BSCS Biology An Ecological Approach

Chapter 7 Continuity Through Development

He not busy being born is busy dying.
Bob Dylan, U.S. singer & songwriter (1941 -)

The First Stages of Embryonic Development

At fertilization, the two sex cells unite to produce a one-celled **zygote**. The zygote begins to divide and forms a small hollow ball (**blastula**) followed by a more complex stage with cell layers (**gastrula**). As the gastrula develops, the dividing cells begin to take on different shapes as they migrate to different areas of the newly formed developing **embryo**. These cells are organized into layers of **ectoderm** (the outside layer), the **endoderm** (the cells on the inside), and the **mesoderm** (those cells between). These layers will begin to differentiate into the various organs and specialized parts of the new organism.

Cell Differentiation and Specialization

As the embryo grows, the developing cells begin to "morph" or grow into specialized groups of cells. Regulatory molecules "trigger" specific genes found within each cell that control their specific growth and function. Each cell contains all of the genetic material for the complete organism. It is this triggering process that results in the specialization of growth. As growth continues, the regulatory chemicals influence the genes that direct cell specialization. Different tissues then begin to form and either move or are folded as the organism begins to differentiate.

Complexity of Development and Specialization

Groups of cells specialize into tissues, and groups of tissues specialize into organs. Finally, organs specialize into systems such as the digestive system.

External Development

Some animals, such as frogs in a pond, develop in an external environment. If the external environment for development is dry, early animal development takes place in an egg with a shell to prevent the developing embryo from drying out. These developing embryos are dependent upon stored food in the form of yolk.

Internal Development

A short time after fertilization, mammalian embryos attach themselves to the wall of the female uterus where they continue to grow and develop. Specialized structures including the placenta, amniotic sac, and uterine muscles assist with the functions of protection and nourishment of the fetus. The health of a developing human fetus can be check through a process known as amniocentesis. In this process, some of the amniotic fluid is removed with a needle and studied for abnormalities. The rapidly developing human young human can be negatively impacted (especially during the first 12 weeks) if the mother uses drugs or alcohol as these substance can alter the growth and development of the fetus.

Controlled and Uncontrolled Development

In most cases, growth and development follows regular and predictable patterns. When the animal reaches adult size, most cell growth and division ceases. Cancer is a condition in which cell growth and development is altered. This often results in abnormal growth of cells, tissues, and organs. Tumors are irregular and uncontrolled growth masses. Scientists are working to better understand and manage cancer.