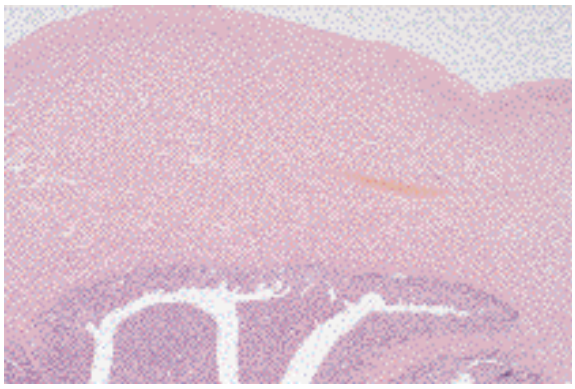
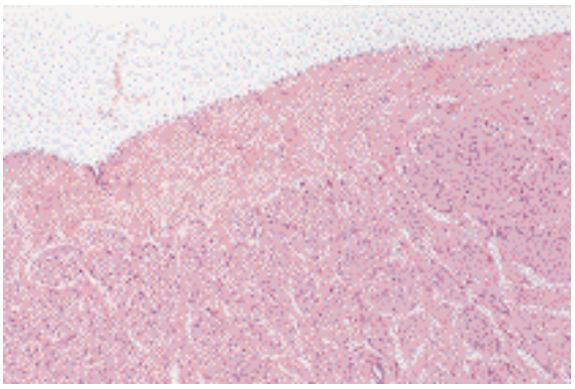
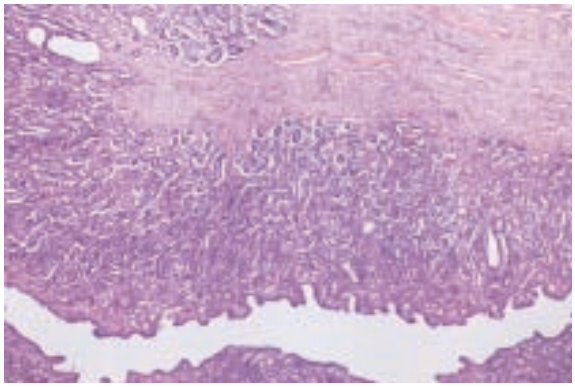


