cetuximab c. Tamoxifen d. Trastuzumab

70. All of the following are examples of immunogen therapy EXCEPT

a. Gene vaccine

- b.Cancer vaccine c. Recombinant gene fusion
- d.T cell modification

Chapter 9: Tumors of Upper Respiratory Tract

71. Which of the following occupational groups are at increased risk of developing squamous cell carcinoma of the nose or paranasal sinuses

- a. Battery and ammunition workers
- b.Coal workers
- c. Nickel refiners
- d. Wood workers

72. Which of the following tumors shows the strongest association with Epstein-Barr virus

- a. Keratinizing nasopharyngeal carcinoma
- b. Non-keratinizing nasopharyngeal carcinoma
- c. Lethal midline granuloma
- d. Olfactory neuroblastoma

73. In the progression development of squamous cell carcinoma of the head and neck which of the following is the least event

a. Loss of 9p

- b.Loss of 3p
- c. Loss of 17p
- d.Loss of 11q

74. All of the following regarding laryngeal carcinoma is correct EXCEPT

- a. Carcinoma in situ of the larynx may present as a papillary lesion
- b.Carcinoma in situ is more common in males than in females
- c. Smoking, alcohol use and human papillomavirus infection all predispose to laryngeal carcinoma
- d. Glottic carcinomas account for approximately two thirds of all laryngeal carcinoma

75. Which of the following regarding sinonasal carcinoma is correct

- a. Sinonasal carcinoma usually arise from inverted papiloma
- b. Sinonasal carcinomas are most often of the transitional type
- c. Sinonasal adenocarcinoma of the tubulopapillary type most often originate from the surface mucous glands
- d. Sinonasal adenocarcinoma is subdivided into intestinal and non-intestinal types

76. Which of the following laryngeal tumors has the lowest metastatic potential

- a. Basaloid squamous cell carcinoma
- b. Carcinoma with neuroendocrine differentiation
- c. Salivary gland type carcinoma
- d. Verrucous carcinoma

77. A transglottic cancer of the larynx is a tumor that

- a. Arises from the true cord
- b. Arises from pyriform sinus
- c. Crosses the ventricle vertically
- d. Involves the false cord

78. Which of the following concerning olfactory neuroblastoma is correct

- a. Like conventional neuroblastoma, olfactory neuroblastoma is a pediatric tumor
- b. Histologically olfactory neuroblastoma often presents as small blue round cell tumor
- c. Similar to peripheral neuroectodermal tumors (PNETs), olfactory neuroblastoma typically harbours a EWS/FLI gene translocation t(11;22)
- d. Early lymphatic metastases is the rule in olfactory neuroblastoma

79. All of the following regarding sinonasal lymphoma is correct EXCEPT

- a. Angiocentric lymphomas in the sinonasal region are immunophenotypically B-cell lymphomas
- b. Natural killer/T-cell cell lymphoma of the sinonasal region is an Epstein-Barr virus associated lymphoma and may present with a hemophagocytic syndrome.
- c. The most common type of non-Hodgkin lymphoma of sinonasal region in the western world is diffuse large B-cell lymphoma
- d. Non of the above

80. Which of the following concerning nasopharyngeal angiofibroma is correct

- a. It typically occurs in female adolescents and young adults
- b. Usually regress spontaneously after puberty
- c. It is considered a benign tumor, however characterized by local aggressive growth
- d. Non of the above

Chapter 10: Tumors of Lower Respiratory Tract

81. All of the following regarding mesothelioma is correct EXCEPT

- a. Presence of extracellular mucin, which stains positively for Alcian Blue, excludes the diagnosis mesothelioma.
- b.Immunohistochemically, mesothelioma stains positively for claretinine, WT-1, CK5/6 and D2-40.
- c. Immunohistochemically, mesothelioma stains negatively for Leu-M1, MOC-31, CEA and TTF-1.
- d. The interval between asbestos exposure and the development of mesothelioma is measured in decades.

82. Solitary fibrous tumor is characterized by

- a. It is poorly circumscribed, composed of bland spindle cells that express β catenin
- b.May be associated with hyperglycemia or hypertrophic pulmonary osteoarthropathy
- c. It stains positively for CK, bcl-2 and S-100.
- d. It is characterized by t(x; 18).

83. All of the following regarding pulmonary squamous cell carcinoma is correct EXCEPT

- a. Mutation of p53 is common in pulmonary squamous cell carcinoma
- b. Central cavitation with necrosis is a characteristic feature of squamous cell carcinoma
- c. It stains positively for CK5/6, CK34 β E12 and CEA.
- d. Basaloid variant carries a favorable prognosis

84. Small cell carcinoma is characterized by

- a. It is the most common type of lung cancer
- b. Mutations of p53 and inactivation Rb gene are found in >90% of small cell carcinoma
- c. Abnormalities of p16 are common in small cell carcinoma
- d. The diagnostic feature of small cell carcinoma is vesicular nuclei with prominent nucleoli.

85. All of the following is correct regarding pulmonary carcinoid EXCEPT

- a. Regional lymph nodes metastases are seen in 5% of typical carcinoid tumors
- b. Atypical carcinoid tumors are distinguished from typical carcinoid tumors by a higher mitotic rate and/or necrosis but main-

tainence of neuroendocrine architecture and staining

- c. Pulmonary carcinoids are TTF-1 negative, CK7 negative and CK20 positive.
- d.Dense-core secretory granules seen on electron microscopy are a distinctive feature of pulmonary carcinoids and small cell carcinoma.

86. Which of the following is not true

- a. KRAS mutation is more common in small cell carcinoma than in non-small cell carcinomas
- b.Chromosome 3p allele loss is one of the most common events in lung cancer pathogenesis
- c. Mucinous bronchoalveolar carcinoma shows an abrupt transition of tall mucinous tumor cells to cuboid cells and normal alveolar epithelium in the tumor periphery.
- d.Mucinous bronchoalveolar carcinoma is CK20 and TTF-1 positive.

Match the following pulmonary lesions with their characteristic features

- 87. Inflammatory myofibroblastic tumor
- 88. Mucoepidermoid carcinoma
- 89. Pleuropulmonary blastoma
- 90. Pulmonary blastomas
 - a. Least common salivary gland type tumors of the lung
 - b. Typical pediatric tumor
 - c. Most common gland type tumors of the lung
 - d. Commonly associated with rearrangement of ALK-1 gene.
 - e. Occurs in adults

Chapter 11: Tumors of the Mediastinum

91. All of the following concerning thymoma is false EXCEPT

- a. Most thymomas are benign tumors which however may recur after excision
- b. Myasthenia gravis is virtually always associated with thymoma
- c. The lymphoid cells of thymoma have a CD3/CD1a/CD99 phenotype
- d. Non of the above

Match the following tumors with their corresponding preferable compartment of mediastinum

- 92. Thymoma
- 93. Teratoma
- 94. Pericardial mesothelioma
- 95. Neural tumors
 - a. Posterior mediastinum
 - b. Anterior mediastinum
 - c. Middle mediastinum

Match the following types of thymoma with their corresponding definitions

- 96. Type A thymoma
- 97. Type AB thymoma
- 98. Type B1 thymoma
- 99. Type B2 thymoma
- 100. Type B3 thymoma
 - a. Composed of a mixture of a lymphocytepoor type A thymoma component and a more lymphocyte-rich type B-like component.
 - b. Composed of bland spindle/oval epithelial tumor cells with few or no lymphocytes.
 - c. Composed predominantly of areas resembling cortex with epithelial cells scattered in a prominent population of immature lymphocytes, and areas of medullary differentiation, with or without Hassall's corpuscles, similar to normal thymic medulla
 - d.Composed of medium-sized round or polygonal cells with slight atypia. The epithelial cells are mixed with a minor component of intraepithelial lymphocytes, resulting in a sheet-like growth of epithelial cells.
 - e. Composed of large, tumor cells arranged in a loose network, closely resembling the predominant epithelial cells of the normal thymic cortex. A background population of immature T cells is always present and usually outnumbers the neoplastic epithelial cells

Chapter 12: Tumors of The Oral Cavity

101. Which of the following salivary gland tumors has the highest prevalence in males and is bilateral/multifocal in 10% of cases

- a. Acinic cell tumor
- b. Adenoid cystic carcinoma
- c. Mucoepidermoid carcinoma
- d.Warthin tumor

102. Which of the following is the most common

malignant tumor of salivary gland

- a. Acinic cell carcinoma
- b. Adenoid cystic carcinoma
- c. Mucoepidermoid carcinoma
- d. Malignant mixed tumor

103. All of the following regarding pleomorphic adenoma is correct EXCEPT

- a. The recurrence rate of benign mixed tumors is dependent on the type of chromosomal rearrangement
- b. It can metastasize
- c. Malignant transformation of benign mixed tumor of the parotid gland is less common than other major salivary glands.
- d. Malignant transformation of benign mixed tumor can occur in either the epithelial or the stromal component

104. Which of the following regarding mucoepidermoid carcinoma is correct

- a. It represents the most common salivary gland tumor in children
- b.It consists of two major cell types mucin secreting and epidermnoid cells
- c. Low grade mucoepidermoid carcinoma consists of well differentiated squamous elements
- d. The most important prognostic factor is the tumor stage

105. All of the following regarding ameloblastic tumors is correct EXCEPT

- a. Ameloblastoma is the most common of the epithelial odontogenic tumors and typically arises in the mandible
- b. Ameloblastoma typically occurs in late adolescence, coincident with the eruption of the wisdom tooth
- c. Ameloblastoma is an invasive tumor with a tendency to recur locally, but is classified as a borderline malignant tumor owing its low propensity for metastases
- d. Ameloblastic carcinoma is similar in microscopic appearance to ameloblastoma save for atypical cytologic features

