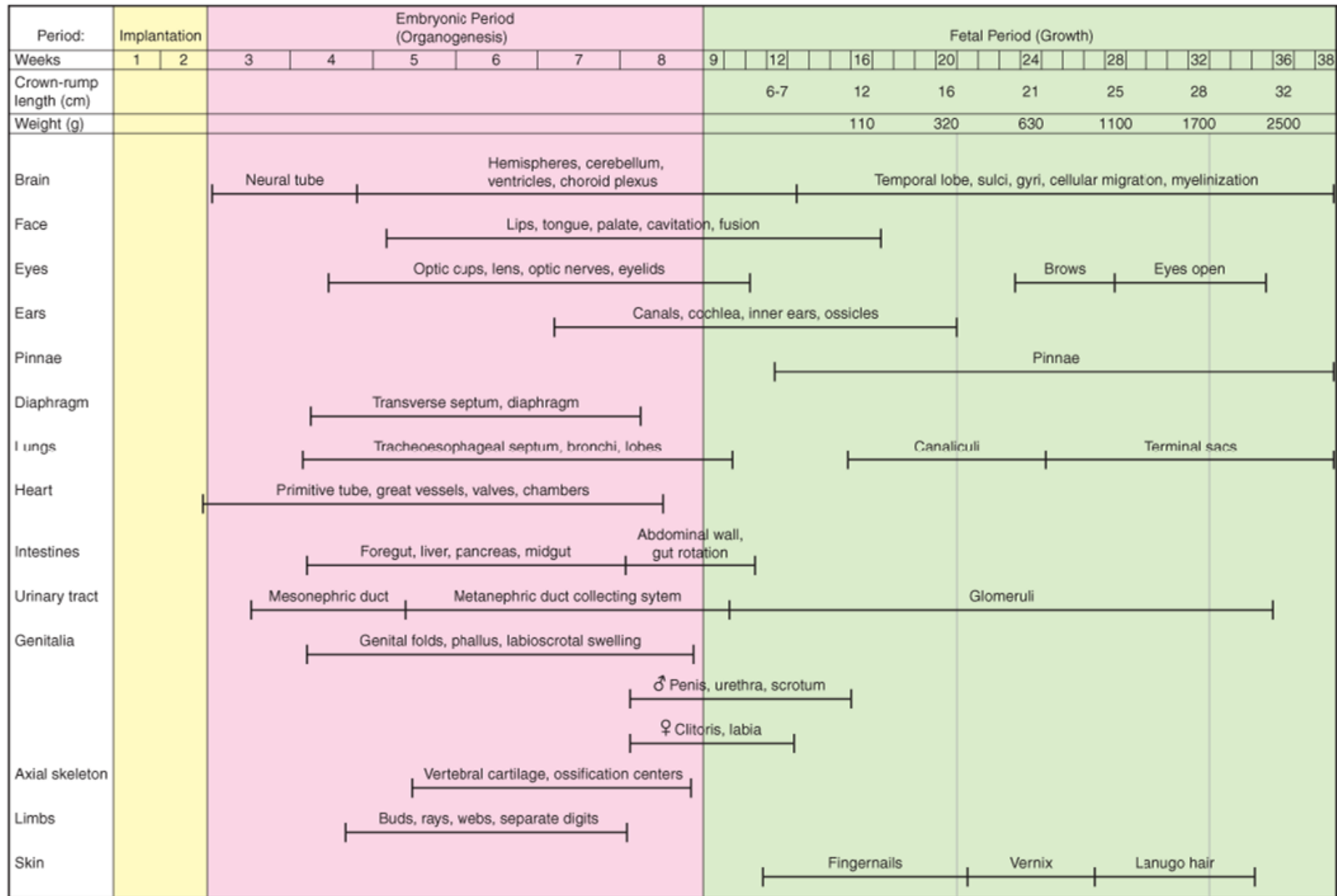


# Pregnancy and Cancer

2020/07/04

FIGURE 7-2

Embryofetal development according to gestational age determined by the first day of the last menses. Times are approximate.



