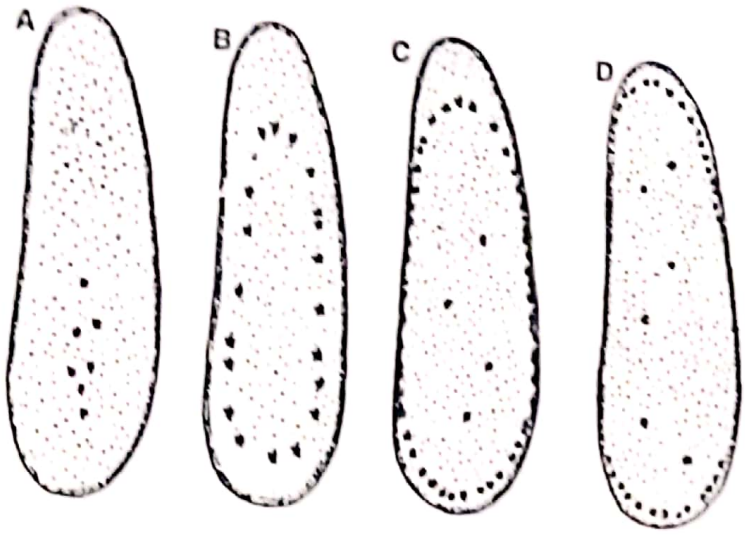


Fig. 2.6. Superficial cleavage in centrolecithal egg of an insect

## 2.3. CLEAVAGE IN AMPHIOXUS

The cleavage in *Amphioxus* is holoblastic. The first cleavage is **meridional** or vertical. The second cleavage is also meridional but at right angle to the first. The third cleavage is horizontal, but this occurs slightly above the equatorial plate, giving rise to four smaller cells called **micromeres** and four larger cells, the **macromeres.** The former occupy the animal pole, whereas the latter, vegetal pole. The fourth and fifth cleavages are meridional and horizontal, respectively. At sixty-four cell stage, the **blastula** becomes pear-shaped.

## 2.4. CLEAVAGE IN AMPHIBIA

In Frog, the first cleavage is meridional. The cleavage is **holoblastic.** The second cleavage is also meridional but at right angle to the first. This results in the formation of four equal **blastomeres.** The third cleavage is horizontal but slightly displaced towards the animal pole. Thus the four blastomeres are cleaved unequally. This division gives rise to four smaller **micromeres** in the animal hemisphere and four larger **macromeres** in the vegetal hemisphere. The fourth cleavage is also vertical (from animal pole to vegetal pole). The fifth cleavage is somewhat irregular (Fig. 2.5).

## 2.5. CLEAVAGE IN BIRDS

Since the eggs of birds are heavily laden with yolk, the cleavages are restricted to the blastodisc which is a small protoplasmic area confined to the animal pole. It is meroblastic cleavage. The first cleavage is meridional which occurs at about 4 hours from fertilzation. The second cleavage occurs at right angle to the first, but is vertical. The third cleavage is also vertical but tends to be irregular. The fourth cleavage cuts off the cells into central and peripheral

