Access to outstanding animations!

KEITH L. MOORE T.V.N. PERSAUD

THE DEVELOPING HUMAN

Clinically Oriented Embryology

8th Edition

International Edition



Contents

1	Introduction to The Povelening		Formation of the Amnietic Coulty Emburgate
<u></u>	Introduction to The Developing		Formation of the Amniotic Cavity, Embryonic
	Human 1 Developmental Periods 2		Disc, and Umbilical Vesicle 44 Development of the Chorionic Sac 45
	Embryologic Terminology 2		Implantation Sites of Blastocysts 45
	Significance of Embryology 7		Summary of Implantation 48
	Historical Gleanings 8		Summary of the Second Week 51
	Ancient Views of Human Embryology 78		Clinically Oriented Problems 53
	Embryology in the Middle Ages 8	_	omitodity Offented Floorettis 33
	The Renaissance 9	4	Formation of Germ Layers and Early
	Genetics and Human Development 11	_	Tissue and Organ Differentiation: Third
	Molecular Biology of Human Development 11		Week 54
	Descriptive Terms in Embryology 11		Gastrulation: Formation of Germ Layers 55
	Clinically Oriented Problems 13		Primitive Streak 57
	Omnicany Offented Floblettis 13		Fate of the Primitive Streak 57
2	The Beginning of Human Development:		Notochordal Process and Notochord 59
_	First Week 14		The Allantois 62
	Gametogenesis 15		Neurulation: Formation of the Neural Tube 62
	Meiosis 15		Neural Plate and Neural Tube 62
	Spermatogenesis 15		Neural Crest Formation 62
	Oogenesis 20		Development of Somites 65
	Prenatal Maturation of Oocytes 20		Development of the Intraembryonic Coelom 65
	Postnatal Maturation of Oocytes 20		Early Development of the Cardiovascular
	Comparison of Gametes 20		System 65
	Uterus, Uterine Tubes, and Ovaries 21		Vasculogenesis and Angiogenesis 66
	Uterus 21		The Primordial Cardiovascular System 67
	Uterine Tubes 21		Development of Chorionic Villi 68
	Ovaries 23		Summary of the Third Week 68
	Female Reproductive Cycles 23		Clinically Oriented Problems 70
	Ovarian Cycle 23		Ordensedenskie Beniede Ferrikk de Fleitele
	Follicular Development 23	5	
	Ovulation 23		Weeks 72
	Corpus Luteum 25		Phases of Embryonic Development 73
	Menstrual Cycle 27		Folding of the Embryo 73
	Phases of the Menstrual Cycle 27		Folding of the Embryo in the Median
	Transportation of Gametes 28		Plane 73
	Oocyte Transport 28		Folding of the Embryo in the Horizontal
	Sperm Transport 28		Plane 73
	Maturation of Sperms 29		Germ Layer Derivatives 75
	Viability of Gametes 31		Control of Embryonic Development 75
	Fertilization 31		Highlights of the Fourth to Eighth Weeks 79
	Phases of Fertilization 31		Fourth Week 79
	Fertilization 33		Fifth Week 79
	Cleavage of the Zygote 35		Sixth Week 80
	Formation of the Blastocyst 36		Seventh Week 80
	Summary of the First Week 39		Eighth Week 81
	Clinically Oriented Problems 39		Estimation of Embryonic Age 86
2	Cormotion of the Dilaminar Embruaria		Summary of the Fourth to Eighth Weeks 90
3	Formation of the Bilaminar Embryonic Disc: Second Week 42		Clinically Oriented Problems 91