Chapter 13: Tumors of GIT

106. All the following regarding esophageal squamous cell carcinoma is correct EXCEPT

a. It has a widely variable incidence around

the world, with hot spots, most likely a function of lifestyle, dietary habits and environmental causes

- b. Most commonly affects upper third
- c. In situ carcinoma is increasingly recognized as the precursor lesion to invasive carcinoma ccccin areas with high incidence of esophageal cancer
- d.Superficial carcinoma and microinvasive carcinoma are terms that refer to the same entity regarding esophageal lesions

107. One of the following histopathologic types of esophageal cancer has an extremely aggressive behavior

- a. Adenosquamous carcinoma
- b. Basaloid carcinoma
- c. Verrucous carcinoma
- d.Non of the above

108. Which of the following is true concerning esophageal adenocarcinoma

- a. Has a better prognosis than squamous cell carcinoma
- b. Majority of cases develop on top of Barrett esophagus
- c. Majority of cases develop in the gastroesophageal junction
- d.Non of the above

109. All of the following concerning gastric adenocarcinoma is correct EXCEPT

- a. The diffuse type signet ring cancer is less associated with environmental factors
- b. The diffuse type mainly affects a younger age group
- c. Mutations of E-cadherin gene are associated with the diffuse type signet ring carcinoma
- d. The involvement of the APC mutation in the adenoma carcinoma sequence is the same in the stomach as it is in the colon

110. Which of the following is the MOST important prognostic factor in gastric adenocarcinoma

a. CA19-9 level b. CEA level c. Pathologic stage d. Patient age

111. A gastric endocrine tumor occurring in the fundus and assolated with achlorhydra and hyper-

- gastrinemia will most likely to secrete or contain a. ACTH
 - b. Enterochromaffin-like (ECL) cells
 - c. Histamine
 - d.Serotonin

112. Mutinous colorectal adenocarcinoma is associated with ONE of the following

- a. A near 100% likelihood of hereditary nonpolyposis colorectal cancer (HNPCC)
- b.A near 100% likelihood of high microsatellite instability (MSI-H)
- c. An excellent response to chemotherapy
- d.A better prognosis compared to signet ring cell carcinoma

113. Which of the following is/are required for classification of a tumor as a signet ring adenocarcinoma

- a. More than 50% of the tumor is comprised of mucin
- b.More than 50% of the tumor cells are signet ring cells
- c. High microsatellite instability (MSI-H)
- d. A family pedigree consistent with HNPCC

114. According to WHO 2010 prognostic groups of GIST, all of the following are classified as benign tumors EXCEPT

- a. Tumor size <2 cm with mitosis >5/50HPF b. Tumor size <2 cm with mitosis <5/50HPF
- c. Tumor size >2 <5 cm with mitosis <5/50HPF
- d.Tumor size >5<10 cm with mitosis <5/50HPF

115. Which of the following is true about carcinoid of the appendix

- a. Frequently associated with carcinoid syndrome
- b.Goblet cell type is consistently negative for chromogranin
- c. Insular type is associated with poor prognosis
- d. Represents an incidental finding in about 1 of 300 appendices

Chapter 14: Tumors of Hepatobiliary System

116. Which of the following are considered precursor lesions for hepatocellular carcinoma a. High grade dysplastic nodule b. Focal nodular hyperplasia c. Small cell change d.a and c

117. An increased risk for developing hepatocellular carcinoma is associated with all of the following EXCEPT

- a. Wilson disease
- b.Hemochromatosis
- c. Alpha-1-antitrypsin deficiency
- d. Primary biliary cirrhosis

118. Which of the following concerning fibrolamellar carcinoma is true

- a. Is associated with hepatitis B infection
- b.Is strongly associated with the use of oral contraceptives
- c. Occurs primarily in young adults
- d. Occurs in the cirrhotic liver

119. Which of the following morphological or immunohistochemical features is MOST significant in diagnosing hepatocellular carcinoma

- a. Bile formation
- b.CAM5.2 immunoreactivity
- c. Cytoplasmic CEA immunoreactivity
- d.Sinusoidal pattern

120. Which of the following are important prognostic factors for hepatocellular carcinoma

- a. Overall TNM stage
- b. Microvascular invasion
- c. Associated cirrhosis
- d.All of the above

121. All of the following are correct concerning hepatoblastoma EXCEPT

- a. May be associated with a variety of congenital anomalies and even with other tumors such as Wilms tumor
- b.Most are composed of spindle cells arranged into rosettes
- c. Approximately 25% contain not only immature liver cells but also mesenchymal components such as bone or cartilage
- d. None of the above

122. Which of the following concerning hepatoblastoma is true

- a. Most common hepatic tumor occurring in teenagers
- b. Is broadly divided into epithelial and mixed epithelial/mesenchymal subtypes on the

basis of histologic appearance

- c. The small cell subtype is associated with a better prognosis
- d.It is staged using an AJCC/UICC TNM staging system

123. Which of the following concerning hepatic sarcoma is true

- a. Leiomyosarcoma is the most common primary hepatic sarcoma
- b. The most common hepatic sarcoma in children is embryonal or undifferentiated sarcoma
- c. Gastrointestinal stromal tumor (GIST) rarely occurs primarily in the liver
- d.b and c

124. Intrahepatic cholangiocarcinoma are associated with which of the following conditions

- a. Primary sclerosing cholangitis
- b.Liver flukes
- c. Recurrent bacterial cholangitis
- d.All of the above

125. Which of the following concerning gall bladder cancer is true

- a. Gall bladder carcinoma is commonly associated with diffuse calcification of the wall
- b.Most gall bladder tumors are sarcomas
- c. Epithelial dysplasia is considered a precursor lesion for carcinoma
- d.Non of the above

Chapter 15: Tumors of Urinary System

126. Which of the following is incorrect concerning molecular pathogenesis of urothelial cancer of the urinary bladder

- a. Chromosome 9 deletions are common and occur on both short and long arms
- b.p53 mutations are associated with carcinoma in situ and aggressive disease
- c. pRb alterations are observed and correlate with poor prognosis
- d.activating FGFR3 mutations are most common in metastatic lesions

127. According to AJCC 7th edition guidelines, what is the correct classification of a urothelial carcinoma with deep muscularis propria invasion with extension into prostatic urethral without prostatic stromal invasion

a. T2a

- c. T3a
- d.T4a

128. Regarding urinary bladder tumors which of the following is INCORRECT

- a. 90% are squamous carcinomas
- b.Painless hematuria is the commonest presentation
- c. Cigarette smoking is an important etiological factor
- d. Superficial tumors are often well controlled by transurethral resection

129. The following are carcinogens important in urinary bladder cancer

- a. Auramine
- b.Benzidine
- c. Beta-naphthylamine
- d. All of the above

130. Which of the following regarding urothelial carcinoma is true

- a. Detection of muscularis propria invasion is more important for prognosis than invasion of lamina propria
- b. Prominent muscle fascicles always indicate muscularis propria in urinary bladder biopsies
- c. Identification of tumor adjacent to fat cells indicates invasion into perivesical tissue
- d. The term carcinoma in situ is used for all papillary transitional cell carcinomas not invading lamina propria

131. All of the following regarding renal cell carcinoma is correct EXCEPT

- a. It is the most common malignancy in patients who have Von Hippel-Lindau disease
- b. Clear cell carcinomas are more often bilateral and multicentric than papillary carcinomas
- c. Papillary carcinomas have a better prognosis than conventional clear cell type
- d. Collecting duct carcinomas are centered in the medulla, have tubulopapillary architecture and evoke strong desmoplastic reaction.

132. A feature of chromophobe renal cell carcinoma is

a. Associated with tuberous sclerosis

b. Good prognosis c. High prevalence of 3p deletion d. Mean age of 25 years

Match the following renal tumors with thier corre-

- sponding characteristic features
- 133. Renal medullary carcinoma
- 134. Collecting duct carcinoma
- 135. Clear cell renal cell carcinoma
 - a. Loss of INI-1 expression
 - b. Associated with sickle cell trait (Hb-AS or Hb-SC) or, rarely, sickle cell anemia (Hb-SS)
 - c. Positive for CD10 and vimentin
 - d. Positive for HMCK, EMA, CK7 and INI-1

Chapter 16: Tumors of Male Genital System

136. Which of the following histopathologic features favor the diagnosis of prostatic adenocarcinoma over hyperplasia

- a. Conspicuous nucleoli
- b. Cystic dilatation of glands
- c. Lymphocytic infiltration
- d. Prominent papillary infoldings

137. Besides age, which of the following is a wellrecognized factor influencing the incidence of prostatic carcinoma

- a. Exposure to environmental toxins
- b.Fat consumption
- c. Nodular hyperplasia
- d.Race

138. Regarding prostate cancer screening which of the following is true

- a. Complex form of prostatic specific antigen (PSA) is released predominantly by prostatic hyperplasia
- b.False-negative rate of core biopsies is approximately 25%
- c. Free form of PSA is released predominantly by prostatic cancer
- d.Transrectal ultrasonography (TRUS) has a 95% sensitivity

139. Which of the following features will differentiate low grade from high grade prostatic intraepithelial neoplasia (PIN)

- a. Negative immunostaining for basal cellspecific markers
- b. Arxhitectureal features

c. Macronucleoli d. Mitotoic figures

140. Which germ cell tumor is associated with widespread hematogenous metastases and high levels of HCG

- a. Pure choriocarcinoma
- b. Yolk sac tumor
- c. Embryonal carcinoma
- d.Seminoma

