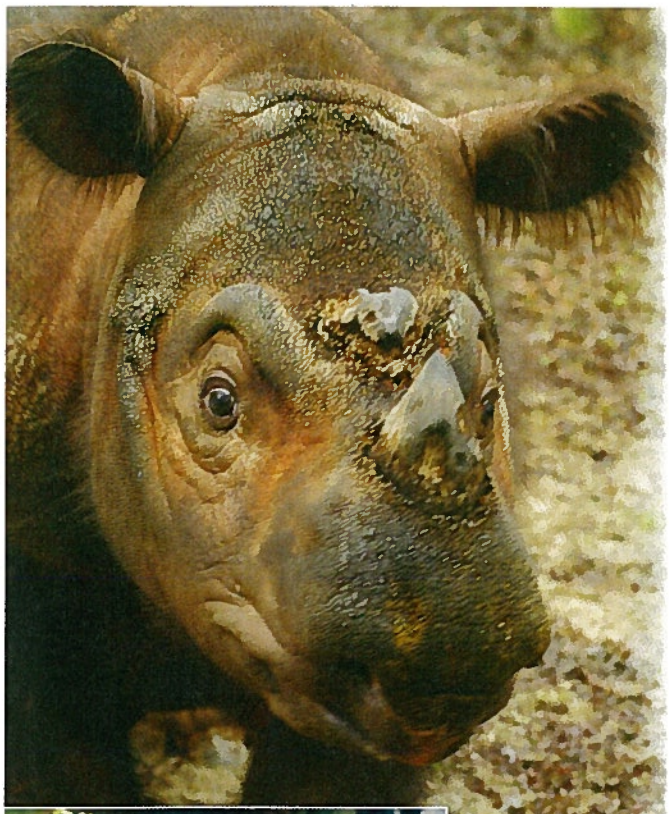
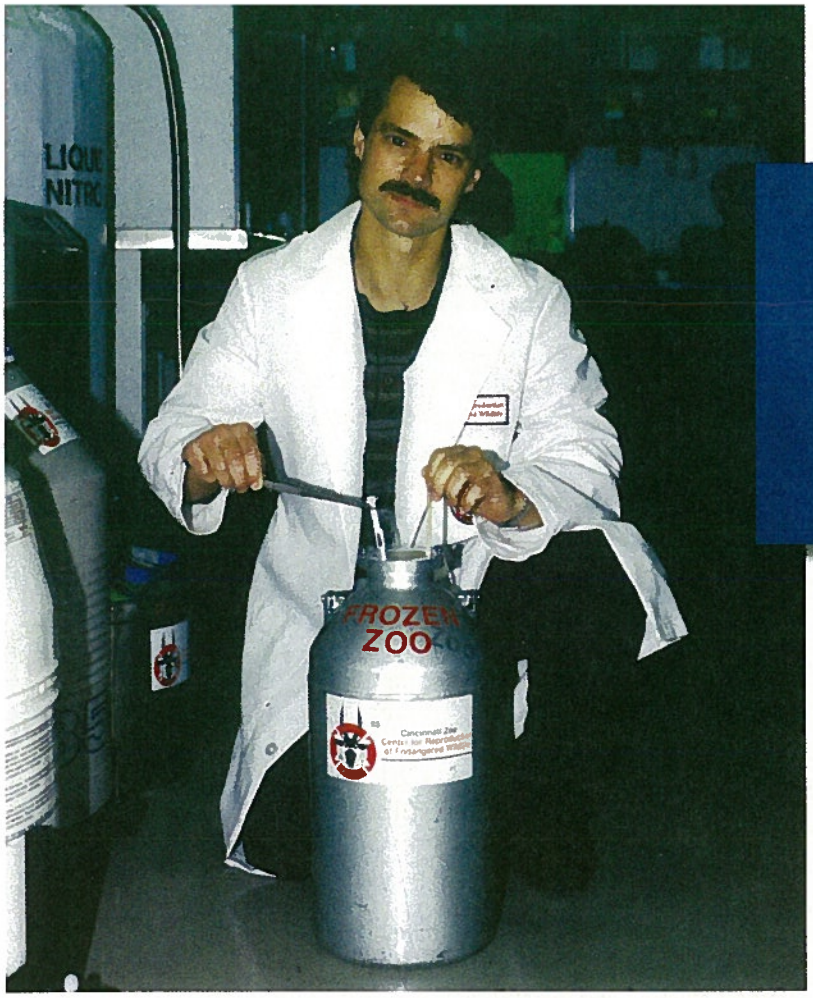


