FRED HUTCHINSON
CANCER RESEARCH CENTER

PRESS RELEASE

CONTACT: Debbie King
425-357-9866

EMBARGOED FOR 11 a.m.
June 19, 2001

SUSPENDED ANIMATION IN ZEBRAFISH MAY HOLD KEY TO TREATMENT OF CERTAIN TYPES OF CANCER

Research raises possibilities for other medical applications as well

SEATTLE, WA, June 15, 2001 – Zebrafish are gaining on Star Trek's genetically-engineered villain, Khan Noonien Singh, found by Captain Kirk floating in space after having survived 200 hundred years in suspended animation. However, unlike Khan, suspended animation comes naturally for Zebrafish.

Scientists at the Fred Hutchinson Cancer Research Center are looking to this specialized response of Zebrafish embryos to an environment lacking in oxygen--a condition known as anoxia--for keys to battling certain types of cancer, as well as pulmonary and cardiovascular disease. In a new study to be published in the June 19, 2001 edition for Proceedings of the National Academy of Sciences, research scientists Pamela Padilla and Mark Roth in the Division of Basic Science discuss their unique experimentation and findings working with Zebrafish embryos deprived of oxygen.

They found that the embryos of these tropical striped fish can survive in suspended animation for up to 24 hours in an oxygen-free environment without ill effect. The embryos enter suspended animation by stopping all microscopically observable movement, including heartbeat. Cell division at certain stages of the embryonic process stops as well.

--more--

Upon being re-exposed to a normal oxygen environment within 24 hours, the embryos developed normally into adult fish, with the ability to reproduce and without distinction from their non-oxygen deprived counterparts. The younger the embryo, the better their chances for survival in the anoxic environment. (Embryos older than two days did not typically survive.)

Using flow cytometry analysis, a method that uses lasers to measure internal cellular structure, Padilla and Roth analyzed the DNA content of the embryonic cells, which revealed exactly where in the cell cycle process development stopped. Their research is the first step in determining the genetic program that triggers the suspended animation survival response in vertebrates to an oxygen-deprived environment.

Padilla and Roth hope their findings can eventually contribute to the formulation of an auxiliary compound that can eradicate stubborn cells that exist inside solid cancer tumors. Because these cells lie deep within the tumor and are distant from oxygen transported by the patient's circulatory system, they are better able to survive at low oxygen levels (hypoxia) and are thus, more resistant to chemotherapy and radiation treatments. The Zebrafish studies could also prove helpful in developing treatment for cardiovascular and pulmonary tissue damaged by diminished blood supply and oxygen deprivation.

Unlocking the key to the genetic mechanism that enables certain vertebrates to arrest cell development in response to shifting environmental changes may pave the way for other fascinating possibilities down the road as well. For example, in nature some mammals have the capacity to stop cell development to allow their young to be born at optimal times of the year. And certain freeze-tolerant frogs are able to stop heartbeat and blood flow in response to cold temperatures for extended periods of time. Padilla speculates that perhaps sometime in the future anoxia-initiated suspended animation can be used, either independently or in combination with cryogenics (freezing), to preserve organs or stop hemorrhaging.

"There are instances in humans where you can survive freezing and stopping of heartbeat," says Padilla, a post-doctorate research fellow at the FHCRC. She cited a case of a toddler in Canada who survived an accidental freezing for several hours in the snow. The toddler's heartbeat had actually stopped but was able to be revived.

# # #