141. Which immunohistochemical markers are expressed in seminoma

- a. CD117
- b.CD30
- c. PLAP
- d.a and c

142. Intratubular germ cell neoplasia (IGCNU) is considered a precursor for all germ cell neoplasia EXCEPT

- a. Choricarcinoma
- b.Classic seminama
- c. Embryonal carcinoma
- d. Spermatocytic seminoma

143. Which of the following histologic patterns is most characteristic of sertoli cell tumor

- a. Glandular arrangement
- b.Mixture of cytotrophoblasta and syncytiotrophoblasts
- c. Tubules reminiscent of immature semineferous tubules
- d. Round nests between lymphocyte-rich septa

144. All of the following regarding adenomatoid tumor of the epididymis is correct EXCEPT

- a. It is the most common tumor of the epididymis
- b.It shows positive reaction for MOC-31, CEA and Leu M1
- c. It is large but well circumscribed and encapsulated benign tumor
- d.It frequently shows vacuolization of the cytoplasm and may simulate vascular tumors

145. Which of the following is considered a grade 1 immature teratoma

- a. Amount of immature neuroectoderm occupies <1 low-power (4x objective) magnification field
- b.Amount of immature neuroectoderm

occupies >1 but <3 low-power magnification fields

- c. Amount of immature neuroectoderm occupies >3 low-power (4x objective) magnification fields
- d.Non of the above

Chapter 17: Gynecologic Tumors

146. Which of the following increases the risk of developing ovarian cancer

- a. Use of oral contraceptives for >5 consecutive years
- b.Nulliparity
- c. Breast feeding
- d. Tubal ligation

147. Which of the following regarding juvenile granulosa cell tumor is correct

- a. It is never diagnosed in adults
- b. Always positive for EMA
- c. Recurrence frequency occur more than five years after initial diagnosis
- d.98% of cases are unilateral.

148. All of the following regarding endometrial adenocarcinoma is correct EXCEPT

- a. Endometrioid (type I) carcinoma has a prognosis twice as good as serous or clear (type II) carcinomas.
- b.Type I carcinomas commonly found to have p53 mutations.
- c. Benign and borderline clear cell tumors are very rare
- d.Her-2/neu amplification is a common feature of type II carcinomas

149. FIGO grading system for endometrioid adenocarcinoma is based mostly on

- a. Architectural features
- b.Hormone receptor status
- c. Mitotic rate and nuclear atypia
- d. Nuclear atypia and architectural features

150. Which of the following applies to uterine leiomyosarcoma

- a. Arise from malignant transformation of benign leiomyomas
- b. Invade locally but rarely metastasize
- c. Occur exclusively in postmenopausal women
- d.Non of the above

Match the following histologic features with their corresponding smooth muscle tumor

- 151. Slight increased cellularity with inimal cytologic atypia and mitosis less than 5/10HP
- 152. Marked atypia with mitotic rate >10/10HPF including abnormal forms as well as coagulative necrosis
- 153. Cellularity and cytology of normal myometrium with mitotic figures >5/10HPF with no abnormal forms or coagulative necrosis
- 154. Cellularity and cytology of normal myometrium with no mitotic figures
- 155. Minimal atypia, slight increased cellularity with mitotic rate <10/10HPF without abnormal forms
 - a. Leiomyosarcoma
 - b.Leiomyoma
 - c. Cellular leiomyoma
 - d. Mitotically active leiomyoma
 - e. Smooth muscle tumor of uncertain malignant potential (STUMP)

Chapter 18: Breast Cancer

Match the following hormone receptor status and proliferation index patterns with their corresponding breast cancer subtype

- 156. ER positive, PR positive, Her-2/neu negative and Ki-67 positive.
- 157. ER negative, PR negative and Her-2/neu positive
- 158. ER negative, PR negative and Her-2/neu negative CK5/6 negative
- 159. ER positive, PR positive, Her-2/neu negative and Ki-67 negative.
- 160. ER negative, PR negative and Her-2/neu negative CK5/6 positive
 - a. Luminal A
 - b. Luminal B (Her-2/neu positive)
 - c. Luminal B (Her-2/neu negative)
 - d. Her-2/neu enriched
 - e. Basal-like
 - f. TNP nonbasal

161. Which of the following pathologic subtypes of breast cancer is associated with more favorable prognosis

- a. Metaplastic
- b.Scirrhous
- c. Tubular
- d. Medullary

162. Factors that increase risk for developing breast cancer include all of the following EX-CEPT

a. Early menarche or late menopause

- b. Age >30 years at time of first pregnancy
- c. Nulliparity
- d. First or second trimester abortion

163. All of the following is correct regarding BRCA1 EXCEPT

- a. Located on chromosome 17.
- b.Contributes to multiple functions, including cell cycle checkpoint control.
- c. Shares functional but not sequence similarity with BRCA2
- d. It is not a classic tumor suppressor gene because both alleles must be lost or mutated to confer an increased risk of cancer.

Match the following lesions with their relative risk for subsequent malignant transformation 164. Atypical ductal hyperplasia

- 165. Ductal carcinoma insitu
 - a. 4 to 5 times
 - b.8 to 10 times
 - c. 1.5 times

Chapter 19: Tumors of Endocrine and Neuroendocrine

166. Which of the following variants of papillary thyroid carcinoma is associated with the worst prognosis

- a. Diffuse sclerosing
- b.Encapsulated
- c. Microcarcinoma
- d. Tall cell variant

167. The following is MOST useful in distinguish-

ing follicular adenoma from follicular carcinoma

a. Determining MIB-1 labeling index

- b. Estimation of p27 and galectin-3 expression
- c. Measurement of the main nodule diameter
- d.Microscopic examination of the entire capsule

168. Insular carcinoma of the thyroid gland is most probably

a. Atypical carcinoid of the thyroid

b. Equivalent to anaplastic carcinoma

- c. Poorly differentiated follicular or papillary carcinoma
- d. Salivary gland-like neoplasm

169. All of the following is true regarding Hurthel cell carcinoma EXCEPT

- a. It is a variant of papillary carcinoma
- b. It is also known as oxyphil cell carcinoma
- c. It has a worse prognosis than papillary or follicular carcinoma
- d.It is less iodine-avid than papillary or follicular carcinoma

170. All of the following is correct regarding adrenocortical tumors EXCEPT

- a. Mitotic activity and venous invasion correlate best with recurrence or metastases
- b. An adrenocortical tumor strongly positive for vimentin and weakly positive or negative for CK is likely to be carcinoma
- c. The presence of aneuploidy strongly favors malignancy over a benign adrenocortical tumor
- d. Chromogranin and CK are most useful in distinguishing adrenocortical tumors from adrenomedullary tumors

171. All of the following are considered to be part of MEN1, EXCEPT

- a. Pituitary adenoma
- b.Carcinoids
- c. Medullary thyroid carcinoma
- d.Benign adrenal tumors

172. Which of the following are considered malignant features in pheochromocytoma

- a. Increased mitotic figures with abnormal forms
- b.Necrosis
- c. Distant metastases
- d.All of the above

173. The majority of medullary thyroid carcinomas associated with MEN2A and MEN2B contain mutations in which proto-oncogene

a. RAS b. PTEN c. RET

d.P53

174. All of the following regarding pituitary adenoma are true EXCEPT

a. Serum levels of prolactin (PRL) above

200ng/ml are considered diagnostic for PRL-producing adenomas

- b.Endocrine amyeloid is not an uncommon feature of PRL-producing adenomas
- c. All ACTH cell adenomas are functional
- d.Adenomas of TSH cell type are the least common pituitary tumor type

175. All of the following are considered favorable histology according to International Neuroblastoma Pathology Committee (INPC) EXCEPT

- a. Poorly differentiated neuroblastoma, schwannian stroma poor with low or intermediate MKI in 1 years old child.
- b. Undifferentiated neuroblastoma, schwannian stroma poor with low MKI in a patient 1 years old child.
- c. Differentiating neuroblastoma, schwannian stroma poor with low or intermediate MKI in a 1 years old child.
- d. Differentiating neuroblastoma, schwannian stroma poor with low or intermediate MKI in a 3 years old child.

Chapter 20: Bone Sarcomas

176. Which of the following conditions is responsible for most cases of osteosarcoma arising in patients older than 45 years

- a. Fibrous dysplasia
- b.Infections
- c. Paget's disease
- d. Prior radiation

Match the following variants of osteosarcoma with its expected behavior

- 177. Parosteal osteosarcoma
- 178. Conventional osteoblastic osteosarcoma
- 179. Periosteal osteosarcoma
- 180. Paget's associated osteosarcoma
 - a. Favorable
 - b.Unfavorable

181. Which of the following is true concerning osteosarcoma

- a. Conventional osteosarcomas have a characteristic 11;22 translocation which is important for the diagnosis
- b.Small cell osteosarcoma is characterized by a chromosomal translocation t(11;22) (q24;q12)
- c. Periosteal osteosarcoma is a synonymous

with parosteal osteosarcoma

d. Post-chemotherapy tumor necrosis is the single most important prognostic parameter in conventional osteosarcoma.

