



Biology Data Book

Second Edition

VOLUME I

COMPILED AND EDITED BY

Philip L. Altman and Dorothy S. Dittmer

Federation of American Societies for Experimental Biology

BETHESDA, MARYLAND

Part III. Swine

Size = greatest length, neck-rump length, or crown-rump length of embryo.

Standard Stage (Witschi)	Age da	Size mm	Identification of Stage	Reference
Cleavage & Blastula				
1	1	..... 0.11-0.14	1 cell	12
2	2	1.0-1.5	..... 2 cells	9,12
3	3	2	..... 4 cells (passing into uterus)	4,5,9,12
4	4	3	..... 8-12 cells	4,5,9,12
5	5	3.5	..... Morula: 16 cells	9,12
6	6	4.75	..... Blastocyst	6,9
7	7	5-7	..... Late blastocyst (still free in uterus)	5,12

continued

28. CHARACTERIZATION OF DEVELOPMENTAL STAGES

Part III. Swine

Standard Stage (Witschi)	Age da	Size mm	Identification of Stage	Reference	
Gastrula					
8	8	7-8	0.49-1.36 ^{1/}	Bilaminar blastocyst (disk) beginning elongation	4,9,10,12
9	9	8-9	2.5-3.0 ^{1/}	Proliferation of mesoderm	4,9,12
10	10	8-9	.....	Beginning primitive streak	9,10,12
11	11	10	.....	Medium primitive streak	9,12
Primitive Streak					
12	12	11-12	10-65 ^{1/}	Completed primitive streak; notochord; attachment to endometrium	5,9,12
Neurula					
13	13	13	.....	Presomite neurula	12
14	14	14-15	2.5-3.0	Occipital somites 1-4; 1st somite not delimited anteriorly	2,7,10,12
15	15	15-16	3.2-5.2	Cervical somites 5-12	1,7
Tail-Bud Embryo					
16	16	15-17	5.2-6.5	Thoracic somites 13-20; spiral torsion; heart bulge	1,7
17	17	17	4.9	Thoracic somites 21-24	1,7
18	18	16.5-18.0	4.5	Thoracic somites 25 & 26; head & tail meet; forelimb bud	1,7
19	19	16.5-17.5	3.6	Lumbar somites 27-29; hindlimb bud	1,7
20	20	17.5	6.8	Lumbar somites 30 & 31; spiraling completed	1,7
21	21	17.5	5.2	Lumbar somites 32 & 33; uncoiling; mandibular & maxillary processes	7
22	22	19	5.8-8.0	Sacral somites 34 & 35	7
23	23	20	6.4	Sacral somites 36 & 37	7
24	24	20	.....	Caudal somites 38-40	7
Embryo					
25	25	20	8.0-8.6	Caudal somites 41-43	7
26	26	20-21	9-10	Caudal somites 44-46; beginning of umbilical hernia	7,9
27	27	21-22	11	Caudal somites 47-49	7,9
28	28	22	11.6-14.4	Caudal somites 50-52 (end of somite formation); cervical sinus closing; hand plate	3,7
29	29	22	16.4-18.6	Cervical sinus closed; lateral palatine processes; pentadactyl rudiments	7,9
30	30	28	19.4-24.0	Premaxillary (median) palatine processes; sex differentiation; eyelids & plica semilunaris	7,9
31	31	30	25	Facial clefts closing; palate developing	9
32	32	32.5	26.5-29.5	3rd & 4th phalanges most prominent; fusion of palatine processes	3,9
33	33	34.5	35	Facial clefts closed; palate completed	7,12
Fetus					
34	34	36-50	35-95	1st fetal stage: growth of eyelids; gut withdrawal from umbilical cord	3,8,11
35	35	50-90	95-220	2nd fetal stage: sealed eyelids	3,8,11
36	36	90-114 ^{2/}	220-295	3rd fetal stage: separation of eyelids	3,11

^{1/} Extraembryonic parts included. ^{2/} Duration of pregnancy is usually given as 110-116 da, with extreme deviations for certain breeds. Average length of pregnancy for York-

shire breed is 114 da, with an average body length of 294 mm at birth [11]. Young are born with open eyelids and open external acoustic meatuses.

Contributor: Kemp, Norman E.

continued

28. CHARACTERIZATION OF DEVELOPMENTAL STAGES

Part III. Swine

References

- [1] Boyden, E. A. 1936. A Laboratory Atlas of the 13-mm. Pig Embryo. Wistar Institute Press, Philadelphia.
- [2] Boyden, E. A. 1940. Carnegie Inst. Wash. Publ. 518: 157.
- [3] Carey, E. J. 1922. J. Morphol. 37:1.
- [4] Green, W. W., and L. M. Winters. 1946. Ibid. 78:305.
- [5] Heuser, C. H. 1927. Carnegie Inst. Wash. Publ. 380: 229.
- [6] Heuser, C. H., and G. L. Streeter. 1929. Ibid. 394:1.
- [7] Keibel, F. 1897. Normentafeln zur Entwicklungsgeschichte der Wirbelthiere. G. Fischer, Jena. pt. 1.
- [8] MacCallum, J. B. 1901. Bull. Johns Hopkins Hosp. 12:102.
- [9] Patten, B. M. 1948. Embryology of the Pig. Ed. 3. Blakiston, New York.
- [10] Streeter, G. L. 1927. Carnegie Inst. Wash. Publ. 380: 73.
- [11] Ullrey, D. E., et al. 1965. J. Anim. Sci. 24:711.
- [12] Waterman, A. J. 1948. A Laboratory Manual of Comparative Vertebrate Embryology. H. Holt, New York.