Completion of Implantation and Continuation of

Embryonic Development 43

6 The Fetal Period: Ninth Week to Birth 95 Estimation of Fetal Age 96 Trimesters of Pregnancy 97 Measurements and Characteristics of Fetuses 98 Highlights of the Fetal Period 98 Nine to Twelve Weeks 98 Thirteen to Sixteen Weeks 100 Seventeen to Twenty Weeks 100	The Allantois 134 Multiple Pregnancies 134 Twins and Fetal Membranes 134 Dizygotic Twins 137 Monozygotic Twins 137 Other Types of Multiple Births 140 Summary of the Placenta and Fetal Membranes 140 Clinically Oriented Problems 143
Twenty-one to Twenty-five Weeks 101 Twenty-six to Twenty-nine Weeks 102 Thirty to Thirty-four Weeks 102	8 Body Cavities, Mesenteries, and Diaphragm 145 The Embryonic Body Cavity 146 Mesenteries 146
Thirty-five to Thirty-eight Weeks 102 Expected Date of Delivery 103 Factors Influencing Fetal Growth 104 Cigarette Smoking 104 Multiple Pregnancy 104 Alcohol and Illicit Drugs 104 Impaired Uteroplacental and Fetoplacental Blood Flow 104 Genetic Factors and Growth Retardation 10 Procedures for Assessing Fetal Status 104 Ultrasonography 105 Diagnostic Amniocentesis 105	Division of the Embryonic Body Cavity Development of the Diaphragm 150 Septum Transversum 150 Pleuroperitoneal Membranes 151 Dorsal Mesentery of the Esophagus 151 Muscular Ingrowth from Lateral Body Walls 152 Positional Changes and Innervation of the
Alpha-fetoprotein Assay 105 Spectrophotometric Studies 105 Chorionic Villus Sampling 106 Sex Chromatin Patterns 106 Cell Cultures and Chromosomal Analysis 16 Fetal Transfusion 107 Fetoscopy 107 Percutaneous Umbilical Cord Blood Sampling 107 Computed Tomography and Magnetic Resonance Imaging 107 Fetal Monitoring 107 Summary of the Fetal Period 107 Clinically Oriented Problems 108	Pharyngeal Apparatus 159 Pharyngeal Arches 160 Pharyngeal Arch Components 160 Pharyngeal Pouches 166 Derivatives of Pharyngeal Pouches 166 Pharyngeal Grooves 169 Pharyngeal Membranes 169 Development of the Thyroid Gland 173 Histogenesis of the Thyroid Gland 173 Development of the Tongue 176 Lingual Papillae and Taste Buds 176 Nerve Supply of the Tongue 177 Development of the Salivary Glands 179
7 The Placenta and Fetal Membranes 110 The Placenta 111 The Decidua 111 Development of the Placenta 111 Placental Circulation 117 The Placental Membrane 118 Functions of the Placenta 118 The Placenta as an Invasive Tumorlike	Development of the Face 179 Summary of Facial Development 182 Development of the Nasal Cavities 182 Paranasal Sinuses 184 Development of the Palate 185 Primary Palate 185 Secondary Palate 186 Summary of the Pharyngeal Apparatus 195 Clinically Oriented Problems 195
Structure 122 Uterine Growth during Pregnancy 122 Parturition 123 The Placenta and Fetal Membranes after Birth 123 The Umbilical Cord 125 The Umbilical Vesicle (Yolk Sac) 133 Significance of the Umbilical Vesicle 134	10 The Respiratory System 197 Respiratory Primordium 198 Development of the Larynx 198 Development of the Trachea 198 Development of the Bronchi and Lungs 202 Maturation of the Lungs 203 Summary of the Respiratory System 208 Clinically Oriented Problems 209