Match the following syndromes with their corresponding associated bony lesions

- 182. Gardner syndrome
- 183. Maffucci syndrome
- 184. McCune-Albright syndrome
- 185. Ollier syndrome
 - a. Multiple enchondromas
 - b. Multiple osteomas
 - c. Multiple enchondromas with soft tissue angiomas
 - d. Fibrous dysplasia

Chapter 21: Tumors of Soft Tissue

186. Which of the following molecular genetics results using florescence in-situ hybridization (FISH) would be consistent with the diagnosis of synovial sarcoma

- a. Demonstration of SS18-SSX1 or SS18-SSX2 fusion gene
- b.Demonstration of EWSR1-FLI1 fusion gene
- c. Demonstration of FUS-DDIT'3 fusion gene
- d.Demonstration of EWSR1-NR4A3 fusion gene

187. Which of the following types of rhabdomyosarcoma has the worst prognosis

- a. Alveolar
- b.Emberyonal
- c. Pleomorphic
- d. All have equally poor prognosis

188. All the following is correct concerning liposarcoma EXCEPT

- a. Myxoid and round cell liposarcoma belong to the same genetic entity and the former is considered a poorly differentiated variant of the latter
- b. Atypical lipomatous tumor category encompasses atypical lipoma and well-differentiated liposarcoma
- c. Dedifferentiated liposarcoma is the term used for the emergence of a non-lipogenic undifferentiated solid component within an atypical lipomatous tumor
- d. Lipoblastoma is distinguished from myxoid

liposarcoma by the virtue of the young age of the patient, distinct lobulation, and absence of giant cells or pleomorphic nuclei

189. Which of the following vascular lesions is thought to arise as a florid form of organized and recanalized thrombus

a. Capillary heamangioma

- b.Intravascular papillary endothelial hyperplasia
- c. Malignant endovascular papillary angioendothelioma
- d. Symplastic heamangioma

190. All of the following are predisposing factors for development of soft tissue sarcomas EXCEPT

- a. Prior radiation exposure
- b.Chronic lympheodema
- c. Multiple endocrine neoplasia (MEN) type 1
- d. Neurofibromatosis type 1

Match the following cytogenetic abnormality with its corresponding sarcoma

- 191. t(11;22) (q24;q12)
- 192. t(12;16) (q13;p11)
- 193. t(x;18) (p11;q11)
- 194. t(2;13)(q35;q14)
 - a. Synovial sarcoma
 - b. Alveolar rhabdomyosarcoma
 - c. Myxoid liposarcoma
 - d. Ewing sarcoma

195. Which of the following is not true concerning soft tissue sarcomas

- a. Histologic subtype is an important determinant of prognosis, natural history and therapy
- b. Nodal metastases are common
- c. Histologic tumor grade is the most prognostic factor
- d.Immunohistochemical status frequently yields evidence used to define the histologic subtype

Chapter 22: Tumors of Skin

196. The immunohistochemical staining most helpful in differentiating dermatofibroma from dermatofibrosarcoma is

a. Actin b.HMB-45 c. CD34 d.Vimentin

197. Besides HIV which of the following viruses is implicated in the pathogenesis of Kaposi sarcoma developing in patients with AIDS

a. Cytomegalovirus

- b.Herpes virus type 8
- c. Human papilloma virus type 16
- d.Human papilloma virus type 18

198. Risk factors for cutaneous melanoma include all the following EXCEPT

- a. Prior scalp radiation
- b.Inherited mutation of p16 (CDKN2A)
- c. Higher socioeconomic status
- d. Pregnancy

Match the following Clark level of melanoma with its corresponding microscopic description

- 199. Clark's level I
- 200. Clark's level II
- 201. Clark's level III
- 202. Clark's level IV
- 203. Clark's level V
 - a. Melanoma involving subcutis
 - b. Melanoma involving upper part of papillary dermis
 - c. Melanoma involving epidermis
 - d. Melanoma involving reticular dermis
 - e. Melanoma involving the whole papillary dermis

204. All the following are true concerning sebaceous tumors EXCEPT

- a. Sebaceous adenomas are associated with tuberous sclerosis
- b.Sebaceous carcinoma of eye lid is more aggressive than those occurring elsewhere in the skin.
- c. Sebaceous adenomas and carcinomas both show expression og EMA and androgen receptors
- d.Sebaceous tumors may be a component of Muir-Torre syndrome

205. All of the following is correct regarding cutaneous squamous cell carcinoma EXCEPT

- a. It may occure as a compliation of xeroderma pigmentosa
- b. Verrucous type is an extremely well differentiated subtype of squamous cell carcinoma
- c. Acantholytic type is the cutaneous equiva-

lent of mucoepidermoid carcinoma of salivary glands

d. It may be composed of spindle cells on histology

Chapter 23: Tumors of CNS

206. All of the following regarding pilocytic astrocytoma is correct EXCEPT

- a. Shows predilection for the anterior optic pathway
- b.Classically associated with Rosenthal fibers and esinophilic granular bodies
- c. Frequently displays extensive infiltration of adjacent subarachnoid space and leptomeninges
- d. Not frequently exhibit malignant degeneration if left untreated.

207. All of the following regarding medulloblastoma is correct EXCEPT

- a. At least 75% of childhood medulloblastoma arise in the lateral cerebellar hemisphere.
- b. The pale islands of desmoplastic medulloblastoma constitute loci of concentrated immunoreactivity for synaptophysin.
- c. The most common genetic alteration associated with classic medulloblastoma is isochromosome 17q formation.
- d.Skeletal deposits, often widespread, account for over 90% of systemic metastases.

208. Which of the following regarding meningioma is correct

- a. Males are more commonly affected than females
- b. Overlying bone invasion (hyperostosis) is indicative for a more aggressive course.
- c. Transitional meningioma is so called because it is a hybrid of meningiothelial and fibrous types.
- d. Papillary variant is considered a WHO grade I tumor.

Match the following CNS tumors with their corresponding associated syndromes

209. Subependymal giant cell astrocytoma (SEGA)

- 210. Hemangioblastoma
- 211. Astrocytoma
- 212. Medulloblastoma
- 213. Malignant peripheral nerve sheath tumor a. Turcot (glioma-polyposis syndrome)

b.Neurofibromatosis 1.

- c. Li-Fraumeni syndrome.
- d. Von Hipple-Lindau syndrome.
- e. Tuberous sclerosis.
- f. Gorlin syndrome.

214. All of the following regarding ependymoma is correct EXCEPT

- a. It tends to be diffusely infiltrating on radiologic study.
- b. CAM5.2 immunohistochemistry is useful in distinguishing papillary ependymoma from choroid plexus papilloma.
- c. Myxopapillay type restricted to the region of conus medullaris and filum terminale
- d. Tanycytic ependymoma are typically encountered at spinal levels.

215. Primary (de novo) glioblastoma multiforme (GBM) is commonly associated with all of the following EXCEPT

a. PTEN inactivation

- b.p53 mutation
- c. CDKN2A deletion
- d. Median age <60 years

Chapter 24: Tumors of Special Senses

216. Which of the following feature is the most significant in the prognosis of retinoblastoma

- a. Extent of necrosis
- b. Extent of optic nerve invasion
- c. Mitotic activity
- d. Presence of calcification
- 217. Which of the following statements is wrong
 - a. Retinoblastoma is a hereditary and acquired disease
 - b. Retinoblatoma gene is incorporated in the pathogenesis of osteosarcoma
 - c. Familial retinoblastoma can be bilateral
 - d.Familial retinoblastoma is a sex-linked disease

218. Concerning glomus jagulare, the following are wrong except

- a. Glomus jagulare is histogenetically related to glomus tumor of the stomach
- b. Glomus jagulare is a benign paraganglioma
- c. Glomus jagulare is a non-invasive tumor
- d.Glomus jagulare is positive for chromogranin

219. Tumors of the ocular adenxa include the following except

- a. Mixed tumor
- b.Lymphoma
- c. Adenoid cystic carcinoma
- d.Yolk sac tumor

220. White pupil in an infant could mean the following except

- a. Retinoblastoma
- b.Congenital cataract
- c. Retinal detachment
- d. Non of the above

Chapter 25: Hematolymphoid Malignancies

221. Which of the following lesions characteristically has the highest proliferation index (Ki-67)

- a. Mantle cell lymphoma
- b.Small lymphoytic lymphoma/chronic lymphocytic leukemia
- c. Marginal zone lymphoma
- d. Hairy cell leukemia

Match the following immunostaining patterns of large B-cell lymphoma with their corresponding subgroup

222. CD10 positive, Bcl-6 positive and MUM-1 negative

223. CD10 negative, Bcl-6 positive and MUM-1 negative

224. CD10 negative, Bcl-6 positive and MUM-1 positive

225. CD10 negative, Bcl-6 negative and MUM-1 positive

a. Non-germinal center-like group (non-GCB) b. Germinal center-like group (non-GCB)

Match the following types of non-Hodgkin lymphoma with their proliferation index (Ki-67)

- 226. Blastoid mantel cell lymphoma
- 227. Burkitt lymphoma
- 228. Pleomorphic mantel cell lymphoma
- 229. Usual mantle cell lymphoma
- 230. Diffuse large B-cell lymphoma a. <10%
 - b.40%-70%
 - **c.** 100%
 - d.10%-30%
 - e.>30%
 - f. < 2%

- a. Occurs mostly in children aged >10 years, mostly localized.
- b.Mediastinal involvement is common in nodular sclerosis type
- c. EBV is detected in 40% of pediatric HL.
- d.Nodular lymphocyte predominant HL (NLPHL) is usually disseminated.

232. All of the following is true regarding nodular lymphocyte predominant HL (NLPHL) EXCEPT

- a. Large cells are LCA positive, CD20 positive, CD15 and CD30 negative
- b.Does not transform to large B-cell lymphoma
- c. Background cells are germinal center derived.
- d. Background T-cells are CD8 negative.

