



Biology Data Book

Second Edition

VOLUME I

COMPILED AND EDITED BY

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27. GERM LAYERS AND DERIVATIVES: EUTHERIAN MAMMALS

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28. CHARACTERIZATION OF DEVELOPMENTAL STAGES

For information on development of tissues and organs, consult reference 1 in Part I.

Part I. Man

Standard Stage (Witschi): For additional information, consult reference 28. **Streeter's Horizon:** For additional identification, consult reference 26. **Age =** fertilization or ovulation age, usually calculated from last menstruation minus

14 days. **Size =** greatest diameter or crown-rump length (values in brackets are approximate chorionic size). **Identification of Standard Stage:** Streeter's horizons are not always comparable to the information given.

	Standard Stage (Witschi)	Streeter's Horizon	Age da	Size mm	Identification of Standard Stage	Reference
Cleavage & Blastula						
1	1	I	1	0.125	1 cell (located in tubes of oviducts)	19,24
2	2	II	2	0.115	2 cells (located in tubes of oviducts)	7,24
3	3	II	.....	0.115	4 cells (located in tubes of oviducts)	7,24
4	4	II	3	0.100	Morula: 8-12 cells (entering uterus)	7
5	5	III	4	0.101	Early blastocyst: 58 cells (located in lumen of uterus)	7
6	6	III	5	0.095	Free blastocyst: 107 cells (located in lumen of uterus)	7
7	7	III	.....	.....	Blastocyst: beginning of implantation	7
Gastrula						
8	8	IV	7-8	0.05 [0.3]	Inner cell mass (bilaminar disk, embryoblast); amniotic cavity	6,28
9	9	V	9	0.1 [0.5]	Embryonic disk & extraembryonic envelopes; extraembryonic mesoderm	6
10	10	VI	11-13	0.15 [1.0]	Beginning primitive streak; yolk sac; exocoelomic membrane	5,28
11	11	VII	14-17	0.3 [2.5]	Median primitive streak; syncytial & cellular trophoblasts	11,16,28
Primitive Streak						
12	12	VIII	19	0.7 [8.0]	Complete primitive streak; chorionic villi	15,16,28
Neurula						
13	13	IX	20	1.5 [12.0]	Presomite neurula: spreading neural plate	9,22
14	14	X	21	2 [13]	Occipital somites 1-4; neural folds; invagination canal	10,17,23, 25
15	15	X	24	2.8 [16.0]	Cervical somites 5-12; beginning of formation of neural tube	2,10,16, 18,21,22
16	16	XI	27	3.3 [22.0]	Thoracic somites 13-20; 2 branchial arches; upper & lower neuropores; primordial germ cells starting to leave yolk sac	8,26-28
17	17	XII	28	3.5	Thoracic somites 21-24; 3 branchial arches; rupture of stomodeum	3,14,26