Fate of the Umbilical Vesicle (Yolk Sac) 134

1.1	The Digestive System 211 Foregut 212 Development of the Esophagus 212 Development of the Stomach 213 Omental Bursa 216 Development of the Duodenum 216 Development of the Liver and Biliary Apparatus 218 Development of the Spleen 223 Midgut 224 Rotation of the Midgut Loop 224 The Cecum and Appendix 227 Hindgut 235 Cloaca 235 The Anal Canal 236 Summary of the Digestive System 241 Clinically Oriented Problems 241		Derivatives of the Pharyngeal Arch Arteries 318 Derivatives of the Second Pair of Pharyngeal Arch Arteries 318 Derivatives of the Second Pair of Pharyngeal Arch Arteries 318 Derivatives of the Third Pair of Pharyngeal Arch Arteries 318 Derivatives of the Fourth Pair of Pharyngeal Arch Arteries 319 Fate of the Fifth Pair of Pharyngeal Arch Arteries 319 Derivatives of the Sixth Pair of Pharyngeal Arch Arteries 319 Pharyngeal Arch Arterial Anomalies 319 Fetal and Neonatal Circulation 325 Fetal Circulation 325 Transitional Neonatal Circulation 327
12	The Urogenital System 243 Development of the Urinary System 244 Development of the Kidneys and Ureters 244 Development of the Urinary Bladder 256 Development of the Urethra 260 Development of the Suprarenal Glands 260 Development of the Genital System 262 Development of the Genital Ducts 265 Development of the Male Genital Ducts and Glands 265 Development of the Female Genital Ducts and	14	Development of Bone and Cartilage 339
	Glands 269 Development of the Uterus and Vagina 269 Development of the External Genitalia 271 Development of the Male External Genitalia 271 Development of the Female External Genitalia 273 Development of the Inguinal Canals 277 Relocation of the Testes and Ovaries 279 Descent of the Testes 279 Descent of the Ovaries 281 Summary of the Urogenital System 282 Clinically Oriented Problems 283		Histogenesis of Cartilage 339 Histogenesis of Bone 339 Intramembranous Ossification 339 Endochondral Ossification 339 Development of Joints 342 Fibrous Joints 344 Cartilaginous Joints 344 Synovial Joints 344 Development of the Axial Skeleton 344 Development of the Vertebral Column 344 Development of the Ribs 346 Development of the Sternum 347 Development of the Cranium 347 Newborn Cranium 347
13	The Cardiovascular System 285 Early Development of the Heart and Blood Vessels 286 Development and Fate of Veins Associated with the Heart 286		Postnatal Growth of the Cranium Development of the Appendicular Skeleton 353 Summary of the Skeletal System Clinically Oriented Problems 356
	Fate of the Vitelline and Umbilical Arteries 292 Later Development of the Heart 292 Circulation through the Primordial Heart 292 Partitioning of the Primordial Heart 292 Changes in the Sinus Venosus 297 Conducting System of the Heart 308 Anomalies of the Heart and Great Vessels 309	15	The Muscular System 357 Development of Skeletal Muscle 358 Myotomes 358 Pharyngeal Arch Muscles 358 Ocular Muscles 358 Tongue Muscles 359 Limb Muscles 359

	Development of Smooth Muscle 360 Development of Cardiac Muscle 360 Summary of the Muscular System 362 Clinically Oriented Problems 363	19	Summary of the Development of the Ear 437 Clinically Oriented Problems 437 The Integumentary System 439 Development of Skin and Skin Appendages 440
16	The Limbs 364 Early Stages of Limb Development 365 Final Stages of Limb Development 366 Cutaneous Innervation of Limbs 368 Blood Supply to the Limbs 371 Anomalies of the Limbs 372 Summary of Limb Development 377 Clinically Oriented Problems 379		Epidermis 440 Dermis 441 Glands of the Skin 441 Development of Hairs 447 Development of Nails 448 Development of Teeth 448 Summary of the Integumentary System 455 Clinically Oriented Problems 456
18	The Nervous System 380 Origin of the Nervous System 381 Development of the Spinal Cord 381 Development of the Spinal Ganglia 383 Development of the Spinal Meninges 384 Positional Changes of the Spinal Cord 384 Myelination of Nerve Fibers 386 Congenital Anomalies of the Spinal Cord 386 Development of the Brain 392 Brain Flexures 392 Hindbrain 393 Chorold Plexuses and Cerebrospinal Fluid (CSF) 398 Midbrain 398 Forebrain 399 Congenital Anomalies of the Brain 404 Development of the Peripheral Nervous System 413 Spinal Nerves 414 Cranial Nerves 414 Development of the Autonomic Nervous System 416 Sympathetic Nervous System 416 Summary of the Nervous System 416 Clinically Oriented Problems 417	21	Congenital Anatomic Anomalies or Human Birth Defects 457 Classification of Birth Defects 458 Teratology: The Study of Abnormal Development 458 Anomalies Caused by Genetic Factors 459 Numerical Chromosomal Abnormalities 459 Structural Chromosomal Abnormalities 466 Anomalies Caused by Mutant Genes 469 Developmental Signaling Pathways 471 Anomalies Caused by Environmental Factors 471 Principles in Teratogenesis 474 Human Teratogens 475 Anomalies Caused by Multifactorial Inheritance 484 Summary of Congential Anatomic Anomalies or Human Birth Defects 484 Clinically Oriented Problems 484
	Development of the Lacrimal Glands 430 Development of the Ear 430 Development of the Internal Ear 431		Summary of Common Signaling Pathways Used during Development 494
	Development of the Middle Ear 433 Development of the External Ear 433		Appendix 496
	Summary of the Development of the Eye 437		Index 507