How and Why Do Cells Die?

For more information go to:
How do cells die?

A cell can die in many ways - through infection, poisoning, overheating or lack of oxygen. An uncontrolled death is messy: the cell swells up, and its contents leak away. This may damage surrounding cells. But there is another, tidier way to go - programmed self-destruction, or apoptosis. It seems that cells often choose to kill themselves. We now know that controlled cell death is crucial for normal human development and good health throughout life.
Why do cells kill themselves?

As you grew in your mother’s womb, apoptosis was vital for your early development. For example your feet were webbed to begin with and rows of cells died between your toes to separate them. When your brain was developing, more than half of its early nerve cells sacrificed themselves. As adults, apoptosis helps keep all our organs the right size - as new cells grow, old ones die. It is also crucial for a healthy immune system: apoptosis weeds out ineffective white blood cells.
Why is apoptosis important?

Apoptosis goes on in every living thing. It shapes the embryo of every animal and is behind the spectacular transformations of caterpillars into butterflies and tadpoles into frogs. Some plant cells also deliberately kill themselves, for example, to stop an invading fungal or bacterial infection spreading.

Apoptosis is behind the spectacular transformation of a caterpillar into a butterfly.
What happens during apoptosis?

To kill itself, a cell first makes a deadly chemical cocktail. It then separates itself from its neighbours, and unleashes the poisons. These include a substance that chews up the DNA in the cell nucleus, and a 'glue' that binds the inside of the cell together. Within a few hours, the cell shrinks, breaks up and is engulfed by other cells.

A cancer cell (mauve) undergoing apoptosis.
What triggers apoptosis?

The death of a cell is just as carefully controlled as its life. Just as there are signals that instruct a cell to divide, there are signals telling it to survive or die. If survival signals are removed, apoptosis starts within hours, even if the cell has all the nutrients it needs to grow. In the body, a healthy cell may commit suicide if it is separated from its neighbours, to avoid growing in the wrong place.

A differential interference micrograph showing stages in apoptosis of a human cell.