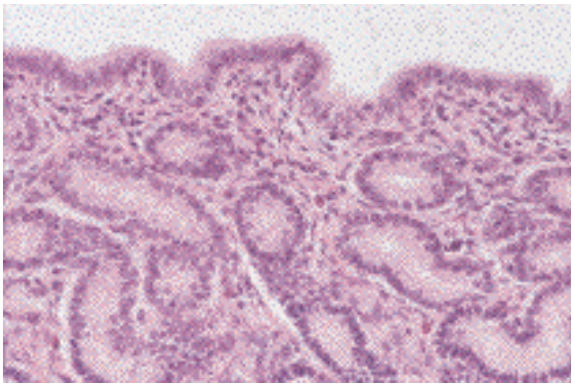
A. UTERINE WALL



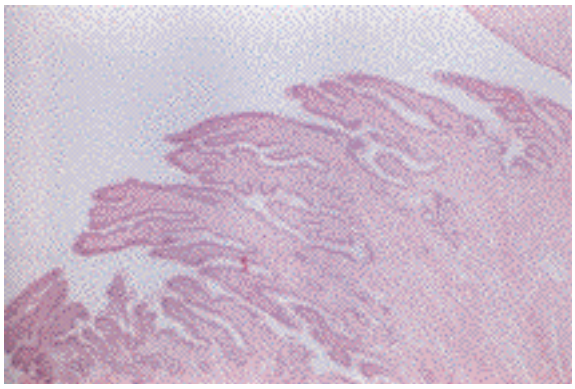
B. MYOMETRIUM



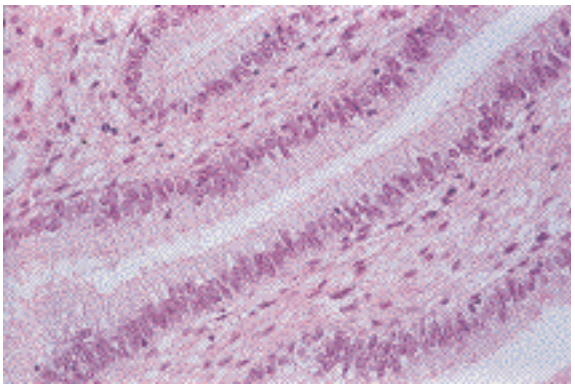
C. ENDOMETRIUM



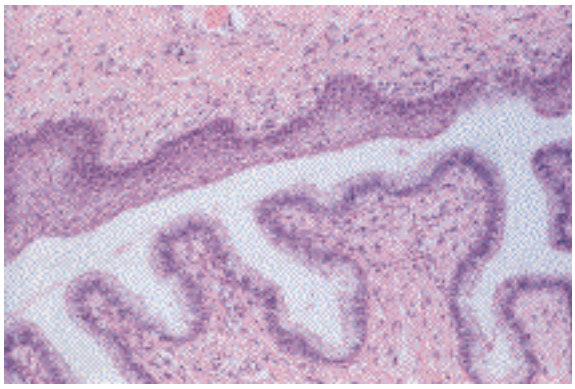
D. ENDOMETRIUM



E. CERVIX



F. CERVIX



G. CERVIX AND VAGINA

FIGURE **1.17.** Photomicrographs of the uterus, cervix, and vagina. The view of the myometrium (B) shows the perimetrium, longitudinal layer, and circular layer (top to bottom). The last view (G) shows the cervical epithelium (below) and vaginal epithelium (above).

MILESTONES: Reproductive Hormones

1930 First report of a gonadotropic substance (later identified as eCG) in the blood of pregnant mares, including characterization of the gonadotropin profile *(321)*.

1932 First descriptions of equilin and equilenin (review: *207, 208*).

1943 Conclusion that the endometrial cups are the source of eCG *(320)*.

1954 First experiment to yield direct information on conversion of testosterone to estrogens *(705)*.

1957 First identification of progesterone in the equine placenta *(1459)*.

1962 Initiation of studies on role of various ovarian cell types in formation of steroid hormones *(1463)*.

1970 Preparation of highly purified eLH and eFSH *(247)*.

1972-73 Series of reports demonstrating the fetal origin (chorionic girdle) of the eCG-producing endometrial cup cells *(57, 62, 674)*.

1973 Initial study in a series that implicated the fetal gonads as an integral component in fetoplacental steroidogenesis *(1305)*.

1974 Characterization of chemical and biologic properties of eCG subunits *(1225)*.

1975 Demonstration of the discharge of progestins through the venous effluent of the gravid uterus beginning on Day 60 *(1506)*.

1975 Identification of 5a-pregnanes in the blood of pregnant mares *(760)*.

1979 First demonstration of pulsatile release of equine hormones (LH; *484*).

1979 Isolation and partial characterization of equine prolactin *(298)*.

1982 Initial studies leading to the conclusion that the isoforms of eLH and eFSH vary during the estrous cycle and the biologic property is influenced by the ratio of isoforms *(20)*.

1986 Purification and characterization of equine relaxin *(1551)*.

1987 Structural studies of the amino-acid sequence of eCG *(1575)* and eLH *(231)* b-subunits

1987 Development of the technique for placing a cannula into the pituitary effluent *(803)* with initial characterization of GnRH, eLH, and eFSH secretory patterns *(23)*.

