Steps taken to protect and rescue cryopreserved embryos during Hurricane Katrina

Hurricane Katrina was a devastating storm that brought lessons in emergency preparedness. All IVF programs should have a plan to protect fresh and cryopreserved embryos in case of natural or human-made disaster. (Fertil Steril® 2006;86:732–4. ©2006 by American Society for Reproductive Medicine.)

On Monday morning August 29, 2005, Katrina, a large category 4–5 hurricane with sustained winds of 140 mph, struck New Orleans. This correspondence describes actions in response to Katrina taken by one IVF program that performed IVF at two hospitals, alternating every 6 weeks between Hospital A in east New Orleans, and Hospital B in a western suburb of New Orleans. The hospitals were 15 mi apart and inside different levee protection systems. Hospital B was the active site when Katrina struck, but cryopreserved embryos were stored in 30- and 34-L liquid nitrogen tanks in IVF laboratories on the ground floor at both hospitals. Three successive, storm-related events occurred: first, Katrina; second, flooding caused by breaks in levees during and after Katrina; and third, a second hurricane, Rita, 3.5 weeks later, that caused further flooding and prevented reentry to the hospitals.

Both the severity of Katrina and the possibility that it would reach New Orleans were initially unrecognized by the National Weather Service and local officials. On Friday morning, August 26, Katrina was a category 1 hurricane near Florida, headed due west but expected to turn north and strike Alabama or Mississippi. By Saturday morning, Katrina had increased to a category 3 hurricane, and New Orleans was in the possible strike zone. At midday Saturday, local officials recommended voluntary evacuation of New Orleans and adjacent parishes. When they learned of this, Fertility Institute of New Orleans personnel put into action an emergency plan to protect cryopreserved embryos in case of flooding due to a break in the levee systems. Liquid nitrogen tanks in which embryos were stored were topped off and moved to the third floor at both hospitals. A total of 1,748 cryopreserved embryos belonging to 485 couples had to be moved. Evacuation of cryopreserved embryos was completed by 6 PM Saturday at Hospital A, and by 6 PM Sunday at Hospital B.

This was the second time in 2005 and the fifth time since 1987 that cryopreserved embryos had been evacuated because of hurricanes. Incubators had been kept operating on emergency power during power outages caused by previous hurricanes. There had been no flooding due to a hurricane in New Orleans since Betsy in 1965. Because of their previous experience with hurricanes, most couples elected to cancel the remainder of their IVF cycle and leave the city. Two patients who received hCG Thursday and Friday, August 25 and 26, while Katrina was still a category 1 or 2 hurricane and not expected to reach New Orleans, elected to stay. One patient underwent oocyte retrieval Saturday morning before the recommendation for voluntary evacuation. The other patient had oocyte retrieval Sunday and was expected to have a fifth-day embryo transfer Friday after Katrina had passed. Two oocyte retrievals had been performed on Thursday, August 25.

Sunday morning, Katrina had increased to a category 4 hurricane and there was an increased probability that it could reach New Orleans. At 9:30 AM, the mayor of New Orleans issued a mandatory evacuation order that included Hospital A but not Hospital B. At 7:30 AM Sunday, the last oocyte retrieval had been performed. Before noon Sunday, the two patients who had oocyte retrievals on Thursday had third-day embryos transferred. Under normal circumstances, they would have had fifth-day transfers. Excess, untransferred embryos from one patient were returned to the incubator for extended culture and cryopreservation on day 5. Sunday evening, there were three sets of embryos in the incubators at Hospital B, none in incubators at Hospital A. The embryologist moved into hospital B, prepared to stay throughout the storm. There was an increased probability that Katrina would strike New Orleans within the next 24 hours but still time for it to veer off to the east or west.