Match the following types of small cell non-Hodgkin lymphoma with the correct immunohistochemical panel

- 233. Follicle center cell lymphoma (follicular lymphoma)
- 234. Small lymphoytic lymphoma/chronic lymphocytic leukemia
- 235. Mantle cell lymphoma
 - a. CD20 +, CD5 +, CD23+, CD10 -, cyclin D1 -
 - b. CD20 +, CD5 -, CD10+, Bcl-2 +, Bcl-6 +
 - c. CD20 +, CD5 +, CD23-, CD10 -, cyclin D1 +

d. CD20+, CD5-, CD23-, cyclin D1 -, IgM +

Chapter 26: Histiocytic and Dendretic Tumors

Match the following histocytic tumors with teir cell of origin

- 236. Juvenile xanthogranuloma
- 237. Rosai Dorfnam disease
- 238. Follicular dendritic cell sarcoma
- 239. Langerhans cell histiocytosis
- 240. Histiocytic sarcoma
 - a. Dendritic cell
 - b.Macrophages
 - c. Other cells

Match the following histiocytic tumors with their corresponding diagnostic immunohistochemical markers

- 241. Langerhans cell disease
- 242. Follicular dendritic cell sarcoma
- 243. Histiocytic sarcoma a. CD163, CD68 b.CD207, S-100, CD1a
 - c. CD21

Match the following histiocytic cells with their histogenic cell of origin

- 244. Follicular dendritic cell sarcoma
- 245. Langerhans and histiocytic tumors a. Hematopoietic (Myeloid) cell
 - b. Mesenchymal stem cell
 - c. Other cell

Answers of MCQs

Chapter 1	Chapter 5	Chapter 9	Chapter 13	142. d	177. a	214. a
1 . h	37. b	71. c	106. b	143. c	178. b	215. d
2. a	38. d	72. b	107. b	144. b	179. a	
3. d	39. b	73. d	108. b	145. a	180. b	Chapter 24
4. c	40. d	74. c	109. d		181. d	216. b
5. g		75. d	110. c	Chapter 17	182. b	217. d
6. f	Chapter 6	76. d	111. b	146. b	183. c	218. d
7. e	41. d	77. c	112. d	147. d	184. d	219. d
8. c	42. c	78. b	113. b	148. b	185. a	220. c
9. c	43. c	79. a	114. a	149. d		
10. a	44. d	80. c	115. d	150. d	Chapter 21	Chapter 25
	45. a			151. c	186. a	221. a
Chapter 2	46. b	Chapter 10	Chapter 14	152. a	187. a	222. b
11. d	47. a	81. a	116. d	153. d	188. a	223. b
12. d	48. d	82. b	117. d	154. b	189. b	224. a
13. c	49. b	83. d	118. c	155. e	190. c	225. а
14. d	50. c	84. b	119. d		191. d	226. е
15. d		85. c	120. d	Chapter 18	192. c	227. с
	Chapter 7	86. a	121. b	156. c	193. a	228. d
Chapter 3	51. c	87. d	122. b	157. d	194. b	229. a
16. c	52. b	88. c	123. d	158. f	195. b	230. b
17. b	53. a	89. b	124. d	159. a		231. d
18. e	54. f	90. e	125. с	160. e	Chapter 22	232. b
19. f	55. d			161. c	196. c	233. b
20. c	56. c	Chapter 11	Chapter 15	162. d	197. b	234. а
21. a	57. f	91. c	126. d	163. d	198. d	235. с
22. g	58. f	92. b	127. b	164. a	199. c	
23. d	59. b	93. b	128. a	165. b	200. b	Chapter 26
24. с	60. b	94. c	129. d	Chapter 19	201. e	236. в
25. d		95. a	130. a	-	202. d	237. b
	Chapter 8	96. b	131. b	166. d	203. a	238. с
Chapter 4	61. b	97. a	132. b	167. d	204. a	239. a
26. c	62. b	98. c	133. a	168. c	205. с	240. b
27. b	63. a	99. e	134. d	169. a		241. b
28. d	64. d	100.d	135. с	170. b	Chapter 23	242. с
29. a	65. c			171. c	206. d	243. a
30. c	66. b	Chapter 12	Chapter 16	172. c	207. a	244. b
31. b	67. a	101. d	136. a	173. c	208. c	245. a
32. f	68. c	102. c	137. d	174. c	209. е	
33. a	69. c	103. a	138. d	175. b	210. d	
34. d	70. b	104. a	139. c		211. с	
35. c		105. b	140. a	Chapter 20	212. а	
36. d			141. d	176. c	213. b	
				-	-	

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Index

A

Abnormal mitosis, 84 Acanthosis nigricans, 376 Accuracy test, 54 Acinar carcinoma, 240 Acquire d immune deficiency syndrome, 42 Acral lentiginous melanoma, 371 Actin, 72 Acute lymphoblastic leukemia (ALL), 442 Acute myelogenous leukemia (AML), 442 Acute promyelocytic leukemia, 442, 444 Acute transforming viruses, 40 Acutoschizis, 98 Adaptive (specific) immunity, 152 Adenocarcinoma, 64 Adenoid cystic carcinoma, 193 Adenomatous hyperplasia, 293 Adenomatous polyps, 209 Adenosarcoma, 294 Adenosquamous carcinoma, 288 Adoptive cell therapy (ACT), 156 Adoptive immunomodulation, 156 Adoptive immunotherapy, 156 Adrenocortical carcinoma, 320 Adrenogenital syndrome, 141, 320 Adult stem cell (ASC), 57 Adult T-cell leukemia/ lymphoma, 425 Aflatoxin, 33 Aggressive lymphoma, 418 AIDS, 42 AIDS-related cancers, 43 Alcohol and cancer, 188 Allogeneic stem cell transplantation (ASCT), 158 Alpha-fetoprotein AFP, 61 Alveolar soft part sarcoma, 358 Al-Zahrawi A, 3

Ameloblastoma,195 Ames B, 319 AML, 442 Amyloidosis and cancer, 145 Amyloidosis, 145 Anal cancer, 218 Anaplasia, 83 Anaplastic astrocytoma, 389 Anaplastic large-cell lymphoma, 424 Anaplastic oligodendroglioma, 385 Anaplastic thyroid carcinoma, 315 Aneuploidy, 88 Angiogenesis, 137 Angioimmunoblastic T-celllymphoma (AITL), 418 Angiosarcoma, 356 Antiangiogenesis, 137 Antibody dependent cellular cytotoxicity (ADCC), 155 Antigen-presenting cells, 148 Antigens in tumors, 147 Antitumor agents, 121, 156 Apoptosis, 98 Appendiceal carcinoid tumor, 226, 227Apudomas (neuroendocrine tumors), 67 Arsenical keratosis, 376 Aristotle, 2 Aspergillus, 145 Astrocytoma, 389 Atypical squamous cells, 286, 287 Autocrine, 97 Autologous bone marrow transplant (AIHA), 158 Autophagy, 98 Avidin-Biotin complex, 62 Axillary lymph nodes, 306

В

Ballon cell melanoma, 371 BIRADS categories (mammography), 300, 401

Barrett esophagus (BE), 198 Basal cell carcinoma, 362 B-cell lymphomas, 418 BCG and cancer, 159 BCL-2, 112 Beatson G, 6 Becquerel, 6 Behavior categories of tumors, 78 Benign lymphoepithelial lesion (BLL), 193 Benign tumors, 78 Beta-catenin, 211 Bethesda cytology reporting, 86 BFB, 110, 117 Biliary carcinoma, 237 Bin Sina, 3 Biomarkers of cancer, 91 Biopsy of cancer, 6 Biotechnology revolution, 7 Biotin-streptavidin (BSA), 62 Bladder cancer, 250 Blast cell, 57, 434, 436 Blastemal tumors, 73 Bloom syndrome, 118 Bone marrow, 433 Bone metastases, in renal cell carcinoma, 345 Bone sarcomas, 335 Brain metastases, 394 Brain tumors, 378 Branchiogenic carcinoma, 172 BRCA-1, 299 BRCA-2, 299 Breast cancer (Egyptian data), 310 Breast cancer, 298 Brenner tumor ovarian, 281 Broder, 80 Burkitt lymphoma, 425

С

Cachexia and cancer, 145 Calcitonin, 315 Cancer antigen, 147 Cancer stem cell (CSC), 57 Candidiasis, 145 Carcinoembryonic antigen, 65 Carcinogenesis, stages, 105 Carcinogens, 33 Carcinoid syndrome, 67, 322 Carcinoid tumor, 67,177, 220, 322 Carcinoma in situ, 287, 251, 263 Carcinoma of unknown primary (CUP), 138 Carcinomas, 64 Carcinosaromas, 77 Carney complex, 359 CEL. chronic eosinophilic leukemia, 445 Cell cycle time, 125 Cell cycle, 125 Cell cycle, regulation, 125 Cell death, 98 Cell growth kinetics, measurement, 129 Cell populations in tumors, 127 Cell receptors (immune cells), 148 Cell receptors (somatic cells), 135 Cell renewal, 100 Central nervous system tumors, 378 Cervical intraepithelial neoplasia (CIN), 287 Cervical lymph nodes (levels), 162 Cervical neoplasms, 285 Chambers and Scott formula, 129 Chemical carcinogens, 33 Chemokines, 152 Chemoprevention, 52 Chemotaxis, 152 Chemotherapy, history, 6 Chemotherapy-induced cancers, 35 Cholangiocarcinoma, 237 Chondrosarcoma, 340 Chordoma, 344 Choriocarcinoma, 296 Chromatin remodeling, 119 Chromogranin A, 69 Chromosome aberrations, 107 Chronic lymphocytic leukemia (CLL), 422, 442, 443 Chronic myeloid leukemia (CML), 443

