A right balance between cell division and cell death is a fundamental principle of metazoan development. Apoptosis, a gene-directed cellular self-destruction serves biologically meaningful functions in this aspect which is usually marked by the presence of characteristic morphological changes, including chromatin condensation, DNA laddering, loss of mitochondrial-membrane potential and detachment from the cellular matrix (Lettre et al, 2006).

Developmental apoptosis has been studied in all major model systems in developmental biology, and pioneering work done in *C. elegans* established that apoptotic cell death is under genetic control and this molecular programme is conserved throughout evolution (Ellis et al 1986, Metzstein et al 1998). In *C. elegans*, the anti-apoptotic protein CED-9 is localized at the mitochondria, where it binds the pro-apoptotic protein CED-4. Initiation of apoptosis begins when the pro-apoptotic protein EGL-1 is expressed and binds CED-9. This binding releases CED-4 from CED-9 and causes the activation of the caspase CED-3. This core apoptotic pathway is conserved in higher eukaryotes. (Kinchen et al, 2005).

Upon its release from CED-9, CED-4 translocates rapidly to the nuclear envelope in a CED-3 independent manner (Chen et al, 2000). It is suggested that CED-4 translocation from the mitochondria to the nuclear envelope plays an important role in apoptosis. However, the identity of the nuclear envelope receptor for CED-4 and its possible role in the execution of apoptosis has remained unknown till date. Recently, Tzur et al (2006) have shown that the inner nuclear membrane SUN-domain protein matefin/SUN-1 binds CED-4 and is specifically required for CED-4 translocation and maintenance at the nuclear envelope. Because both the SUN-domain proteins and the core apoptotic machinery are conserved in evolution, it is tempting to suggest that these proteins are the link for apoptotic processes between the cytoplasm and nucleus in higher eukaryotes as well. Also, though the core apoptotic machinery has been well characterized, the molecular events that determine the timing of cell death are still poorly understood.

Recent work by Maurer et al, (2007) shows that the timing of tail spike cell death of *C. elegans* depends upon the transcriptional induction of the ced-3 caspase, which is regulated by the transcription factor PAL-1 that is the *C. elegans* homolog of the mammalian tumor suppressor gene Cdx2. This suggests a role for the transcriptional regulation of caspases in controlling the timing of cell death onset during animal development.

Thus, study of apoptosis in *C. elegans* has led to the identification of some key components of the apoptotic cascade that is conserved throughout evolution and is an integral part of development of most multicellular organisms. New ideas are constantly being generated in this aspect, and the future is bright with the obvious fact that C.
elegans has still plenty to teach about why and how it occurs. Not bad at all for a tiny little worm…………

References:


