News
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******Scientists make gains in understanding hyaline membrane disease.

DALLAS--Each year some 25,000 premature babies die gasping for breath with a problem of underdeveloped lungs known as hyaline membrane disease. For those who survive, hospital costs may be staggering.

Now, University of Texas Health Science Center researchers have made some significant advances toward the day when doctors might be able to make a fetus' lungs mature faster in anticipation of early delivery.

The main problem seems to revolve around a substance which is a chemical cousin to the stuff the housewife sprays on her cooking pans to keep food from sticking. The substance, called "surfactant," is normally secreted by a specialized lung cell up to ten weeks prior to birth. It spreads throughout the tiny, spongelike air sacs and helps prepare them to open easily with the first breaths of air.

Without surfactant, the lung sacs stay shut and "hyaline" membranes form on the surfaces. The baby is born in respiratory distress.

Dr. John Johnston, professor of Biochemistry and Obstetrics and Gynecology; with Dr. Paul MacDonald, former chairman of Obstetrics and Gynecology; and Dr. John Porter, professor of Obstetrics and Gynecology, have been able to define:

1. How surfactant is made inside a particular type lung cell in tiny round "factories" having rings looking like those of an onion.
2. How the surfactant leaves the cell and moves to the air sacs. (The cell builds a system of tubules looking for all the world like a miniature plumbing system.)
3. What signal is given to the specialized lung cells some time between 30 weeks and birth to initiate the production of surfactant.

The scientists at the UT Health Science Center looked closely at the chemical origin of surfactant.

"We examined various enzymes that catalyze the synthesis of the lecithin and showed that during the last few days of gestation in the rabbit, the activity of a critical enzyme increases," said Dr. Johnston.

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Tracking this enzyme, phosphatidic acid phosphohydrolase, or PAPase for short, paid off a medical dividend:

Amniotic fluid (from the sac in which the fetus floats) in the human also showed this increase in PAPase in the last few weeks of gestation.

"There were tests available to assess the maturation of the baby lung in utero (in the mother) but with the PAPase we can assay it in 15 minutes rather than two to three hours and we have found it is a good index--earlier and maybe more definitive," said Dr. Johnston.

So now, a doctor who must make a decision on a Caesarean has a much better test available to determine whether the baby will survive.

In the third phase of their study, the scientists took a look at the small "onion ring" factories inside the lung's Type II cells which seem to make the non-stick surfactant.

"In animals, we found the cell makes a protein we call 'tubulin' which facilitates the transport of the substance to the lung sacs," explained Dr. Johnston. Although the electron micrographs show formation of a tube, exact method of transport is not yet understood, he said.

What starts the production of surfactant?

"We think that, in part, it's a hormone produced by the pituitary gland of the fetus," theorizes Dr. Johnston.

One pituitary hormone identified with the production of milk--prolactin--may be important in this process.

Drs. Porter and MacDonald checked the level of prolactin in the umbilical cords of babies born at varying terms.

"They compared the level of cord blood prolactin with the incidence of respiratory distress syndrome. There was a highly significant correlation,"said Dr. Johnston.

For babies in the 29½ to 33 week range who showed less than 200 billionths of a gram of prolactin per milliliter, 20 out of 25--or 80 percent--had respiratory distress.

For babies in the same range with greater amounts of prolactin--none showed respiratory distress.

"Our efforts now are focusing on getting an increase in prolactin and other hormone secretion by the fetus in utero in experimental animals," said Dr. Johnston.

One bizarre fact had pointed this way: Heroin is known to increase prolactin levels and workers have been unable to find the child of an addict who has had hyaline membrane disease.

The doctors hasten to add that there are a number of other drugs that might be more effective in doing the same thing and this is the main arena of research at the moment.

The motivation--aside from the saving of life--is strong.

"If you have to deliver a baby prematurely and if the baby develops hyaline membrane disease, the cost is fantastic," says Dr. Johnston.

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