Cirrhosis, 232, 233 CIS. (carcinoma in situ), 287, 251, C-Kit, 96 Clark, melanoma staging, 373, 263Classification of cancer, 57 Clear cell carcinomas, 246, 320, 288, 292 Clear cell sarcoma, 249 Clear (balloon) cell melanoma, 371 Clearance zone of tumors, 90 Clinical behavior of cancer, 78 Clonal evolution, 105 Clonal expansion, 105 Cloning of DNA in bacteria, 9 CML. (chronic myeloid leukemia), 440 CMV. (cytomegalovirus), 145 C-myc, 112 Cohnheim, 74 Collecting duct carcinoma, 246 Colony stimulating factors, 433 Colorectal cancer, 205 Complete hydatidiform mole, 295 Complications of therapy, 146 Crossing over, 111 Cowden syndrome, 375 COX-2, 173 Cribriform carcinoma, 303 Criteria of malignancy, 83 Criteria of malignancy, in-vitro, 91 Cryptococcosis, 145 CSF, colony stimulating factors, 433 Culture, cancer cells, 91 Curability of cancer, 6 Curie M, 6 Cushing syndrome, 143, 321 Cutaneous melanoma, 368 Cutaneous T-cell lymphoma, 373 Cytogenetics, 9, 13 Cytokeratins, 64 Cytokines, 152 Cytopathology, 86

D

Dedifferentiation, 67 Definition of cancer, 95 Deletion of chromosomes, 108 Dermatofibrosarcoma protuberans, 353, 361 Dermatologic syndromes, 374 Dermatomyositis, 144 Desmin, 71 Desmoid tumor (fibromatosis), 352 Desmoplastic small round cell tumor, 358 Detection, Cancer, 54 Diagnostic markers, 61 DiGeorge thymic hypoplasia, 48 Diet and cancer, 43 Differentiated thyroid carcinoma, 314 Differentiation arrest and cancer, 118 Differentiation of cancer, 58, 78 Differentiation, induction, 119 Diffuse large B-cell lymphoma (DLBCL), 423 Diffuse neuroendocrine system, 67 Diploidy, 87 Direct criteria of malignancy, 83 Disseminated peritoneal adenomucinosis, (pseudomyxoma), 227 DNA (structure and regulation), 7 DNA analysis, 13 DNA changes in cell cycle, 125 DNA methylation, 119 DNA oncogenic viruses, 37 DNA probes (diagnostic), 11 DNA repair, 101 Dominant syndromes, 45 Dormant cancer cells, 137 Double-hit model (Knudson), 115 Duct carcinoma, pancreas, 240, breast, 303 Ductal carcinoma in situ (DCI, breast), 301 Ductal carcinoma in situ (DCIS), 301 Dysgerminoma, 280 Dysplasia, 286, 287 Dysplastic nevus syndrome, 368

Ε

E-cadherin, 134

Eclectic theory, 121 Ectopic tumors, 75 EGFR. (epidermal growth factor receptor), 96, 112 Electron microscopy, diagnostic, 6 Embryonal carcinoma, 271, 281 Embryonic rests and cancer, 73 Embryonic stem cell (ESC), 57 Embryonic tumors, 73 Endocrine ablation, 6 Endocrine malignancies, 313 Endocrine mechanisms, 48 Endocrine syndromes, 142 Endodermal sinus (yolk sac) tumor, 272, 281 Endometrial adenocarcinoma, 290Endometrial carcinoma, 290 Endometrial hyperplasia, 293 Endometrial stromal sarcoma, 294 Enteropathy-type T-cell lymphoma, 222 Envision detection system, 62 Eosinophilic granuloma, 454 Ependymomas, 389 Epidemiology of cancer, 15 Epidermal growth factor (EGF), 95,97 Epidermal growth factor receptor (EGFR), 96, 112 Epigenetic mechanisms, 119 Epithelial ovarian cancer, 280, 281 Epithelioid sarcoma, 358 Epithelium-to-mesenchyme transition (EMT), 135 Epstein, J, 38 Epstein-Barr virus (EBV), 38 Erdheim-Chester disease (ECD), 345, 456 Errors, diagnostic, 92 Esophageal cancer, 198 Estrogen receptor (ER), 120 Etiology of cancer, 32 Eton-Lambert syndrome (myasthenia), 144, 185 Ewing sarcoma, 342 Ewing, 6 Extragonadal germ cell tumors, 75 Extranodal marginal zone B-cell

lymphomas, 422 Extranodal NK/T-cell lymphoma, nasal type, 418 Extranodal peripheral T-cell, 418

F

Factor VIII, 71 False negative diagnosis, 54 False positive diagnosis, 54 Familial adenomatous polyposis (FAP), 210 Fanconi, 118 Fearon and Vogelstein, multistep model, 105 Female genital cancer, 277 Feminizing syndrome, 141 Fever and cancer, 145 Fffector immune cells, 149 FGF. Fibroblast growth factor, 97 FGFR3, 97 Fibrohistiocytic tumors, 353 Fibrolamellar hepatocellular carcinoma, 234 Fibromatosis, 352 Fibrous dysplasia, 339 Field carcinogenesis, 104 FIGO. International Federation of Gynecology and Obstetrics, staging, 282, 283, 289, 292 Five-year survival, 6, 7 Flow cytometry, 86 Fluorescent in situ hybridization (FISH), 13 FNA. (Fine needle aspiration), 316 FNH. (Focal nodular hyperplasia), 234 Follicular adenocarcinoma, 314 Follicular dendritic cell (FDC), 451, 456 Follicular dendritic cell sarcoma (FDCS), 456 Follicular lymphomas, 423 Forbes-Albright, 322 Foulds, L, 105 Fungal infection, 145

G

Galen, 3 Galileo G, 4 Gallbladder carcinoma, 237

Ganciclovir, 158 Gardner syndrome, 210, 374 Gastric adenocarcinoma, 200 202Gastrinoma, 332 Gastroenteropancreatic neuroendocrine tumors (GEP-NET), 327, 328 Gene expression profile (microarray), 13 Gene mutation theory, 106 Gene regulation, 8 Gene therapy, 157 Genodermatosis, 374 Genomic stability, 101 Geographic pathology of cancer, 15 Germ cell tumors, 73 Germ cells (embryology), 73 Germinomas, 73 Gestational trophoblastic tumors, 295 GF (growth fraction), 128 Giant cell tumor, bone, 343 GISTs, (gastrointestinal stromal tumors, 223 Gleason grading system, prostate, 265 Glial fibrillary acid protein, GFAP, 385 Glial tumors, 389 Glioblastoma multiforme, 389 Glioblastoma, 389 Glioma, 389 Global cancer problem, 15 Glucagonoma, 331 Gonadotropic syndromes, 141 Gonadotropin-releasing hormone, 141 Gorlin syndrome (naevoid basal cell carcinoma syndrome), 363, 375 Grading of cancer, 80 Grading of soft tissue sarcomas, 349 Granular cell tumor, 68, 365 Granulocyte colony-stimulating factor (G-CSF), 433 Granulocyte-macrophage colony - stimulating factor (GM-CSF), 433 Gross pathology, 5 Growth factors (Ligands), 95

Growth fraction (GF), 128 Gruber-Frantz tumor, pancreas, 241 GTM stage, 81 Gynecomastia,141

Η

Hairy cell leukemia (HCL), 422 Halsted, 6 Hand-Schuller-Christian disease, 454 HCC, (hepatocellular carcinoma), 232 HCL, (hairy cell leukemia), 422 Hedgehog signaling pathway in 236, 240, 363, 370 Hemangiopericytoma, 356 Hematologic syndromes, 144 Hematopoietic stem cell transplantation (HSCT), 158 Hemolymphoid malignancies, 406 Hemophagocytic syndromes (HLH), 453 Hepatic adenoma, 234 Hepatic metastases, 237 Hepatitis B virus, 37 Hepatitis c, 41 Hepatobiliary malignancies, 213 Hepatocellular carcinoma, (HCC), 232 Hepatocyte growth factor (HGF), 97 HER-2 (neu) signaling, 122 HER-2 scores, breast cancer, 305 HER2/neu, 123 Heredity and cancer, 45 Hereditary non-polyposis colorectal cancer (HNPCC) (Lynch syndrome), 212, 213 Hereditary papillary renal cancer syndrome, 245 Herpes simplex virus, HHV-6, 145 Hippocrates, 2 Histiocytic sarcoma (HS), 456 Histiocytosis (classification), 452 Histiocytosis (immunophenotyping), 452 Histochemical stains, 58, 59 Histogenesis of cancers, 58, 61 Histones, 7, 32

Histone acetylation, 119 History of cancer, 1 History of surgery, 6 HIV (human immunodeficiency virus), 42 HIV-1 virus, 42 HLA, (human leukocyte antigen), 148 Hodgkin lymphoma (HL), 409 Hodgkin, disease, 409 Homeostasis, 95 Hormone dependence, 48 Hormone receptors, 120, 304 Hormone responsiveness, (predictive markers, 63, 304 Hormone-induced malignancy, 48 Hormones and cancer, 48 Horner syndrome, HOX genes, ovarian cancer, 279 Howel-Evans syndrome (tylosis), 198 HPO, (hypertrophic pulmonary osteoarthropathy), 144 HPV, (human papilloma virus), 39 HSCT, (hematopoietic stem cell transplantation),158 HSTCL, (hepatosplenic T-cell lymphoma), 418, 449 HTL-1 virus, 41 Huggins, 6 Human chorionic gonadotropins, HCG, 91, 92, 296 Human herpes virus 6 (HHV-6), 145 Human immunodeficiency virus (HIV), 42 Human leukocyte antigen (HLA), 148 Human metapneumovirus (HMPV), 146 Human oncogenes, 111 Human papillomavirus (HPV), 39 Human T-cell leukemia/ lymphoma retrovirus (HTLV-1), 41 Humoral theory (historic), 2, 3 Hybridoma technology, 9 Hypercalcemia, 142 Hypergrowth syndromes, 141 Hypermethylation of DNA, 119

