FYI . . .

New research into surfactants

Surfactant replacement therapy has been shown to reduce mortality rates by 30-50% for infants with neonatal respiratory distress syndrome. Fully 80% of the decline in the infant mortality rate in the US between 1989 and 1990 (the year surfactant therapy was introduced) was attributed to surfactant therapy. But despite these glowing reports, researchers believe surfactants can be improved upon. Chemical engineers at the University of California, Santa Barbara, are working to do just that.

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," says Joseph A. Zasadzinski, professor of chemical engineering and materials. "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."

Such a mixture, he believes, could be easily and cheaply produced without any batch-to-batch variance. The composition could also be tailored to optimize the properties of the mixture for the treatment of specific cases. (University of California, Santa Barbara)

SIDS gene identified

Researchers from the University of Texas Southwestern Medical Center at Dallas have discovered an enzyme deficiency that is responsible for some infant deaths attributed to Sudden Infant Death Syndrome (SIDS). The finding could lead to a new postnatal test to identify those at risk.

The deficiency occurs during the breakdown of fatty acids derived from fat stores in the body that are used as an energy source when the body's normal energy supply of glucose is exhausted. In the event of fasting, infants tend to exhaust their limited glycogen supply quickly and begin using the stored fat. The clinical consequences of the deficiency occur when fatty acids from the stored fats enter the liver and fail to generate energy or produce ketones, a vital energy source for the brain. Fat that gets into the liver in these infants can't be metabolized and released. The infants' brains starve from the deficit of ketones, and they ultimately become comatose. (Pediatric and Developmental Pathology, 7-8/99)

Children with severe asthma do okay

Dutch researchers have found that children with severe asthma perform only slightly less well than other children on some measures of functioning, despite the fact that they are at greater risk for increased school absences, restraints on exercise, and negative emotions.

The study gauged the impact of the disease on general functioning via a series of tests on 25 children, ages 10 to 13 years, with severe asthma, and 25 age-matched healthy controls. Subjects were tested in the areas of memory, concentration, school performance, physical condition, and subjective symptoms. (Journal of Asthma, 8/99)

Pollution exacerbates childhood asthma

Children with asthma are significantly more affected by severe air pollution than other children, according to the latest findings of a groundbreaking 10-year smog study.

The study took place in 12 middle-class suburban communities in Southern California and involved 150 fourth graders, 75 seventh graders, and 75 tenth graders from each. Parents were asked to fill out a questionnaire about their child's chest symptoms in the past 12 months. They were also asked questions about their home environment, including the presence of smokers in the home, cockroaches, pets, gas stoves, bedroom carpets, and mildew. Measurements of a variety of pollutants were collected from outdoor air monitoring instruments in each of the communities.

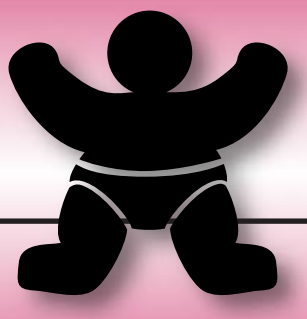
Results showed that children with asthma who lived communities with high levels of pollutants were more likely to have had bronchitis and phlegm, reflecting exacerbation of asthma. These results were not explained by the presence of common indoor triggers of asthma. (Environmental Health Perspectives, 9/99) ■

AARC Cultural Diversity Forum

5-7 p.m.
December 13, 1999
Las Vegas Hilton

Come Celebrate Our Differences and Our Similarities...and Dress the Part! Wear something that identifies your ethnic, religious, or other cultural group — come prepared to show off!

Contact AARC Cultural Diversity Committee Chair Janyth Bolden at jbolden@chw.edu for more information.