1990 Report that progesterone from the fetoplacental system is utilized or metabolized locally

Urinating. Other signs associated both with sexual receptivity and with the act of urination are raising and arching of the tail to expose the genitalia, passing of fluids through the vulva, and winking of the clitoris. These signs may occur during teasing and during mounting. Raising of the tail occurs in all degrees from barely perceptible to extremely exaggerated (Figures 3.2 and 3.4). Passing of fluids varies from a few drops of a viscous substance (Figure 3.4) to frank urination. This sign is frequently termed urination, but it is emphasized that it has not been determined that all of the discharge is from the urinary bladder. The color and viscosity of the fluid vary widely from clear and thin with a yellowish tinge to cloudy and thick, but these variations do not appear related to the sexual state. To exemplify the variability in the nature of the fluid discharge, 350 determinations were described as dripping (39%), spurting (2%), streaming (13%), combinations of these (10%), and not seen (36%; *575*). Presumably, the passage of fluids leads to olfactory cues. Urinating or passing fluids may be persistent; one mare postured and passed fluids during 20 distinct periods in an hour. Apparently, when an estrous mare is first exposed to a stallion frank evacuation of a full bladder may occur. Thereafter, the passage of fluids may involve only spurting or dripping or be imperceptible or missed. When it is not clear whether the mare is responding to a full bladder or sexual stimulation, it may be helpful to retease after the signs subside.

Winking. Clitoral winking is characterized by rhythmic eversion of the labia with exposure and projection of the clitoris (Figure 3.5). This sign is also referred to as the clitoral or vulval flash. The winks may number from 1 to 100 or more in regular succession every few seconds. Nothing, apparently, is known about the role of the clitoral wink. One may speculate that it is part of the attention-getting display of the mare.

In cattle, ovulation was hastened *(1311)* and pregnancy rate increased *(1000)* by various mating stimuli or digital clitoral massage. Attempts have been made to determine whether a similar phenomenon exists in mares, encouraged by the prominence of the clitoral wink. In a study involving pasture breeding *(582)*, time of ovulation and growth rate of the ovula-tory follicle were not different between mares that were isolated from stallions and mares that were continuously pastured with a stallion. That is, there was no support for the

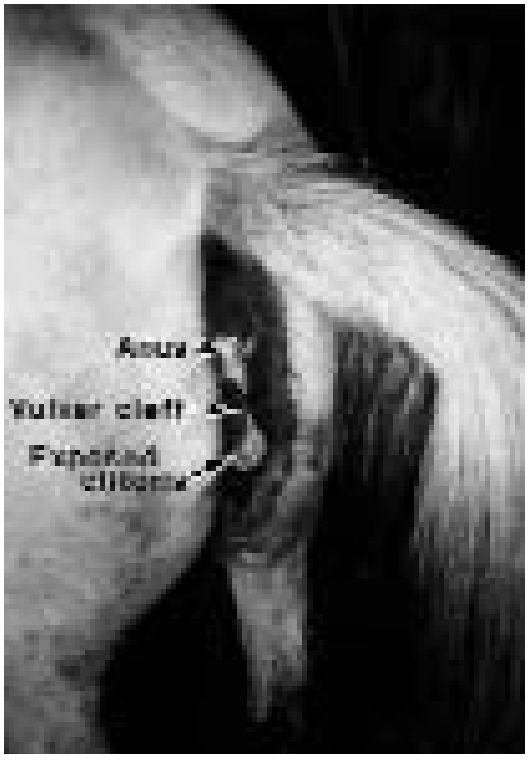


FIGURE **3.5.** Eversion of ventral portion of labia with exposure of clitoris.