Hypernatremia (high Na ion), diabetes insipidus, 322 Hyponatremia (SIADH), low Na ion, 143 Hyperparathyroidism, 142 Hypertension and tumors, 141 Hyperthyroidism, 141 Hypertrichosis (increased hair), 376 Hyperuricemia and cancer, 146 Hyperviscosity syndrome, 426 Hypoglycemia, islet cell tumors, 331 Hypomethylation of DNA, 119 Hyponatremia (SIADH), 143 Hypopharynx, 169 Hypophosphatemic osteomalacia, 143

Ι

IARC classification of carcinogens, 33 Iatrogenic cancers, 45, 55 Iatrogenic effects on cancer, 89 Idiotype-anti-idiotype, 156 IFN, Interferons, 152 IGF signaling, 96, 97 IL-2, interleukin, 152,153 IL-6/JAK/stat 3,148,149 INK-family, 126 Immunoglobulin heavy-chain disease, IPSID, 222 Immunoglobulins, 152 Immunologic escape, 155 Immunology of cancer, 147 Immunomodulation, 156 Immunopathology of tumors, 62 Immunophenotyping, 61, 63 Immunosurveillance, 147 Immunosuppression,47 Immunotherapy, 156 Incidence rate, 15 In situ hybridization (ISH), 11, 13 In vitro (cancer cell), 91 Incidence rate, 15 Incomplete (partial) mole, 296 Indeterminate (uncertain) tumors, 79 Indeterminate dendritic cell tumor, 456 Indirect criteria of malignancy,

85 Infections in cancer patients, 145 Inflammatory breast cancer (IBC), 306 Inflammatory myxohyaline tumor, 359 Initiation, 105 Innate (natural) immunity, 151,154 Insulinoma (Islet cell tumor), 332 Interdigitating dendritic cell histiocytosis (IDT), 456 Interferons (IFN), 152 Interleukin-2 (IL-2), 152,153 Intermediate filaments, 62 Intraepithelial neoplasia (IEN), 263, 286 Intravascular large B-cell lymphoma, 418 Invasion of cancer, 133, 135 Invasive cervical carcinoma, 285 Invasive mole, 296 Invasive squamous cell carcinoma, 364 Inversion, 108 IPI. (International Prognostic Index), 421 Islet cell tumors, 331 Isochromosome, 108

J

JAK-2, 149 Joshi grading system, neuroblastoma, 325 Juvenile xanthogranuloma, 452

Κ

K cells (killer cells), 150 Kaplan-Meier curves, 5 Kaposi sarcoma (KS), 43, 373 Keratoacanthoma, 365 Ki-67 (MIB-1) proliferation index, 131 Kikuchi disease, 432 Kinetics of tumor growth, 125 Kip-family, 126 Klinefelter, 298 Knudson double-hit model, 115 Knudson, 115 K-ras, 112

L

Lactate dehydrogenase (LDH), 92, 421 Lacunar cells, 411, 412 LAK cells, Lymphokin-Activated Killer cells, 154 Lambert-Eaton myasthenic Syndrome, 144 Laminin, 134,135 Langerhans cell histiocytosis (LCH), 454 Langerin, 452 Large cell carcinoma, NSCLC, 174 Large cell neuroendocrine carcinoma (LCNEC), 173 Laryngeal cancer, 170 Larynx, 170 L. Chikawa (tar carcinogens), 5 LCIS (lobular carcinoma in situ), 302 LCNEC. (large cell neuroendocrine carcinoma), 173 Leiomyosarcoma, 355 Lentigo malignant melanoma, 371 Letter-Siwe disease, 454 Leucocytic common antigen, (LCA), 63 Leukemia, (specific types), 442 Li-fraumeni syndrome, 117 Ligands (growth factors), 95 Lipid storage disorders, 454 Liposarcoma, 353 Lobular carcinoma invasive, 303 Local effects of tumors, 140 Locally-aggressive tumors, 79 LOH. (loss of heterozygosity), 113 Low-malignant potential tumors, 79 Lung cancer, 173 Lymph node (histology), 406 Lymphocyte depleted Hodgkin lymphoma, 411 Lymphocyte-rich classical Hodgkin lymphoma, 411 Lymphokines, 152 Lymphoma. (specific types), 72, 406 Lymphomatoid granulomatosis, 418

Lymphoplasmacytic lymphoma,

429 Lynch syndrome (HNPCC), 212, 213

Μ

Macrophages, 150 Magnetic resonance imaging (MRI), 383-384 Major Histocompatability (MHC) molecules, 148 Male genital cancer, 263 Malignant effusions, 179 Malignant fibrous histiocytoma (MFH), 353 Malignant lymphoma, 406 Malignant melanoma, 368 Malignant Rhabdoid tumor, 249 Malignant tumors, 79 MALT lymphoma. Mucosaassociated lymphoid tissue), 422 Mammography, 300 Mantle cell lymphoma (MCL), marginal zone B-cell lymphomas, 424 Mast cell disease (MCD), mastocytosis, 448, 440 Matrix metalloproteinases (MMP), 135 MCD, (mast cell disease), 440, 448 MDS, (myelodysplastic syndrome), 438 Medications and cancer, 35 Medullary carcinoma, breast, 303 Medullary carcinoma, thyroid, 315 Medulloblastoma, 390 Megakaryocytes, 435 MEN, (multiple endocrine neoplasia), 333 Meningiomas, 392 Mesenchymal cancer stem cell, 71 Mesonephroma, 74 Metachronous cancers, 104 Metastases, unknown primary, 139 Metastasis, 134 Metastasis, lymph nodes, 138 Metastasis, mechanism, 135 Metastasis, organ sites, 138

Metastasis, patterns, 138 Middle East cancers, 22 Mickulicz syndrome, 193 Micro RNA (mi RNA), 121 Microarray gene expression profile, 13 Microsatellite instability, 212 Migratory thrombophlebitis, 144 Minimal residual disease (MRD), 139 Misdiagnosis, 92 Mitogen-activated protein kinase, MAPK, 113, 149 Mitosis in tumors, 83 Mixed cellularity Hodgkin lymphoma, 412 Mixed gliomas, 391 Mixed mesodermal tumor, mullerian, 294 Mixed sarcomas, 76 Mixed tumors, 76 MMP (matrix metalloproteinases), 135 Molecular classification (breast cancer), 305 Molecular genetics (diagnostic methods), 11 Molecular pathology, 7 Molecular genetics, 13 Monoclonal antibodies, drugtargeting, 156, 159 Monoclonal antibodies, monoclonal gammopathy, 426 Monoclonality, 104 Monoclonals, 156 Monocytic leukemia (MC), 444 Morgagni G, 5 Mortality rate, 15 mTOR (PI3-K/AKT), 96 Mucinous adenocarcinoma, 214, 292, 281, 303 Mucoepidermoid carcinoma, 192 Mucormycosis, 145 Muller J, 6 Mullerian carcinosarcoma, 294 Multicentric cancers, 104 Multifocal origin, 104 Multihit carcinogenesis, 105 Multiple endocrine neoplasia type 1 (Wermer syndrome), 333-334 Multiple endocrine neoplasia

type 2A (Sipple syndrome), 333 Multiple endocrine neoplasia type 2B, 333 Multiple myeloma, 427 Multiple primary cancers, 104 Multiploid tumors, 88 Multistep carcinogenesis, 105 Muir-Torre syndrome, 375 Mutations, 106 Myasthenia gravis,144 Mycosis fungoides, 373 Myelodysplastic syndrome (MDS), 438 Myeloproliferative neoplasms (MPN), 440 Myoglobin, myosin, 71 Myositis ossificans, 338 Myxoid liposarcoma, 353 Myxoma, 359

Ν

Nasopharyngeal carcinoma, 166-168 Nasopharynx, 166 Natural (Innate) immunity, 154 Natural killer (NK) cells, 150 NCI Registry, 25, 26 Necrosis in tumors, 98, 99 Neoplastic syndromes, 46, 47 Nephroblastoma (Wilms tumor), 248 Neuroblastoma, 323 Neuroectoderm (embryology), 67 Neuroectodermal tumor, 67, 322 Neuroendocrine tumors (Apudomas), 68,69,322 Neuroendocrine tumors (NET), 68, 322 Neurofibromatosis type 1, 114 Neurofibromatosis type 2, 114, 405 Neurofilaments (NF), 68 Neuromuscular syndromes, 143 Neuron-specific enolase, NSE, 69 NHL (non-Hodgkin lymphoma), 414 NK cells, natural killer cells, 150 Nodal marginal zone lymphoma, 423

Nodal peripheral T-cell lymphoma, 424 Nodular fasciitis, 353 Nodular lymphocyte predominant Hodgkin lymphoma, 412 Nodular melanoma, 371 Nodular sclerosis Hodgkin lymphoma, 412 Nodular tenosynovitis, 353 Non-seminomatous germ cell tumors, 271 Nondysjunction, 108 Non-clear-cell renal cell carcinoma, 245 Non-Hodgkin lymphoma (NHL), 414 Non-proliferative pool, 127 Non-small cell lung cancer (NSCLC), 173 Northern blot, 13 Nottingham prognostic index (NPI), 309 Notch signaling, 433