Perinatal-Pediatrics Bulletin
Nov./Dec. '99

American Association for Respiratory Care

Notes from the Chair

by Peter Betit, RRT

While I was compiling items for this issue of the *Bulletin*, I realized that I was coming upon the end of my first year as section chair. So far I have found this experience to be a very positive one, mostly because of the colleagues that I have met and been fortunate to work with. The most challenging goal of the chair is to ensure the participation of section members in the various section activities. While I think I have made some headway in this area, membership participation simply has to improve. My main objective for the coming year will be to contact members in an attempt to get a better understanding of how the section can assist them and how they can assist the section.

A good place to start will be at the AARC International Congress in Las Vegas. The Perinatal/Pediatric Specialty Section meeting is tentatively scheduled for Wednesday, December 15, at 12:45 p.m. in Rooms N109-114. Please verify the time and place in the final program. All are welcome!

I have taken a sneak peek at the preliminary program for Las Vegas, and I do not think you will be disappointed. Quite a large number of perinatal/pediatric abstracts will be presented at the Open Forum. There are also a number of lectures devoted to perinatal/pediatric topics, including the latest and greatest in asthma management and neonatal and pediatric critical care.

We have been working on an update of our Resource Panel Directory over the past few months and plan to have a completed version ready to mail with our January-February 2000 issue. The individuals on this Panel have agreed to make themselves available to their peers to answer questions or discuss issues of concern via the telephone or e-mail. I am also encouraging each and every one of them to contribute a *Bulletin* article related to their area(s) of expertise. If you have signed up for the Panel, don't forget to forward your *Bulletin* articles to me by fax or e-mail. (My contact information appears on page 2.) A good example of a *Bulletin* article submitted by a Panel member — David Ellwanger — appears in this issue. ■

Nasal CPAP for Neonates: New Choices

by David L. Ellwanger, RRT, neonatal coordinator for respiratory care services, Piedmont Hospital, Atlanta, GA

CPAP has been a widely used mode of therapy for the treatment of respiratory distress syndrome ever since Gregory first described it 30 years ago. Over the years, this mode has gone through many phases, from head hood, negative pressure generators, and ET tubes, to all types of nasal prongs. All utilized flow through a restriction to generate pressure, most typically through a small bore circuit to deliver pressure through nasal prongs or a nasopharyngeal tube. Although these systems were effective in delivering pressure, most had some inherent airway resistance. Flow through the tubing was delivered at a bias to the airway. This posed a problem with smaller neonates who were not able to overcome the resistance from the flow, or with airway devices that were narrow or much longer that the infant's natural airway.

In the 1980s, Moa and Nillson developed a new type of nasal CPAP that was designed to overcome the

"New Choices" continued on page 2

"New Choices" continued from page 1

airway resistance of some of the bias flow CPAP devices. Their device utilized the Coanda effect used in fluidic circuits to deliver flow directly to the airways, parallel to the infant's breathing pattern. Upon exhalation, the design of the CPAP "generator" caused the flow to reverse direction, reducing resistance to exhalation. This effect was called the "Fluidic Flip."

The device utilized a "driver" that was essentially a box with an Air-Oxygen blender, a flowmeter, an oxygen analyzer, and a pressure manometer. Because of high pressures generated proximal to the generator, the infant flow could not be used with conventional ventilators, as could most of the conventional CPAP systems. However, the design enabled much smaller infants, particularly the premature infant <1500 grams, to tolerate nasal CPAP much better than conventional CPAP. Subsequent clinical studies showed that a higher percentage of premature infants on nasal CPAP were able to avoid intubation than those who received CPAP through conventional means.

The device was manufactured by EME in England and called Infant Flow. It enjoyed wide popularity throughout Europe after its introduction in the mid '80s. In the mid '90s, Hamilton Medical became the sole US distributor of the Infant Flow. Up to this point, Hamilton was known for its adult ventilator technology, and the company did not have prior experience with pediatrics. The EME Infant Flow device was marketed under its brand, Aladdin, although EME still manufactured the device.