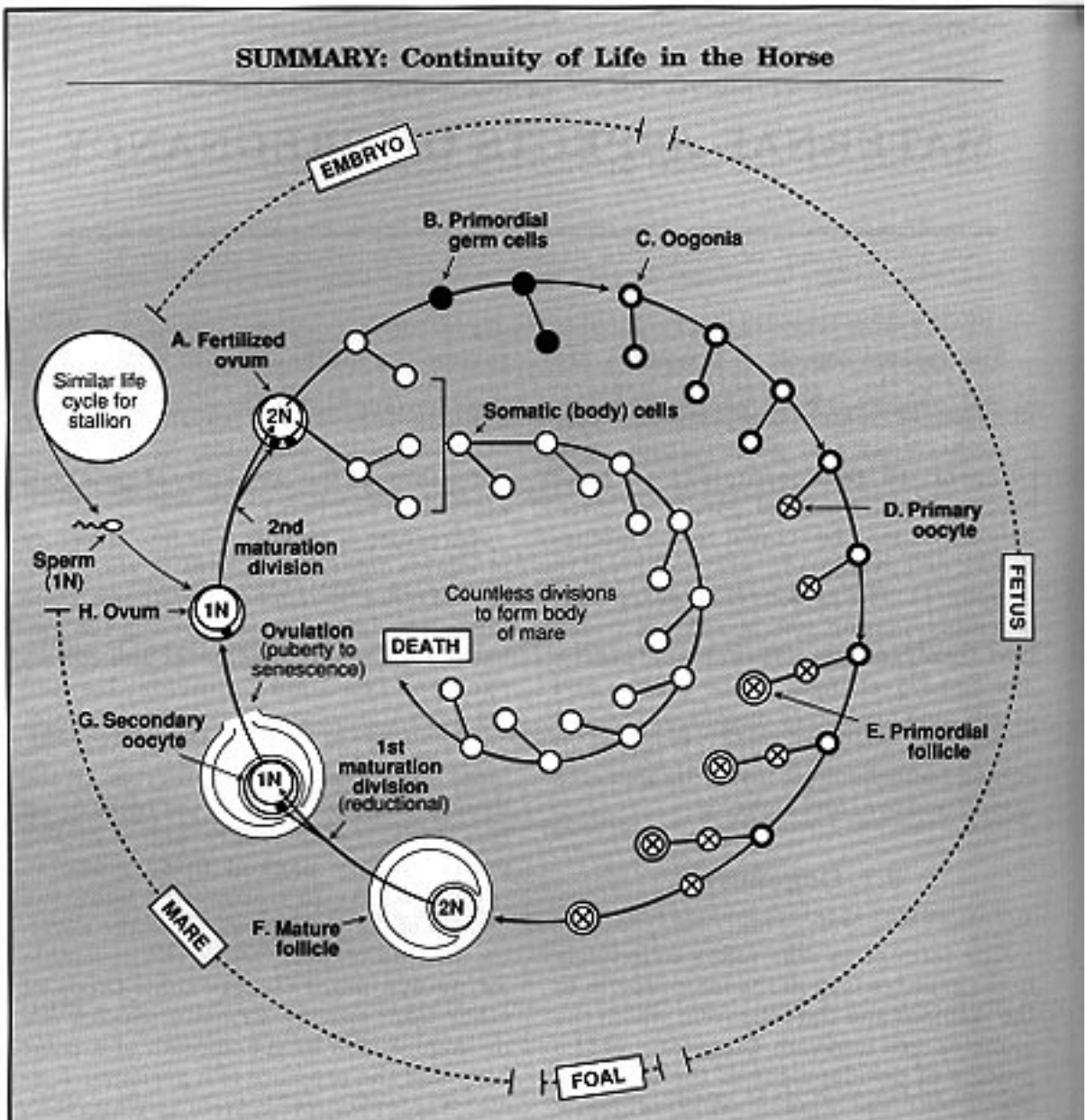
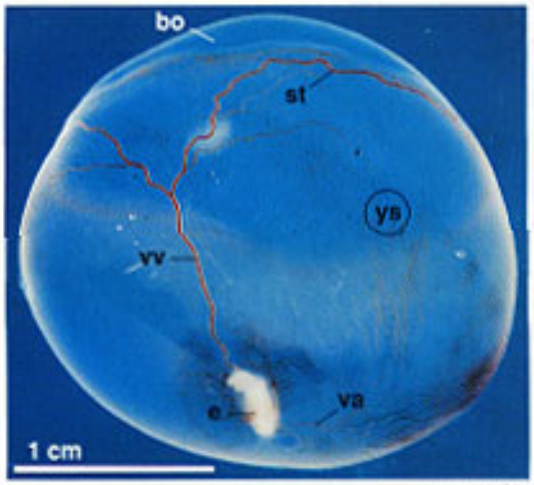
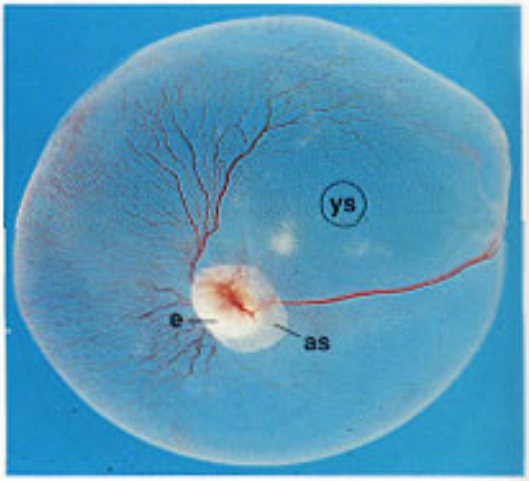