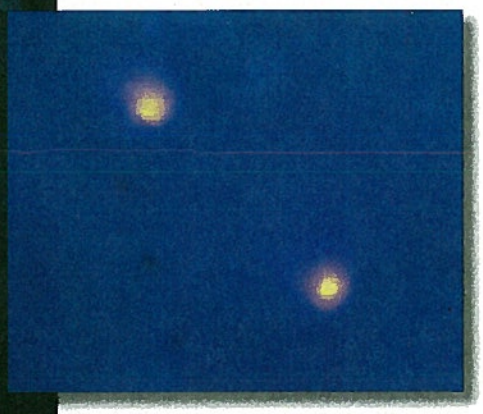
C.R.E.W.
Lindner Center for Conservation and Research of Endangered Wildlife

The Challenge of Conservation in a Terrorist Age

by Dr. Bill Swanson, Director of Animal Research

CREW scientists travel extensively throughout the United States and the world to conduct conservation research in direct collaboration with more than 90 zoos, botanical gardens, universities and conservation facilities. One constant factor associated with each project is the need to pack up our research samples and equipment, load them as baggage onto airplanes and transport these materials between Cincinnati and the collaborating institution. As we all know, boarding a commercial aircraft these days entails running the gauntlet of airport security, including x-ray screening of all checked luggage by the Transportation Security Administration (TSA). For CREW scientists, this heightened airport security has created an additional concern—specifically, what is the potential impact of airport luggage screening on the viability of the frozen sperm and embryos from endangered species that we frequently must transport between distant locations?





(*above*) Spermatozoa with radiation-induced DNA damage as shown by the comet tails.

(*left*) Dr. Swanson placing frozen samples into a dry shipper for air transport.

In a study conducted this past year, CREW intern Kayleen Gloor sought to answer this important question. Her results suggest that we should be afraid – very afraid – of the luggage screening devices that are used at most airports. For the study, frozen domestic cat and fishing cat sperm samples were placed into a portable dry shipper container (to keep the samples frozen) and exposed to the rigors of TSA screening. Initially, the frozen sperm were just transported on a round-trip flight between Cincinnati and Jacksonville, Florida, resulting in one hand-inspection by TSA on the outbound flight and one x-ray screening procedure on the return flight. With the cooperation of TSA, some of the sperm samples were screened two more times at the Cincinnati airport. Radiation dosimeters were placed in the dry shippers during screening to allow us to measure the amount of radiation exposure. The frozen samples then were thawed and evaluated for sperm motility and DNA integrity. To assess DNA damage, we used a technique called single cell gel electrophoresis but more commonly known as the Comet assay (for the comet tails that are observed when fragmented DNA migrates through the gel).

Kayleen's findings were disturbing, to say the least. Each TSA screening procedure requires three separate x-ray exposures to allow generation of a 3-D image of the contents of the checked baggage. Our radiation measurements indicated that each screening procedure was equivalent to receiving three successive chest x-rays. Even with just a single screening procedure, we found that sperm motility was decreased, probably due to injury to the sperm mitochondria (the powerhouse for sperm tail movement). Although an increase in DNA fragmentation was not detected after a single screening, three screening procedures caused substantial DNA damage as shown by increased length of the comet tails in those samples. Because spermatozoa with damaged DNA are still capable of fertilization, these induced genetic defects could be passed on to any resulting offspring.

For those of us who work with endangered species, this risk of radiation-damaged sperm or embryos being used to produce offspring with genetic defects is totally unacceptable. Our only current option is to ship our frozen biological samples by overnight transport services such as DHL or Fed Ex (who do not x-ray their cargo) but this alternative can be very expensive and is not always available internationally. With publication of our research findings, however, we are hopeful that we will be able to reach some accommodation with TSA to allow routine hand-checking of our dry shippers and avoid the potential risk of radiation damage to these invaluable biological materials.