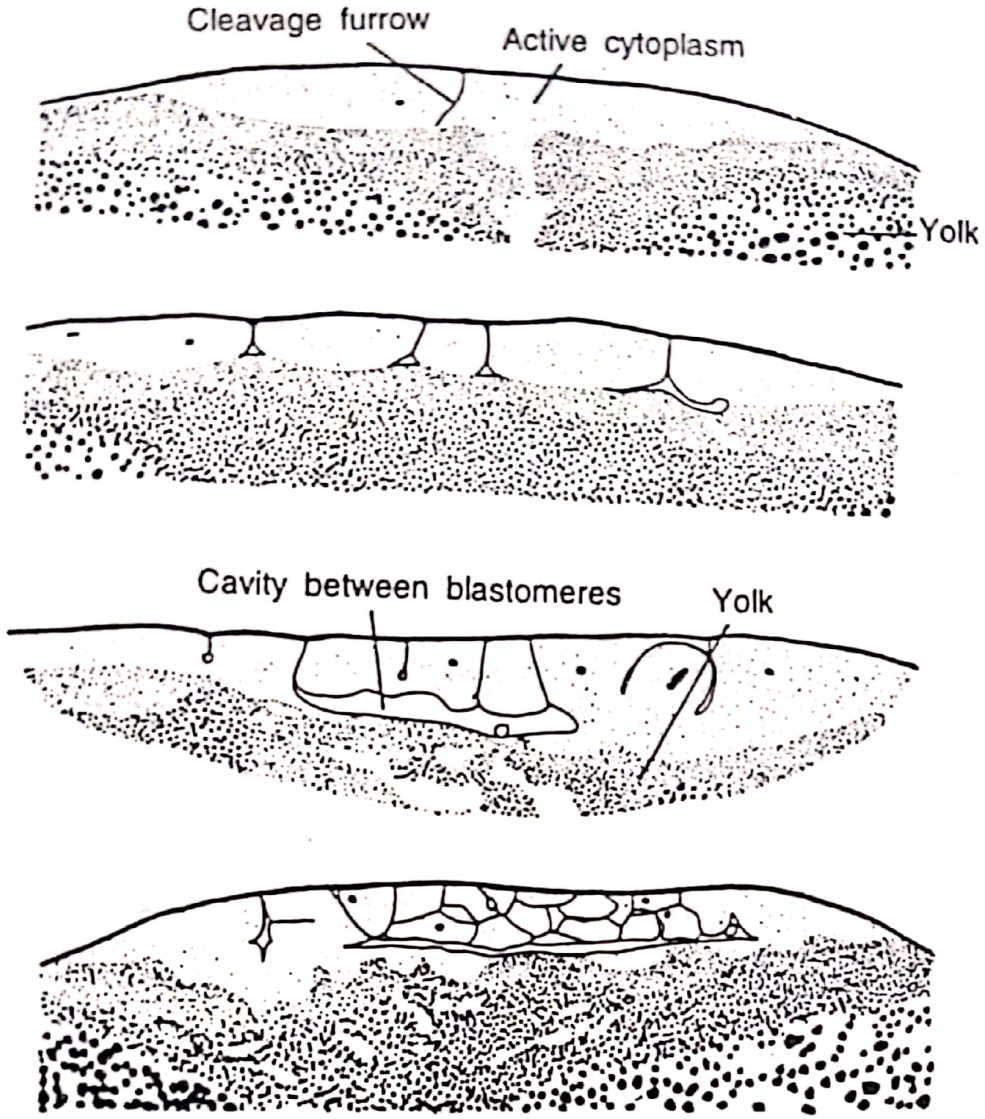


**Fig. 2.7.** Stages in the cleavage of hen's egg in sections (*A–D*)

parts. In this way, eight central blastomeres and eight marginal blastomeres are formed.

## 2.6. CLEAVAGE IN MAMMALS

Eutherian eggs have holoblastic cleavage. But there is no synchronization among the blastomeres as far as the timing of cleavage is concerned. Moreover, the speed of cleavage is slower than that of other vertebrates. Two-cell stage is reached after 12 hours of fertilization; one of the two blastomeres is slightly larger than the other. The larger cell divides first. The smaller cells are slower in division. Mitotic spindles of the cleavages are at right angles to one another. There is a good deal of asynchrony and independence among the blastomeres of mammalian morula.

## 2.7. CLEAVAGE THEORIES

There are several theories to account for the formation and occurrence of cleavage. These are:

(i) Astral growth theory,

(ii) Spindle elongation theory,

(iii) Cortical gel contraction theory,

(iv) Expanding polar membrane theory,

(v) Furrow membrane growth,

(vi) Endoplasmic flow factor.

There are a few working principles behind the formation of cleavage furrows. These have been stated by different workers.

**1. Sach's law:** According to this law, the successive cleavages occur at right angles to each other and, secondly, the blastomeres tend to be of equal size unless obstructed by yolk.

**2. Hertwig's law:** In the isolecithal egg spindle is located in the centre whereas in the telolecithal egg it is shifted somewhat towards the animal hemisphere. The axis of the spindle lies in the longest axis of the protoplasmic mass. Thus the plane of the furrow cuts the long axis across.

**3. Balfour's law:** The cleavage is determined by the yolk in the egg. The amount of yolk is inversely proportional to the speed of cleavage.

□□□