

STAGES OF EMBRYONIC DEVELOPMENT OF AMPHIBIANS

Staging embryos:

This exercise will help you to become familiar with embryonic stages and terminology. In order to standardize observations and experiments on developing embryos, and to enable different investigators working at different times and in different places to compare results, it has been found convenient to assign a series of stages of development to embryos. Staging has proved a more reliable index of developmental age than age given in terms of "time elapsed since fertilization," although in some reports both stage and age may be given together. This is because developmental rate is known to vary depending on temperature and time of year (in some species).

Stages are ordered numerically starting from one; some series use Arabic numbers, others use Roman numbers. Stage assignments are based largely on external criteria. In some instances, a single external morphological feature may suffice to define a stage (e.g., during cleavage). Later in development, several criteria may be used collectively to stage an embryo. Because the success of experiments on living embryos will depend on having embryos at the desired stage, it is desirable to learn to recognize and identify embryos at different stages. You have a series of diagrams of amphibian stages of development in your atlas.

Observations of fixed material and staging of embryos of the frog *rana pipiens*:

You will have available to you a number of embryos from the first cleavage through tadpole development. The developments that these frog embryos go through will be very similar to the developments you will see in living salamander species. Follow the instructions at the time of class for separating and organizing your embryos for examination. Observe your specimens using your dissecting microscope and determine their stage(s) of development and characteristics that distinguish them.

Using the chart on the next page as a guide, stage embryos at as many stages as are available to you. Make sketches of the embryos at the various stages in your notebook for use as reference next week when observing living embryos.

After you have finished observing your embryos, make sure they are tightly covered in their containers so that you can continue to refer to them as comparisons for living embryos next week.

Which of the following stages do you have available to you today in lab?

Stage Brief Description

1. 1 cell (unfertilized)
2. Gray crescent visible (fertilized egg)

Cleavage stages:

3. 2 cell stage
4. 4 cell stage
5. 8 cell stage
6. 16 cell stage
7. 32 cell stage
8. Mid-cleavage = Medium cell blastula
9. Late cleavage = Small cell blastula

Gastrulation stages:

10. Dorsal lip
11. Mid-gastrula
12. Late gastrula

Neurula: neurulation stage of gastrulation:

13. Neural plate
14. Neural fold
15. Rotation
16. Neural Tube
17. Tail bud (embryo begins to assume the appearance of an elongated tadpole)

Beginning stages based largely on observation of activities in living embryos/tadpoles: embryos rapidly assume elongated shape of tadpoles

18. Muscular response
19. Heart beat
20. Gill circulation [Hatching to tadpole at this stage]
21. Mouth open
22. Tail fin circulation
23. Opercular fold and Teeth
24. Opercular closed on right
25. Operculum complete
- 26-33. Metamorphosis into frog