



## **ABSTRACT**

*“Autophagy: a common mediator of cell death and organismal longevity in plants”*

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Animals have evolved sophisticated machinery to remove apoptotic bodies and clean up necrotic debris for damping inflammatory response. Plants appear more pragmatic, as they utilize dying cells and cell corpses to construct their bodies, as well as to store and transport nutrients, growth factors, and secondary metabolites. The presence of rigid cell walls and the absence of phagocytosis permit cell corpses to stay post-mortem for a very long time. Disassembly of plant cells during developmental programmed cell death (PCD) is likewise a slow process, which can take up to several days. This mode of PCD is reliant on the gradual engulfment of the cytoplasm by the lytic vacuoles and is hence called vacuolar cell death. We have found that autophagy – a major cellular catabolic process - plays a central role in the execution of vacuolar cell death in the Norway spruce embryo-suspensors. The role of autophagy is cell-autonomous, since down-regulation of *ATG* genes specifically in the suspensor cells acts as a switch from vacuolar cell death to necrosis, which impairs embryonic patterning and leads to developmental arrest.

It has become well known in the last few years that yeasts, worms, flies and mammals with enhanced level of basal autophagy live longer, whereas suppression of autophagy results in premature death or shortened lifespan. Current studies in my laboratory establish autophagy as an important process in the control of plant phenology and longevity. We have found that changes in the expression of some *ATG* genes can modulate autophagic flux in the leaves of *Arabidopsis*, which in turn affects phenology and lifespan of the plants. Interestingly, manipulation of both autophagic flux and organismal lifespan can also be achieved in wild type Columbia plants by changing their caloric status through increasing or decreasing light intensity.