UC SANTA BARBARA

THE Current

August 22, 1999
Gail Gallessich

NEW STUDIES OF A LIQUID OF LIFE -- LUNG SURFACTANT

(New Orleans, LA) Breath is essential to life.

Chemical engineers at the University of California, Santa Barbara are working to characterize and refine a special substance that is especially important to babies born prematurely: it allows them to breathe.

Worth more than all the gold in the world to these premature babies and their families, it's a miraculous lifesaver.

Without it many thousands more babies would die each year -- before ever leaving the neonatal intensive care unit. Some adults with lung disease are helped by it as well.

Called lung surfactant, this very special substance -- a mixture of lipids and proteins -- coats the inside of all mammalian lungs and allows them to draw breath, by reducing the work of breathing.

In the U.S., 40,000 premature babies per year are born without enough lung surfactant, and thousands of deaths result. The typical preemie has only 1/20 of the lung surfactant needed to breathe. Fortunately, additional lung surfactant can be administered.

For the past decade, doctors have been able to insert one of two types of lung surfactant directly into the babies' lungs. Both were approved by the Food and Drug Administration in 1989, but each has its drawbacks.

"Our research program is directed at determining basic physical measures of an ideal replacement surfactant, and relating these measures to the components found in natural lung surfactants," said Joseph A. Zasadzinski, professor of chemical engineering and materials, who has been working on lung surfactant for many years with his research group. (See website http://www.chemengr.ucsb.edu/people/faculty_d.php?id=10)

Graduate student Junqi Ding will present the group's latest research findings, funded by the National Institutes of Health, at the national meeting of the American Chemical Society in New Orleans, on Sunday, August 22.

"An ideal replacement formulation would be a mixture of synthetic lipids, in a ratio based on a good understanding of their individual functions in lung surfactant, combined with simple peptide sequences which capture the full activity of the native lung surfactant mixture," said Zasadzinski.

"Such a mixture could be easily and cheaply produced without any batch to batch variance," he said. "The composition could be tailored to optimize the properties of the mixture for the treatment of specific cases."

Surfactant replacement therapy has been shown to reduce mortality rates by 30 to 50 percent for infants with neonatal respiratory distress syndrome. And, 80 percent of the decline in the infant mortality rate in the United States between 1989 and 1990

(the year in which surfactant therapy was introduced) could be attributed to surfactant therapy, according to the researchers.

While lung surfactant replacement therapy has been of great help, it needs improvement in order to treat infants more effectively, in a more refined way, and to begin to address adult respiratory distress syndrome, they explained.

Adult respiratory distress syndrome is a broad class of lung disease that can be related to: trauma, smoking, long term chronic obstructed lung disease, pneumonia, the hanta virus, near drowning, and other unknown causes.

When neonatal respiratory distress occurs, insufficient surfactant results in a progressive failure of the lungs, manifested clinically by

---

About UC Santa Barbara

The University of California, Santa Barbara is a leading research institution that also provides a comprehensive liberal arts learning experience. Our academic community of faculty, students, and staff is characterized by a culture of interdisciplinary collaboration that is responsive to the needs of our multicultural and global society. All of this takes place within a living and learning environment like no other, as we draw inspiration from the beauty and resources of our extraordinary location at the edge of the Pacific Ocean.