

# Doctors Study Infant Incubator Noise Levels

Noise levels which can permanently destroy hearing are something we've come to expect in boiler factories, cotton gins, textile mills, airports and even discotheques.

But not in infant incubators.

Now researchers at Duke and the National Institute of Environmental Health Sciences have suggested that incubator noise levels may be a possible cause of hearing loss in infants.

Dr. Joseph C. Farmer, an assistant professor in otolaryngology at Duke, and Dr. Stephen A. Falk of the NIEHS have measured the noise levels in standard incubators and found them to be well below industrial noise limits allowed by federal law.

But those standards are based on exposure levels for adults for an eight-hour work day, Farmer said. No one yet knows the effects of loud, continuous noise on a newborn infant, particularly when that noise may continue uninterrupted for weeks or even months.

"We need to establish some kind of

damage-risk criteria for noise exposure levels for infants and then design the next generation of incubators to meet these criteria," Farmer said.

Farmer and Falk measured noise levels in six incubators. Each was analyzed twice, with the microphone of the sound level meter placed where the infant's head would normally rest, and then placed where the feet would be. They found no difference between the levels in the two positions.

The measurements revealed an average linear noise level of 74.5 decibels and an A-weighted level of 57.7 decibels. The linear measure is the average noise of all frequencies. The A-weighted measurement suppresses some of the low sound frequencies in much the same way as the human middle ear does and thus gives a closer approximation of the actual noise levels transmitted to the inner ear.

The source of the noise was found to be the electric motor and fan below the infant compartment of the incubator.

Federal regulations for industrial noise

will allow a maximum of 90 decibels, A-weighted for a duration of eight hours a day. With a sound level of 115 decibels, the law allows only a 15-minute or less exposure per day.

According to industrial criteria, Farmer said, the noise levels found in incubators would not be considered a risk to hearing. But he said there are several reasons why this should be reevaluated.

First, the present criteria were based on adult studies and are possibly not applicable to noise exposure in infants. Second, he said, continuous noise is potentially more damaging than intermittent noise, which provides an opportunity for some recovery. A premature infant in an incubator is subjected to continuous noise levels for weeks or months.

Third, he said, some studies have shown that exposure to loud noise increases the potential damage to the inner ear from certain types of antibiotics. He said the use of these potentially ototoxic antibiotics on

newborns in incubators should be studied and limited to use in those infection cases in which these antibiotics are the only effective drugs, as shown by appropriate microbiological studies.

Farmer said the American public has a higher frequency of neurosensory hearing loss than people in other areas of the world and doctors believe a significant amount of this is due to noise.

"Noise is like other environmental problems," Farmer said. "The public really hasn't become concerned until the last few years."

"But noise as a cause of sensorineural hearing loss has been well established for some time," he said.

Loss of hearing due to noise is a cumulative condition. Once hair cells in the inner ear have been irreversibly damaged by loud noise, they are not replaced. As persons grow older, arteriosclerosis and impaired inner ear blood flow can also cause hair cells to die, leading to a condition called presbycusis.

Farmer said in older persons it is sometimes hard to tell the cause of sensorineural hearing loss, aging or noise or both. But when significant sensorineural hearing losses are seen in younger people, it is frequently due to excessive noise exposure, which can occur in multiple situations such as factories, firearms and loud music.

Hearing aids are often not much help for presbycusis or noise-induced hearing loss, he said, because although the aids amplify sound, the person has lost the ability to discriminate pitch and frequency and differentiate between sounds, and hearing aids cannot perform

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## Intercom

duke university medical center

VOLUME 20, NUMBER 34

AUGUST 24, 1973

DURHAM, NORTH CAROLINA

## Dive Tests Breathing Mix In Hyperbaric Chamber

A month-long series of simulated dives began today in the medical center hyperbaric chamber to test a new three-gas breathing mixture which could permit man to dive farther beneath the sea, and with greater safety, than is now possible.

Two of the six dives in the series will be to a simulated depth of 1,000 feet below sea level. In one of the deep dives, the four divers will breathe the helium-oxygen mixture now standard for deep sea work. In the other the divers will breathe a mixture of helium, oxygen and nitrogen. This will be the first time that nitrogen has been used at this depth.

Nitrogen has not been used in deep diving because of its narcotic or intoxicating effect at depths greater than 100 feet. But the helium in the deep diving mixtures now used also causes problems—a phenomena called High Pressure Nervous Syndrome which comes on at depths of 500 feet or greater.

HPNS is characterized by nausea, dizziness and tremors, and the symptoms become more severe with increasing depth. This phenomenon has limited the depth to which man can safely dive.

Dr. Peter B. Bennett, professor of anesthesiology and an internationally known authority on the physiological problems of diving, will direct the experimental dives.

Bennett said animal experiments and a few human studies have shown that the effects of HPNS can be negated by adding a certain amount of anesthetic or narcotic gas such as nitrogen to the helium-oxygen diving mixture. It also has been shown, he said, that the effects of the nitrogen narcosis which then result can be relieved with increasing pressure.

Thus, if just the right balance can be found between helium and nitrogen, Bennett said, it may be possible for divers

to overcome the effects of both narcosis and HPNS and work at much greater depths than ever before. Other detrimental effects of helium, such as voice distortion—the "Donald Duck" effect—and the extreme loss of body heat, might also be overcome.