Source: F. Gary Cunningham, Kenneth J. Leveno, Steven L. Bloom, Catherine Y. Spong, Jodi S. Dashe, Barbara L. Hoffman, Brian M. Casey, Jeanne S. Sheffield: *Williams Obstetrics*, 25th Edition  
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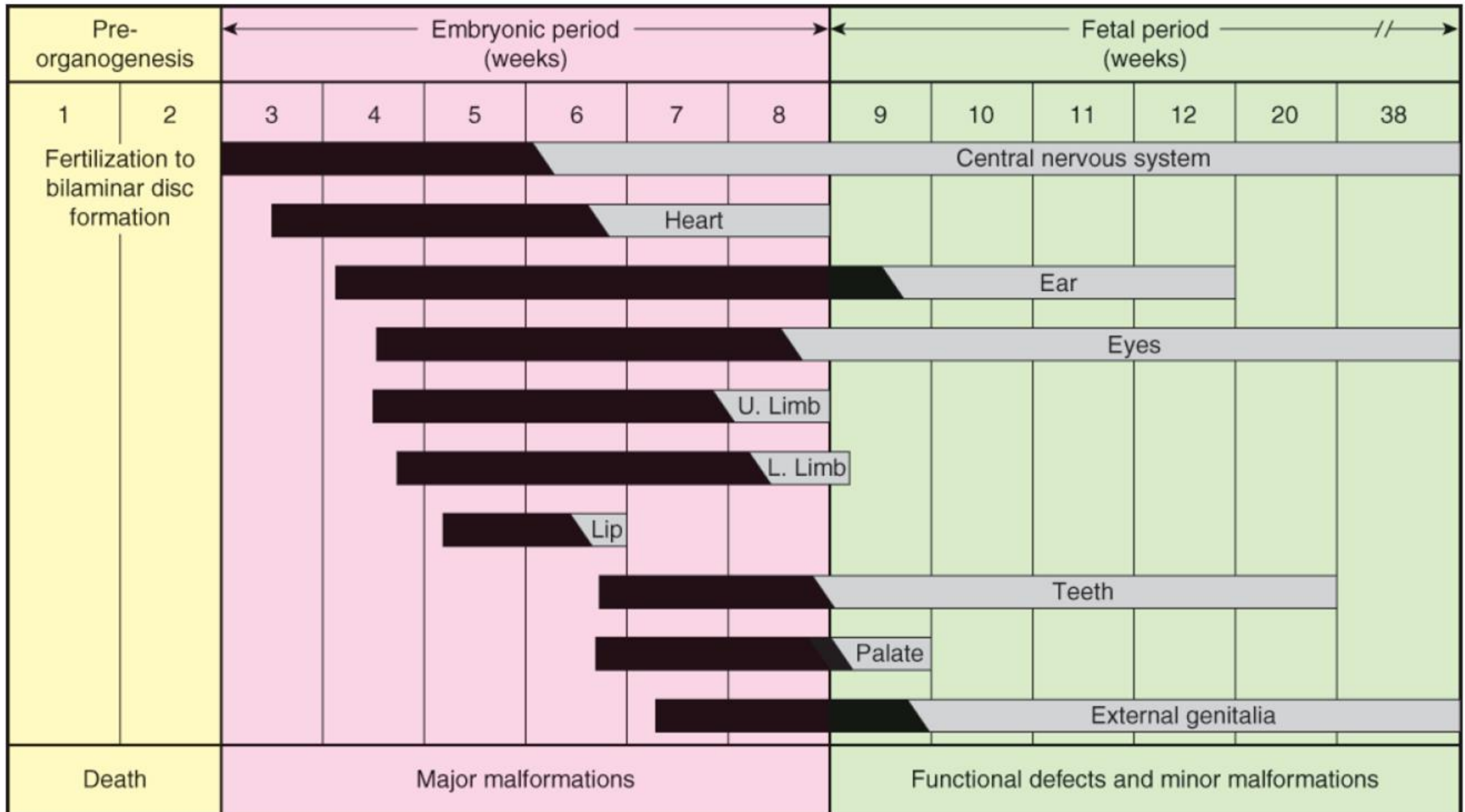
- *William 25<sup>th</sup> ed.*

TABLE 12-1

## Selected Teratogens and Fetotoxic Agents

• *William 25<sup>th</sup> ed.*

Acitretin	Lithium
Alcohol	Macitentan
Ambrisentan	Methimazole
Angiotensin-converting enzyme inhibitors	Mercury
Angiotensin-receptor blockers	Methotrexate
Androgens	Misoprostol
Bexarotene	Mycophenolate
Bosentan	Paroxetine
Carbamazepine	Phenobarbital
Chloramphenicol	Phenytoin
Cocaine	Radioactive iodine
Corticosteroids	Ribavirin
Cyclophosphamide	Tamoxifen
Danazol	Tetracycline
Diethylstilbestrol (DES)	Thalidomide
Efavirenz	Tobacco
Fluconazole	Toluene
Isotretinoin	Topiramate
Lamotrigine	Trastuzumab
Lead	Tretinoin
Leflunomide	Valproic acid
Lenalidomide	Warfarin



**Table 1.** Some Measures of Ionizing Radiation ↩

Measure	Definition	Legacy Unit	SI* Unit
Exposure	Number of ions produced by X-ray or gamma radiation per kilogram of air	Roentgen (R)	$2.58 \times 10^{-4}$ C/kg
Dose	Amount of energy deposited per kilogram of tissue	Rad (rad) <sup>†</sup>	Gray (Gy) <sup>†</sup> 1,000 mGy = 1 Gy 1 Gy = 100 rad
Relative effective dose	Amount of energy deposited per kilogram of tissue normalized for biological effectiveness	Roentgen equivalent man (rem)	sievert (Sv) 1,000 mSv = 1 Sv 1 Sv = 100 rem

\*International System of Units (SI) – these are preferred.