0

Occult metastases, 139 Occupational cancers, 35 Ocular lymphoma, 402 Oligodendroglioma, 389 Oligonucleotide, 7,123 Ollier disease, (Multiple enchondromas), 341 Oncogene theory, 111 Oncogenes, 111 Oncogenic viruses, 37 Oncologic emergencies, 140 Oral cavity, 188 Orbital tumors, 402 Organ specific markers, 66 Oropharynx, 169 Osteitis fibrosa cystica, 320 Osteosarcoma, 338 Ovarian cancer, 277

Р

PI3-K-AKT pathway, 96 p53 protein product of (TP53 gene), 116 P63, 343 Paget, 302, 335 Pancreatic cancer (exocrine), 239 Pancreatic cancer (endocrine),

331 Papanicolaou, 6 Papillary serous carcinoma, 281, 292Papillary thyroid carcinoma, 314 Parachordoma, 359 Paracrine, 97 Paraganglia, 68 Paragangliomas, 68 Parameters of tumor growth, 128 Paraneoplastic syndromes, 142 Paraptosis, 98 Parathyroid carcinoma, 319 Partial moles, 296 Pathogenesis of cancer, 95, 104 Pathology of cancer, 5, 6 PAX-5, 408 PCNA, (proliferating cell nuclear antigen), 131 PDGER, (platelet-derived growth factor receptor), 97 PDGF, (platelet-derived growth factor), 97 PEComa, 356 Pediatric cancer, 25 Penile cancer, 274 Peripheral T-cell lymphoma, 424 Peritoneal mucinous carcinomatosis, 227, 228 Peutz-Jeghers syndrome, 207, 374 Pheochromocytoma, 323 Phyllodes tumor, 310 PIN. (prostatic intraepithelial neoplasia), 264 Pitfalls in diagnosis, 92-94 PJS. (Peutz-Jeghers Syndrome), 207, 374 Placental-site tumors, 296 Plasma cell disorders, 426 Platelet-derived growth factor (PDGF), 97 Platelet-derived growth factor receptor (PDGFR), 97 Pleuripotent, 57 Plummer-Vinson, 169 PMF (primary myelofibrosis), 440 POEMS, 429 Polycythemia vera, 440 Polycythemia,435 Polymerase chain reaction

(PCR),9,10 Polymorphic (mixed) cell tumors, 76 Population changes in cancer, 127 Population of Egypt, 25 Potential doubling time (Tpot), 128 Pott (history of epidemiology), 5 Precancerous conditions, 50, 51 Precancerous lesions, 50, 51 Preclinical cancer, 129 Precursors of cancer (dysplasia), 50 Premalignancy, 50 Predictive markers, 63 Prevalence rate, 15 Prevention of cancer, 50 Primary CNS lymphoma, B-cell lymphoma, 394 Primary mediastinal lymphoma (thymic), 418 Primary prevention, 50 Primitive neuroectodermal tumors (PNET), 67, 68 Probe, DNA, 11 Profile of global cancer, 15 Progenitor cell, 57 Progesterone receptor (PR), 304 Prognostic factors (breast cancer), 308 Prognostic factors, 80 Prognostic, markers, 63 Progression, 105 Proliferation index, 128 Proliferative compartments, 127 Proliferative pool, 127 Promotion, 105 Promotor insertion, 108 Prostate cancer, 263 Prostatic acid phosphatase, PAP, 59 Prostatic intraepithelial neoplasia (PIN), 264 Prostatic specific antigen, PSA, 267, 268 Proteasome (protein degradation), 12, 13 Proteomics (analysis), 11, 13 Proto-oncogene products, 111 PSA (prostate-specific antigen), 267, 268 Pseudoepitheliomatous hyper-

plasia, 365 Pseudomyxoma peritonei, 227 **PTEN**, 96 PTH (parathyroid hormone), 142, 319 Pyriform sinus, 169 Q Quiescence (G0), 125, 126 R Radiation and cancer, 36 Radiation-induced cancers, 36 Radioimmunotherapy, 156, 157 Radiotherapy, history, 6 RAS oncogene, 112 Rb, 126 Receptors of immune cell, 148, 149 Recessive syndromes, 45-47 Reed-Sternberg giant cells, 409-411 Renal cell carcinoma, 245 Renal syndrome in cancer, 144 Restriction endonuclease enzymes, 8 Retinoblastoma (RB) gene, 115 Retinoid, 124 Reverse transcriptase, 39, 40 Reversibility of cancer, 106 Rhabdomyosarcoma, 354 Richter syndrome, in CLL, 418 Risk factors, 80 RNA oncogenic viruses, 39 RNA silencing by (mi RNA), 121 Rosai-Dorfman syndrome or disease (RDS, RDD),453 S S-100 protein, 61

Salivary gland cancers, 191 Sarcomas, 70 Sarcomatoid renal cell carcinoma, 246 Schiller-Duval bodies, 272 Schwann, 6 Scientific revolution, 4 Scoring of cancer, 81 Screening, 53 SCT Stem cell transplant, 158 Sebaceous carcinoma, 367 Seborrheic keratosis, 364 Second primary malignancy, 104 Secondary prevention, 53, 35 Secretory carcinoma, breast, 303 Seminoma, 271 Sentinel lymph node mapping, 133, 306 Sensitivity, test, 54 Sequencing (genetic), 13 Serous adenocarcinoma, histology, 281, 292 Serrated adenoma, 208, 212 Sezary syndrome, 373 Shimada, 325 SIADH. syndrome of inappropriate antidiuretic hormone secretion, 143 Signal transduction, 95 Signet-ring adenocarcinoma, 214 Sipple syndrome (MEN IIA), 333 Skin carcinomas, 362-367 Slow transforming viruses, 40 Small cell carcinoma, lung, 173-174 Small cell carcinoma, (of prostate), 265 Small cell lung carcinoma, 173-174 Small lymphocytic lymphoma (SLL), 422 Smoking, 34 Soft tissue sarcomas, 347 Solar radiation and cancer, 36 Solitary plasmacytoma of bone, 343 Somatostatinoma, pancreas, 332 Southern blot, 13 Specificity, test, 54 Splenic B-cell marginal zone lymphoma, 448 Spontaneous regression, 106 Spread of cancer, 133 Squamous cell carcinoma (SCC), 64, 189, 252, 364 Squamous intraepithelial lesions, 286-287 Staging of cancer, 81 Stem cells, 57 Steroid hormones, 48 Subpopulations of tumors, 127 Suicide vector therapy, 158 Superficial spreading malignant melanoma, 370-371

Supernatural concepts, 1

Surgical margins, 89 Survival (breast cancer), 308, 309 Sweet syndrome, 376 Synaptophysin, 69 Synchronous cancers, 104 Syndromes, cancer, 210, 298, 333, 347, 374, 379 Synovial sarcoma, 358 Synovioma, 358 Systemic effects of tumors, 141 Systemic mastocytosis, 440-441

Т

T lymphocytes, 150 Tamoxifen, 304, 56 Targeted therapy, 121 Tc (cell cycle time), 125 T-cell lymphoma,418 Td (volume doubling time), 128 Telomerase, 117 Telomere problem, 117 Teratoma, 73 Terminal deoxynucleotidyl Transferase (TdT), 72 Terminal differentiation, 58 Tetraploid tumors, 88 TGF, (Transforming Growth Factor), 96 Therapeutic effects on tumors, 89 Thrombophlebitis,144 Thymidine labeling index, 130 Thymoma, 182 Thyroid carcinoma, 313 Thyroid transcription factor 1, (TTF-1), 66 TIL cells, tumor infiltrating lymphocytes, 156 Time trends of cancer, 25 TLS (tumor lysis syndrome), 146 TNM staging, 81 Tobacco and cancer, 34 Totipotent, 57 TP 53 gene, 116 Tpot (potential doubling time), 128 Transcription factor, 95,112 Transforming growth factor (TGF), 96 Transit, metastases, 133 Transitional cell carcinoma, 252 Transitional cell tumors, 252 Translocations of chromosomes,

108

Tuberous sclerosis, 375, 245 Tubular adenoma, 209 Tubulovillous adenoma, 207 Tumor antigens, 147 Tumor markers, 63, 91 Tumor necrosis factor alpha (TNF-a), 152 Tumor suppressor genes (TSG), 113 Tumor volume, 129 Tumor-host interactions, 140 Tumor-like lesions, 353, 364, 365 Tyrosine kinase inhibitors (TKIs), 122

U

Ubiquitin, 12, 13 Uncertain histogenesis (tumors), 76 Undifferentiated tumors, 78 Unipotent, 57 Urachal carcinoma, 74 Urothelial cancer, 252 Uterine cervix tumors, 285 Uterine corpus tumors, 290 Uterine sarcomas, 294 Uveal melanomas, 397

V

Vaccines for cancer, 156 Van Nuys grading, 301 Van Nuys prognostic index (VNPI), 302 Vascular endothelial growth factor (VEGF), 97, 137 Vascular syndromes, 144 Verner-Morrison syndrome, 333 Verruca vulgaris,(HPV), 39 Verrucous carcinoma, 171, 252 Vesalius (anatomy), 4 Vestigial remnants (tumors), 73 Villous adenoma, 207 Vimentin, 71 Vipoma, 333 Viral oncogenes, 41 Virchow, 6 Virilizing syndrome, 141 Viruses and cancer, 37 Volume doubling time, 128 Von Hippel Lindau syndrome,

245

W Waldenstrom's macroglobulinemia, 429 Waldeyer, ring, 169

Weremer syndrome (MEN I), 333- 334 Wilms tumor (Nephroblastoma), 248 Wiskott-Aldrich syndrome, 48 WNT signaling, 211

Х

Xeroderma pigmentosum, 363

Y

Yamagiwa, 5