At 6:00 AM on Monday, August 29, Katrina made landfall 90 mi southeast of New Orleans with top winds of 140 mph. By nightfall, Katrina had passed to the east of New Orleans with reduced winds. Both IVF laboratories were undamaged. Electrical power was lost throughout the city, but provided by generators at both hospitals. Tuesday morning, the day after the hurricane, the situation appeared to be good at Hospital B, although the elevators were no longer working. Embryos inside the incubators were intact, and cryopreserved embryos were safe. Fifth-day embryos remaining from one of the two Sunday transfers were

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cryopreserved Tuesday morning. Transfer or cryopreservation of embryos from the retrievals performed Saturday and Sunday were planned for 3 and 4 days, respectively, after the hurricane.

Although wind damage to the hospitals from hurricane Katrina was minimal and loss of electrical power was compensated for by generators, damage due to flooding was severe and became the more important problem. During the height of the storm on Monday, levees gave way, flooding eastern New Orleans with up to 20 ft of water. Cryopreserved embryos at Hospital A in east New Orleans became inaccessible except by boat. Initially, cryopreserved embryos and embryos in the incubators at Hospital B, on the west side of New Orleans, appeared to have escaped any danger from flooding.

The situation changed suddenly at 8:00 PM Tuesday evening when Hospital B administrators, responding to reports on national and local television that additional levees on the west side of New Orleans had been breached, and that there could be 15 ft of water in the hospital within 12 hours, closed the hospital and recommended that all hospital personnel leave as rapidly as possible. There was not enough time to cryopreserve the 2- and 3-day postretrieval embryos remaining in the incubators, a process that could take 4 hours, without endangering the life of the embryologist.

Hospital B did not flood, but because 80% of the city did flood and people who were trapped inside their homes and at public shelters needed to be evacuated, the city was closed to reentry for the next 5 days by civil and military authorities. The embryologist who had planned to return in 2 days to transfer or cryopreserve the remaining embryos was unable to do so until 5 days later, when it was possible to top off the liquid nitrogen tanks. Hospital B did not reopen for patients until October 3, 5 weeks after Katrina. The IVF retrievals resumed on November 7, 10 weeks after Katrina. Because of the extended length of time that disposable supplies were subjected to high temperatures in the absence of air conditioning, it was necessary to discard all stores of disposable supplies and order new supplies before resuming IVF.

Although the cryopreserved embryos at Hospital A were believed to be safe for 27 days after topping off of the tanks with liquid nitrogen, Fertility Institute personnel recovered the embryos at Hospital A 13 days after Katrina hit, once water had receded sufficiently and civil unrest was under control. The recovery required the assistance and coordination of the National Guard, Louisiana State Police, and Illinois Conservation Agents using both overland vehicles and boats (Fig. 1). The “rescued” embryos were moved to Hospital B, which had not flooded. A major concern during the recovery was that the tanks would tip over, resulting in loss of embryos and injury to rescue personnel unfamiliar with handling liquid nitrogen. The importance of the early recovery became apparent 15 days later when Rita, a second hurricane, passed to the west of New Orleans on September 23, causing new levee breaks and further flooding in eastern New Orleans.

Our experience with Katrina proved that it is not necessary to be at ground zero to be affected by a natural disaster. An event miles away may disrupt electrical power and accessibility for an extended period of time; therefore, relying on generators until power is restored and delaying transfer to the fifth day may not be sufficient. All IVF programs need plans to protect fresh and cryopreserved embryos in the event of a natural or human-made disaster. Natural disasters vary by location: hurricanes in coastal areas, tornadoes in the Midwest, earthquakes on the West Coast, snowstorms in the North, flooding in many areas. Fire and smoke permeation of the laboratory, power outages, and terrorist attacks can occur anywhere. Most IVF programs in southern coastal areas have emergency plans because of the frequency of hurricanes but may need to
review them. Programs in other areas may not be aware that they need plans. (The current Fertility Institute of New Orleans Emergency Plan can be viewed at www.fertilityinstitute.com. Displaced patients unable to contact their clinic can locate an IVF program in another city or state on the Society of Assisted Reproductive Technology (SART) website, www.sart.org.)

Last, we were overwhelmed by the offers of assistance that we received from IVF programs in neighboring cities and states, not only to help care for our patients but also to help us restart our program with loans of equipment and supplies.

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