Why plants usually live longer then animals

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Stem cells are crucial for the continuous generation of new cells. Although the importance of stem cells in fuelling plant growth and development still many questions on their tight molecular control remain unanswered. Plant researchers at VIB and Ghent University discovered a new step in the complex regulation of stem cells. Today, their results are published online in this week's issue of *Science Express*.

Lieven De Veylder said: "Our data suggest that certain organizing stem cells in plant roots are less sensitive for DNA-damage. Those cells hold an original and intact DNA copy which can be used to replace damaged cells if necessary. Animals rely on a similar mechanism but most likely plants have employed this in a more optimized manner. This could explain why many plants can live for more than hundreds of years, while this is quite exceptional for animals."

Quiescent organisers of plant growth

Plant growth and development depend on the continuous generation of new cells. A small group of specialized cells present in the growth axes of a plant is driving this. These so-called stem cells divide at a high frequency and have the unique characteristic that the original mother cell keeps the stem cell activity while the daughter cell acquires a certain specialization. Besides these stem cells, plant roots also harbor organizing cells. These organizing cells divide with a three- to ten-fold lower frequency, therefore often referred to as quiescent center cells. The organizing cells control the action of the surrounding stem cells and can replace them if necessary.

A new molecular network

For almost 20 years, scientists all over the world have been studying the action of the stem cells and that of their controlling organizing cells. Until now it was not known how quiescent and actively dividing cells could co-exist so closely and which mechanisms are at the basis of the quiescent character. Plant researchers at VIB and Ghent University have now identified a new molecular network that increases our understanding of stem cell regulation and activity. Central in this process is the discovery of a new protein, the ERF115 transcription factor. The scientists demonstrated that the organizing cells barely divide because of the inhibition of ERF115 activity. When the organizing cells need to divide to replace damaged surrounding stem cells, ERF115 gets activated. ERF115 then stimulates the production of the plant hormone phytosulfokine which in turn activates the division of the organizing cells. Thus, the ERF115-phytosulfokine network acts as a back-up system during stress conditions which are detrimental for the activity of stem cells.

More information: "ERF115 Controls Root Quiescent Center Cell Division and Stem Cell Replenishment" *Science*, 2013.

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