<sup>†</sup>For diagnostic X-rays, 1 rad = 1 rem, 1 Gy = 1 Sv.

Modified from Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BL, et al. General considerations and maternal evaluation. In: Williams obstetrics. 24th ed. New York (NY): McGraw Hill Medical; 2014. p. 926–39.

- ACOG

**Table 1:  
Potential Health Effects (Other Than Cancer) of Prenatal Radiation Exposure**

Acute Radiation Dose* to the Embryo/Fetus	Time Post Conception	Time Post Conception	Time Post Conception	Time Post Conception	Time Post Conception
	Up to 2 weeks	3 <sup>rd</sup> to 5 <sup>th</sup> weeks	6 <sup>th</sup> to 13 <sup>th</sup> weeks	14 <sup>th</sup> to 23 <sup>rd</sup> weeks	24 <sup>th</sup> week to term
< 0.10 Gy (10 rads)†	Non-cancer health effects NOT detectable				
0.10–0.50 Gy (10–50 rads)	Failure to implant may increase slightly, but surviving embryos will probably have no significant (non-cancer) health effects.	Growth restriction possible	Growth restriction possible	Non-cancer health effects unlikely	
> 0.50 Gy (50 rads) The expectant mother may be experiencing acute radiation syndrome in this range, depending on her whole-body dose.	Failure to implant will likely be high, depending on dose, but surviving embryos will probably have no significant (non-cancer) health effects.	Probability of miscarriage may increase, depending on dose.  Probability of major malformations, such as neurological and motor deficiencies, increases.  Growth restriction is likely	Probability of miscarriage may increase, depending on dose.  Growth restriction is likely.	Probability of miscarriage may increase, depending on dose.  Growth restriction is possible, depending on dose. (Less likely than during the 6th to 13th weeks post conception) Probability of major malformations may increase	Miscarriage and neonatal death may occur, depending on dose.

- [https://www.cdc.gov/nceh/radiation/emergencies/pdf/303779-A\\_2019\\_Radiation-and-Pregnancy\\_508.pdf](https://www.cdc.gov/nceh/radiation/emergencies/pdf/303779-A_2019_Radiation-and-Pregnancy_508.pdf)

Examination type	Typical Fetal dose (mGy)	Risk of childhood cancer per examination
Group 0 Ultrasound Magnetic Resonance Imaging (MRI)	0	0
Group 1: X ray skull X ray chest X thoracic spine Mammogram Head or neck CT	0.001-0.01	<1 in 1000000
CT pulmonary angiogram Lung ventilation scan	0.01-0.1	1 in 1000 000 to 1 in 100000
Group 2: X-ray of abdomen, pelvic or hip or barium meal CT scan of the chest and upper abdomen Nuclear Medicine scans using technetium-99m including thyroid scan, lung perfusion scan, renal scan (DMSA, MAG3) or white cell scan	0.1-1.0	1 in 100 000 to 1 in 10 000
Group 3: Lumbar spine x-ray Barium enema IVP or urogram CT abdomen or lumbar spine Nuclear scans using technetium-99m: bone scan, cardiac pool scan, myocardial scan, renal scan Thallium-201 myocardial scan	1.0-10	1 in 10 000 to 1 in 1000
CT of pelvis or pelvis plus abdomen PET-CT technetium-99m myocardial SPECT (rest-exercise protocol)	10-50	1 in 1000 to 1 in 200

Table 1. Typical fetal doses and risks of childhood cancer for common radiology. Note: natural childhood risk of cancer is 1 in 500.

## Adverse Effects of Antineoplastic Agents on the Fetus and Neonate

### Immediate

Spontaneous abortion  
 Teratogenesis  
 Organ toxicity  
 Premature birth  
 Low birth weight

### Delayed

Carcinogenesis  
 Sterility  
 Retarded physical and/or mental growth and development  
 Mutation  
 Teratogenic in second generations

## Relative Risks of Diminished Germ Cell Function Associated with Common Chemotherapeutic Agents

	Males	Females
Common	Cyclophosphamide, Nitrogen mustard, Chlorambucil, Nitrosoureas, Procarbazine	Busulfan, Cyclophosphamide, Melphalan, Nitrosoureas
Possible	Vinblastine, Cisplatin, Corticosteroids	Cisplatin, Vinblastine, Chlorambucil, Etoposide, Hydroxyurea, Tamoxifene, Actinomycin D
Rare	Vincristine, Methotrexate, Doxorubicin, 5-FU, 6-Mercaptopurin	Methotrexate, Bleomycin, Doxorubicin, Vincristine, DTIC, 5-FU
No data	Navelbine, Interferon	Taxol, Navelbine, Interferon