continued

28. CHARACTERIZATION OF DEVELOPMENTAL STAGES

Part I. Man

Standard Stage (Witschi)	Streeter's Horizon	Age da	Size mm	Identification of Standard Stage	Reference	
Tail-Bud Embryo						
18	18	XII	29	3.8 [24.0]	Lumbar somites 25-27; stomodeum resorbed; primordial germ cells in hindgut & ventral mesentery	20,26,27
19	19	XII	30	4 [25]	Lumbar somites 28 & 29; appendicular ridges	26,28
20	20	XIII	31	4.3 [26.0]	Sacral somites 30-32; forelimb & hindlimb buds; primordial germ cell migration reaching borders of mesonephric ridges	26-28
21	21	XIII	32	4.6 [27.0]	Sacral somites 33 & 34; 4 branchial arches	26
22	22	XIII	33	4.8 [28.0]	Caudal somites 35 & 36; otic pits detaching	13,26
23	23	XIII	34	5 [29]	Caudal somites 37; slender yolk stalk	16,26
24	24	XIII	35	5.4 [30.0]	Caudal somites 38; lens placodes; primordial germ cells migrating from hindgut to median mesonephric ridges	26,27
Complete Embryo						
25	25	XIV	35-37	6 [28-35]	End of somite formation; forelimb & hindlimb buds fully formed; regression of tail bud; primordial germ cells in genital ridges (end of migration)	4,12,26,28
Metamorphosing Embryo						
26	26	XV	38	8 [32]	Differentiation of hand plate; beginning of umbilical hernia	12,26
27	27	XVI	40	8-10 [35]	3rd & 4th branchial arches disappearing under cervical & opercular folds; pigmented eyes; yolk sac separating from gut	26
28	28	XVII	42	12	Pentadactyl rudiments; closing of cervical sinus	26
29	29	XVII	44	12.5-14.0 [40.0]	Median processes of maxillaries advancing; chorionic villi longer at point of attachment of umbilical cord; cartilage forming in vertebrae	20,23,26,28
30	30	XVIII	46	14.6	Premaxillary processes; beginning of sexual differentiation of gonads	20,27,30
31	31	XVIII	48	15.6	Closing of facial clefts; hands & feet lateral to body wall	26,28
32	32	XIX	50	17	Phalanges & 1st links; hands far apart, bending over heart; 1st ossification centers in mandible & clavicle	26
33	33	XX-XXII	56	22-25 [47]	Closed facial clefts; auricles rising; large umbilical hernia; arms & feet growing; fingers from left & right hands touching nose	26,28
Fetus						
34	34	XXIII+	56-70	26-45	1st fetal stage: growth of eyelids; gut withdrawing from hernia; palatine raphe; differentiation of ♂ & ♀ external genitalia	12,16,26,28,29
35	35	.....	70-140	45-180	2nd fetal stage: periderm-sealed eyelids; ossification of vertebral column beginning; 1st oocytes in ovaries; hair follicles; disk placenta	20,28,30
36	36	140-266	180-340	3rd fetal stage: resorption of periderm; cornification & separation of eyelids; fetal hair; uterovaginal differentiation	20,28,29

Contributor: Witschi, Emil

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28. CHARACTERIZATION OF DEVELOPMENTAL STAGES

Part I. Man

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Part II. Rat

Age = days after fertilization, calculated from copulation age minus eight hours; numbers in brackets are corresponding ages of mouse embryos at same stage, based chiefly on references 7 and 8. Size = largest dimension of embryo in

natural position, unless otherwise indicated; numbers in brackets are largest and smallest dimensions of blastocysts and chorionic vesicles.

Standard Stage (Witschi)	Age da	Size mm	Identification of Stage
Cleavage & Blastula			
1	1	0.07	1 cell (located in oviduct)
2	2 [1]	0.08 × 0.06	2 cells (located in oviduct)
3	3	.....	4 cells (located in oviduct)
4	3.25 [2]	0.08 × 0.05	8-12 cells (located in oviduct)
5	3.5	0.08 × 0.04	Morula (located in uterus)
6	4	[0.08 × 0.03]	Early blastocyst (located in uterus)
7	5 [4]	[0.12 × 0.05]	Free blastocyst (located in uterus)
Gastrula			
8	6 [4.5]	[0.28 × 0.07]	Implanting blastocyst with trophoblastic cone & inner cell mass; extraembryonic hypoblast (outgrowth of endoderm)
9	6.75 [5]	.....	Trophectoderm; inner cell mass (pendant) covered with endoderm
10	7.25 [5.5]	[0.3 × 0.1]	Implantation near completion; inner cell mass beginning differentiation into embryonic & extraembryonic parts
11	7.75 [6.5]	[0.5 × 0.1]	Implantation complete; primary amniotic cyst; ectoplacental cone
Primitive Streak			
12	8.5 [7]	[1.04 × 0.26]	Connecting ectochorionic & amniotic cavities; rudiments of amniotic folds; primitive streak; start of 3rd layer formation; primordia of heart & pericardium

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