FIGURE 8.1. Continuity of life in the horse through perpetuity of germ plasm. All somatic (body) cells and almost all germ cells die, but life is passed in unison from stallion (one sperm) and mare (one ovum) to an individual of the next generation beginning with a fertilized ovum. The letter designations in the following account of this marvelous system refer to those on the figure.

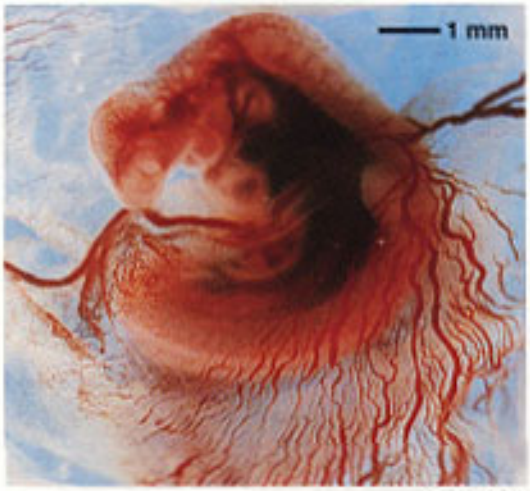
A. Fertilized ovum. The fertilized ovum contains all the genetic information from the stallion and the mare. The genetic information is housed in chromosomes of the cell nucleus. In horses, the number of chromosomes is 64 (32 from the sire and 32 from dam). That is, each gamete (sperm or ovum) contains one-half (1N) of the number of chromosomes in a fertilized ovum (2N).



