

DARE Cells & Apoptosis

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Why in News?

Researchers recently identified that DARE cells initiate the programmed cell death (apoptosis) cascade following severe damage but halt the process before dying, subsequently multiplying to rebuild damaged tissue.

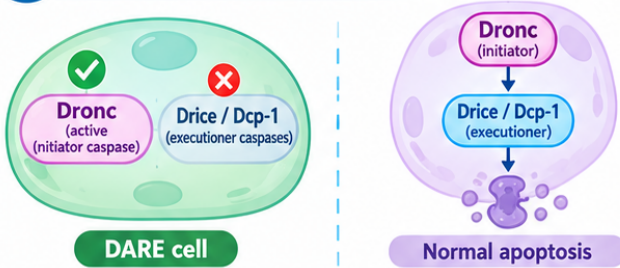
DARE Cells (Dronc-Activated Radiation-Resistant Epithelial Cells)	NARE Cells (Non-Activated Radiation-Resistant Epithelial Cells)
- Cells in which initiator caspases (specifically <i>Dronc</i>, the fruit fly ortholog of mammalian Caspase-9) switch on to trigger cell death, but the cascade stalls. - Instead of undergoing destruction, these cells survive, proliferate rapidly, and replenish nearly 50% of damaged tissue within 48 hours.	- A complementary population of death-resistant cells where the initiator caspase is never activated. - While NARE cells contribute to tissue recovery, they cannot drive regeneration independently; removing DARE cells causes compensatory tissue repair to cease completely.

Molecular Mechanism of Survival

- **Decoupling Initiator** - In normal apoptosis, active initiator caspases activate downstream **executioner caspases** (e.g., Caspase-3/7), which dismantle cellular structures.
- In DARE cells, the pathway stalls specifically at the initiator stage.
- **Role of Molecular Motor (Myo1D)** - The survival mechanism is mediated by a motor protein (Myosin 1D / Myo1D).
- It tethers the active initiator caspase (*Dronc*) to the cell membrane, preventing it from activating executioner caspases in the cytoplasm.
- **Paracrine Feedback Loop**
 - Dying neighbor cells release paracrine signals that trigger DARE cell induction.
 - Active DARE cells secrete growth factors to stimulate neighboring NARE cells.
 - NARE cells, in turn, release inhibitory signals back to DARE cells, establishing a **negative-feedback loop** that prevents uncontrolled tissue overgrowth or hyper-proliferation.

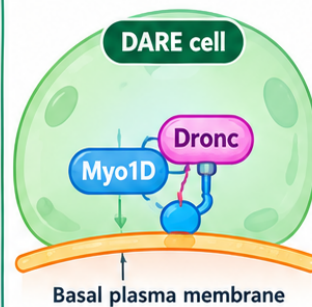
➤ DARE Cells: Survival & Proliferative Homeostasis ⚡

1 Caspase Decoupling



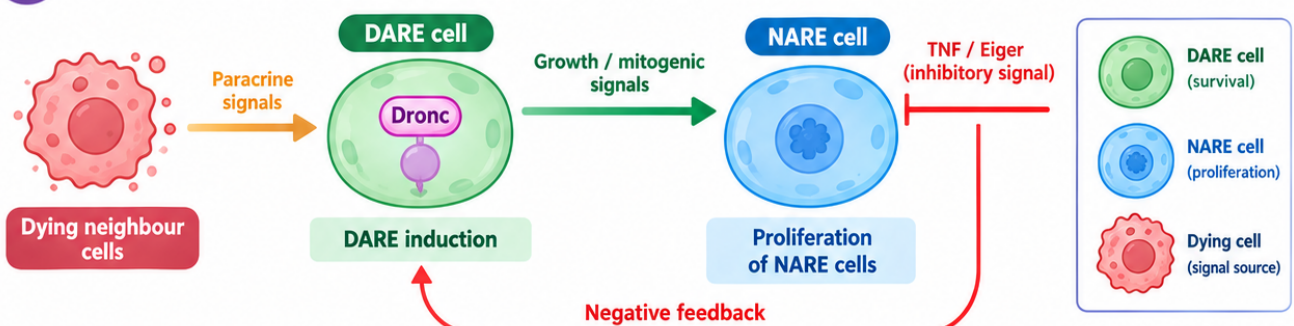
In DARE cells, active initiator caspase (Dronc) is present, but executioner caspases (Drice/Dcp-1) are not activated, so apoptosis is avoided.

2 Myo1D Protection



- Myo1D tethers Dronc to the basal plasma membrane.
- This prevents activation of effector caspases in the cytoplasm and supports DARE-cell survival.

3 Paracrine Feedback



➤ **DARE-NARE signaling maintains balanced compensatory growth.** ⚡

Significance

- **Acquired Radio-Resistance-** When regenerated tissue was exposed to subsequent rounds of ionizing radiation, descendants of DARE cells proved **~7 times more resistant** to cell death than untreated control cells.
- **Insights into Cancer Recurrence** - Provides a biological explanation for why recurrent tumors that survive initial radiotherapy or chemotherapy often return with heightened multi-drug and radiation resistance.
- **Regenerative Medicine-** Understanding how cells safely stall apoptosis without undergoing malignant transformation opens pathways to engineer controlled tissue regeneration in severe burns, ischemic injury, and organ scarring.

Reference

[Science Daily | Cells that cheat death and rebuild damaged tissue](#)



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