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The Impact of starvation and hypoxia on germ line stem cells in *C. elegans*

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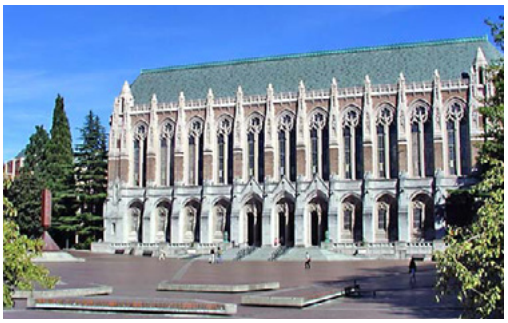
Abstract

Like most animals, *C. elegans* reproduction is driven by the proliferation and differentiation of germ-line stem cells. Under favourable conditions, when food and oxygen is abundant, robust production of sperm and oocytes leads to the generation of greater than 300 offspring in a typical hermaphrodite. Conditions in the wild are not always optimal, however, and wild nematodes may have to cope with shortages in nutrition and/or oxygen. To better understand how stem cells adapt to environmental challenges, the author have examined the impact of starvation and oxygen deprivation on the *C. elegans* germ line. We found that starved *C. elegans* adults can arrest reproduction and preserve their reproductive potential for more than 100 days, 30x longer than their normal reproductive lifespan. During starvation, somatic tissues survive but become severely damaged and filled with highly unusual structures and organelles. In the germ line, differentiated cells die off via apoptosis, leaving 35 germ line stem cells fully protected in the stem cell niche. Food restoration results in regeneration of the germ line, which coincides with a striking rejuvenation of somatic tissues. Oxygen deprivation also significantly impacts germ line stem cells. Germ line stem cells are preserved during hypoxia exposure, but there is a decrease in oocyte production after re-oxygenation that correlates with the length of hypoxia exposure. The author also found that oxygen deprivation leads to the formation of tumours in the distal portion of the germ line, which appear to be due to excess cell division. The findings are consistent with studies in mammalian cell culture models, which show that hypoxia can cause cells to become cancerous. Like in mammals, formation of the tumours in *C. elegans* is completely dependent upon hif-1. In summary, the study of nutrient stress has revealed remarkable new mechanisms of tissue preservation and a potentially new model for understanding the genesis of cancer.

Biography

Marc R Van Gilst completed his PhD degree from the University of Oregon in 1998. He carried out his postdoctoral studies at the University of California-San Francisco from 1998-2004. From 2005-2011, He was a faculty member at the Fred Hutchinson Cancer Research Centre in Seattle, WA. After taking time off from 2011-2016 for non-scientific activities, he has renewed his research program and taken a position as Assistant Professor at the University of Washington-Seattle in the Department of Anaesthesiology and Pain Medicine.



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