

The primary roles of adult stem cells in a living organism are to maintain and repair the tissue in which they are found.

Adult stem cells (ASCs) are unspecialized or undifferentiated cells found throughout the body after embryonic development. ASCs can be found in juvenile as well as adult animals and humans.

An adult stem cell can be found among differentiated cells in a tissue or organ, and can renew itself and can differentiate to yield some or all of the major specialized cell types of the tissue or organ. ASCs multiply by cell division to replenish dying cells and regenerate damaged tissues.

Scientific interest in adult stem cells has centered on their ability to divide or self-renew indefinitely, and generate all the cell types of the organ from which they originate, potentially regenerating the entire organ from a few cells.

Stem cell division and same. A - stem cells; B - progenitor cell; C - differentiated cell; 1 - symmetric stem cell division; 2 - asymmetric stem cell division; 3 - progenitor division; 4 - terminal differentiation

Adult stem cells (ASCs) lie dormant (quiescent) and non-dividing within different adult human tissues until they are activated by signals from diseased, dying or damaged tissue to not only divide to form more stem cells, but also to differentiate into different types of specialized cells to replenish or regenerate these affected cells.

ASCs were generally thought to be 'multipotent' lineage-restricted cells with the ability to only differentiate into types of cells predetermined by the germ layer-origin of the tissue within which they reside. However, in vitro studies have shown that, given the right conditions, some ASCs can differentiate into cell types of germ-origin different to their tissue of origin. This is called Trans-differentiation or Plasticity. 4, 5, This makes these ASCs 'pluripotent' and hence very attractive in on-going stem cell research to find ways of culturing and transplanting healthy cells to replace diseased, damaged or dying tissues. 6.

Scientists also use the term somatic stem cell instead of adult stem cell, where somatic refers to cells of the body (not the germ cells, sperm or eggs). ASCs can be described in a number of ways depending on their potency, germ layer of origin, or their tissue of origin. For example, ASCs present in adipose tissue may be called Multipotent, Mesenchymal, Adipose-derived, ASCs.

Adult stem cell treatments have been successfully used for many years to treat leukemia and related bone/blood cancers through bone marrow transplants in humans. Adult stem cells have also been used extensively in veterinary medicine to treat arthritis in dogs as well as tendon and ligament injuries in horses.