Three of the divers have been provided by the Harbor Branch Foundation and the other one from Oceaneering International Inc. of Houston, Tex. The F.G. Hall Laboratory for Environmental Research and the Department of Anesthesiology are conducting the research.

The dive which began today is to a depth of 192 feet. The divers are using compressed air, which contains 79 per cent nitrogen and 21 per cent oxygen.

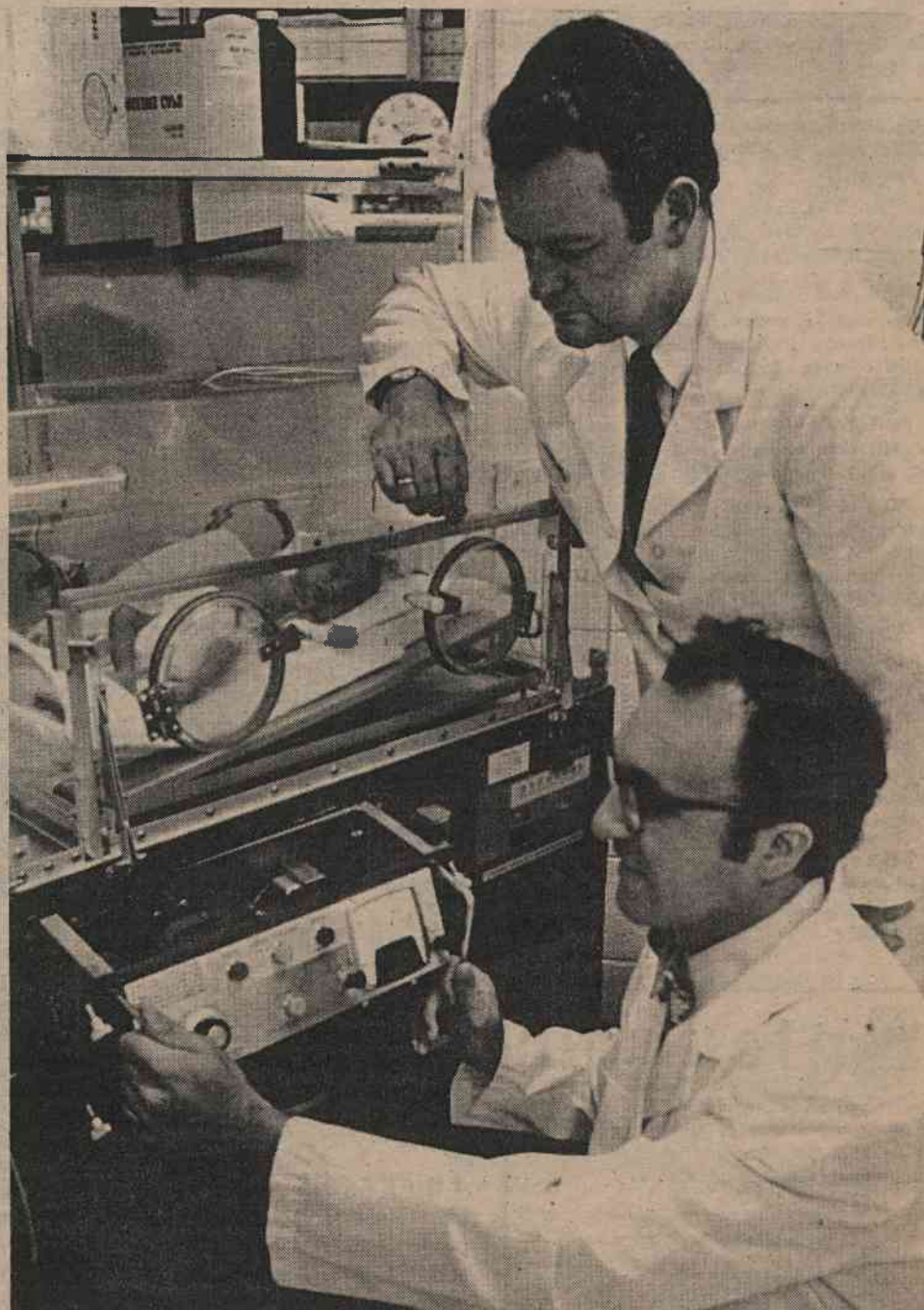
On Aug. 28 the divers will be taken to 720 feet using the three-gas mixture, then on Sept. 5 or 10 they will go to 720 feet breathing helium and oxygen.

On Sept. 21 there will be another compressed air dive to 272 feet. The first 1,000-foot dive will come Sept. 25 using the three-gas mixture, then on Oct. 2 another dive to 1,000 feet using helium and oxygen will complete the series.

Very rapid compression times will be used, with the divers going from the "surface" to a pressure equivalent to 1,000 feet below the sea in only 20 minutes. They will remain there for about an hour. Decompression from this depth will take about three days. The divers will come out of the hyperbaric chamber between each dive for rest and testing.

The divers will be in a dry chamber throughout the dives except during the decompression period of the two helium-oxygen dives. Then a tank below the pressure chamber—the "wet pot"—will be filled with water and the divers will test some equipment for

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**AN EAR FOR NOISE**—Dr. Joseph C. Farmer (standing), assistant professor of otolaryngology, checks an incubator motor with Dr. Stephen A. Falk of the National Institute of Environmental Health Sciences. The two measured noise levels inside several types of incubators and suggested that this noise could be a possible cause of infant hearing loss. The noise comes from the motor and fan under the infant compartment. (Photo by Jimmy Wallace)