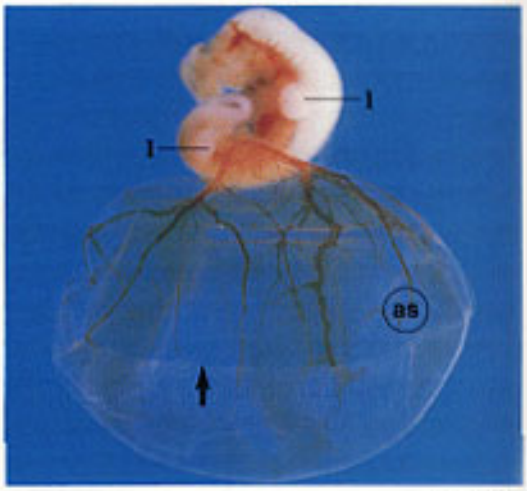
A. Day 21



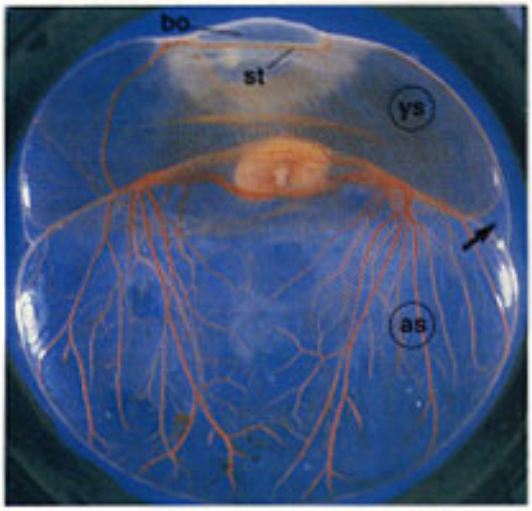
B. Day 24



C. Day 24



D. Day 24



E. Day 30

F. Day 30

FIGURE **9.11.** *Days 21 to 30.* *Legend on page 363.*

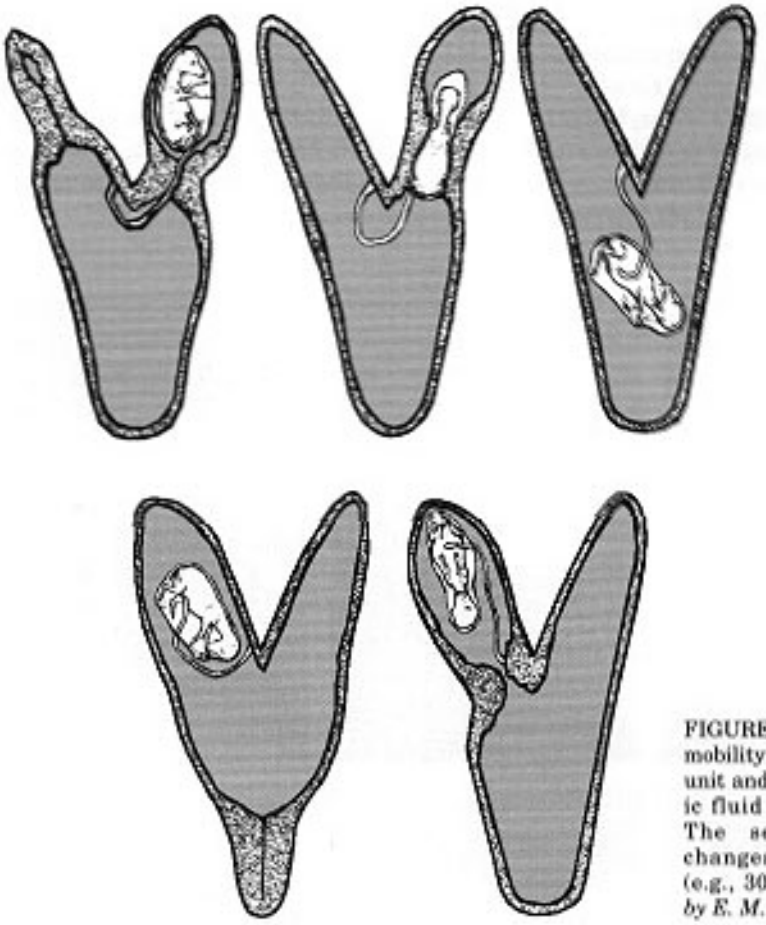


FIGURE **9.62.** Illustration of mobility of the fetal-amniotic unit and shifts in the allantoic fluid on Days 60 to 100. The series of depicted changes can occur rapidly (e.g., 30 minutes). *Prepared by E. M. Carnevale.*

observed in which the fetal-amniotic unit was hidden in a uterine horn and then appeared to be forced through the constricted horn entrance into a dilated uterine body. The side of umbilical attachment did not affect the location of the fetus (cord horn versus noncord horn). Yet, as noted above, the fetus is usually in the horn of the umbilical cord at term. The extensive fetal mobility apparently began to decline after Day 100 and ceased (as indicated by cessation of movements between horns) by approximately Day 180 *(648)*. Considerable study will be needed to determine the cause and role of the extensive activity and to characterize the manner in which the fetus finally assumes a cranial presentation in the cord horn. Clearly, the fetal-amniotic unit, unattached except by the long umbilical cord, is free to move within the allantochorionic cavity during the early fetal stage and does so with vigor. Therefore, transuterine migration, described above, is not the result of a one-way trip. Perhaps the extensive activity and mobility in this species at this early stage play a role in fetal development of muscle and nerve coordination; this, in turn, may be related to the advanced limb development in this species.

Allantoic fluid shifts. It also was discovered *(649)* that the dimensions of various portions of the allantochorionic fluid compartment changed dramatically over Days 69 to 78. The resulting allantoic fluid shifts corresponded to changes in the diameter of various portions of the