

Stage 2 Beginning of Segmentation
20–24 Hours

Within 24 hours the first cleavage division is completed. The eggs are near the exit of the ampulla, between the first and the second loop of the oviduct (Fig. 9). This second loop is said to exhibit peristaltic contractions, which aid ova transport [5]. *The first cleavage* yields two cells of about equal size, with finely granulated cytoplasm. Their large spherical nuclei contain 4–5 nucleoli that are surrounded by a small border of chromatin. The egg and zona pellucida shrink considerably after Bouin's fixation. The overall diameter is 48 to 64 microns, including the zona. After fixation with OsO₄ there is much less shrinkage and the zona appears in sections as a distinct thick ring (Figs. 10 and 11), with an overall diameter of 83 microns. In the fresh, unfixed state, eggs of this stage are 80–100 microns in diameter.

The second polar body is tangentially cut in Fig. 12. The first polar body, visible in another plane of section, is located about 90 degrees from the second, and is in metaphase. The nucleus of the second polocyte is typically small and has peripheral chromatin (Fig. 10).

The corpus luteum has slightly enlarged cells, which form irregular trabeculae separated by invading capillaries. As an exception, in Fig. 9 a distinct central blood coagulum is visible. *Spermatozoa* are visible in the oviduct and uterus up to 20 hours after copulation (KT 975). There are also few leukocytes and other free cells. Thereafter, spermatozoa disappear completely.

Material	Age	Content
KT 975/76	20 h	4 fertilized eggs: one 2-celled, in the process of cleavage, one degenerating
KT 790/91	24 h	4 fertilized eggs: all 2-celled, at lower end of first loop of oviduct
KT 729	45 h	Eggs not fertilized, some exhibiting second meiotic division, some degenerating

Figs. 9–12: Beginning of segmentation, 20 h

FIG. 9. Overall picture: ovary–oviduct.

Drawing (*right*) shows location of eggs in oviduct (*arrow*); *Cl* = fresh corpus luteum. Bouin, H.-E. KT 791. 40:1

FIG. 10. Two-celled egg with polar body indicated by *P*. Phase contrast. Fixation OsO₄. KT 790. 270:1

FIG. 11. Two-celled egg.

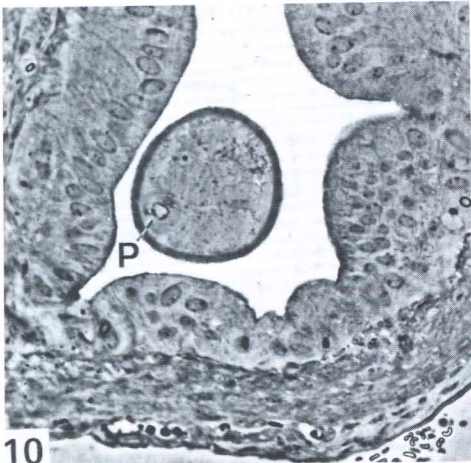
In nucleus, *N*, several small nucleoli are visible. Phase contrast. Fixation OsO₄. KT 790. 270:1

FIG. 12. Two-celled egg, higher magnification. Bouin, H.-E.

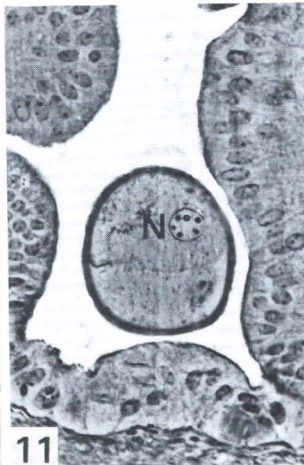
The zona pellucida obviously thinned in comparison to Figs. 10 and 11. KT 791. 580:1



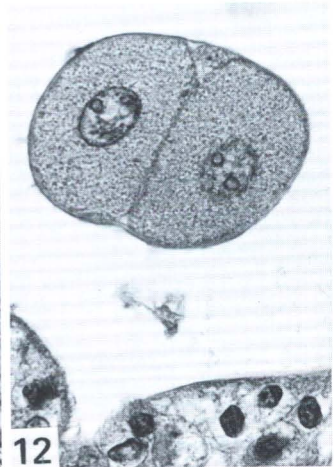
9



10



11



12

Stage 3 Segmenting Egg

2 Days, Morula

 Horizon II/b
 Segmenting egg

After 52–53 hours the embryos are composed of 2 to 16 cells. This difference in degree of development must have existed in the previous stage, and is probably a result of different fertilization times.

The *blastomeres* are of unequal size, and some are dividing mitotically. The cytoplasm is finely granulated throughout and the nuclei are rather small. On the other hand, nucleoli enlarge considerably, and their number decreases. In the two-celled egg, 4 or 5 small nucleoli are visible in each cell. In the 4-celled stage, there are only 2 or 3.

A *segmentation cavity* is not yet visible. At the 8-celled stage, the contours of the blastomeres of fresh specimens are no more distinctly visible (stage of compaction): the cells attach close together.

The *diameter of the morulae* after Bouin fixation is 70 microns (KT 845), including the shrunken *zona pellucida*. The eggs are still in clusters. They have advanced to the lower half of the oviduct.

The *polocytes* are still present, even in the 16-celled morulae. Their nuclei appear pycnotic.

Corpora lutea measure 700–750 microns. The central cavity is filled by connective tissue and contains little blood and fibrin. Rarely leukocytes are encountered (Fig. 15).

Spermatozoa are no longer visible in the uterus or the oviduct.

Material	Age	Eggs
KT 846	52 h	1 one-celled and 3 four-celled eggs
KT 845	53 h	4 six-celled, 1 nine-celled, and 1 sixteen-celled egg

Figs. 13–17: Cleavage, 53 h

FIG. 13. Corpus luteum, overall picture. Bouin, H.-E.

Drawing (*right*) shows location of eggs in oviduct.

KT 845. 125:1

FIG. 14. Detail of Fig. 13, showing the connective tissue organization of the central region. 360:1

FIG. 15. Detail of the adjacent section.

Arrow indicates leukocytes appearing in connection with the central reorganization. 720:1

FIG. 16. Segmenting egg of 9 cells, with polar body, *P*, in oviduct. Bouin, H.-E.

KT 845. 270:1

FIG. 17. Segmenting egg of 9 cells, median section.

Zona pellucida extremely thin (fixation effect).

KT 845. 760:1