Hamilton's distribution contract was for three years, but at the end of that time EME did not renew the contract. EME instead chose Sensormedics, a company known for its high frequency oscillator ventilator and pulmonary function systems, to distribute the device. Sensormedics now distributes the EME device under its original name of Infant Flow.

During the time of transition, EME changed its external design from a rounded white plastic appearance to a gray, more angular one, partially to reduce the weight of the generator but also to distinguish the product that Sensormedics was going to distribute from the one that Hamilton distributed. But internally and functionally, the two devices are identical.

Upon learning that it was going to lose distributorship of the Infant Flow, Hamilton embarked on the development of its own CPAP device. In 1998, Hamilton introduced the Aladdin^{II}, its version of the Infant Flow. Hamilton's device is curved up and back and similar in appearance to the original Aladdin/Infant Flow. It utilizes two jets that are directed to the infant's airway, and the company claims that its design has the same bi-directional flow capability as the Infant Flow. The drivers of both devices are interchangeable.

This created a lot of confusion in the medical community. Hamilton representatives were bringing around a new product, the Aladdin^{II}, which looked similar to the old Aladdin, and Sensormedics reps were bringing around a device that looked new. They called it the Infant Flow but claimed that it was the same as the old Aladdin. In an effort to highlight the differences, *Neonatal Intensive Care* published an article in its April-May 1999 issue on a bench study indicating that the Infant Flow has less airway resistance that the new Hamilton Aladdin^{II}. Hamilton published a letter in the following issue that disputed those results and presented a bench study of its own basically showing no difference in the two devices.

Our hospital put the matter in the hands of our nursery staff. They tried both devices; in some cases they worked the same, and in others they did not. The staff chose the device they felt was the best for their patients and their style of care. There will likely be some clinical studies comparing the two devices, and maybe more objective observations can be made that will distinguish one from the other. In the meantime, if your institution is considering one or both of these devices, try to have both of them on hand at the same time so that you can compare them one-on-one. Until more studies come forth, that may be the only way to make a logical decision on which one to purchase.

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Aerosolized Antibiotics: *Should We Take Precautions?*

by Peter Betit, RRT

Aerosolized antibiotics have been prescribed for the management of pulmonary infections associated with cystic fibrosis and immuno-compromised patients. Aerosolized Tobramycin, Amikacin, and Colistin have been prescribed to patients with cystic fibrosis as both a preventive measure and as a treatment against gram negative pulmonary infections caused by species of pseudomonas, klebsiella, serratia, proteus, and escherichia coli. These antibiotics work by inhibiting microbial protein synthesis.

Aerosolized Amphotericin B has been administered prophylacticly and as a treatment for fungal infections caused by species of aspergillus, cryptococcus neoforms, coccidoides immitus, and histoplasma capsulatum. Immuno-compromised patients, such as those who have received solid organ transplants, have benefited. The mechanism of action is disruption of the organism cell membrane.

Aerosolized Pentamadine is used to treat infections caused by pathogenic protozoa, such as pneumocystis carini. It has typically been used prophylacticly and as a treatment, particularly in patients infected with the human immunodeficiency virus (HIV). The mechanism of action is unclear.

During earlier years of the AIDS epidemic, aerosolized Pentamadine was routinely used. Studies suggested that health care providers may experience health effects due to the secondary exposure to Pentamadine, including altered breathing, cough, chest tightness, eye and throat irritation, headaches, and fatigue. The practice of using filtered nebulizers to help minimize secondary exposure to health care providers became a standard practice, despite the fact that no occupational exposure limit had been established by the Occupational Health and Safety Administration (OSHA).

Little information exists regarding the potential health effects due to secondary exposure of aerosolized Tobramycin, Colistin, Amikacin, Amphotericin, or other antibiotics, and OSHA has not established any occupational exposure limits for these medications. Potential adverse effects of Tobramycin and Amikacin, when administered intravenously or intramuscularly, include ototoxicity and nephrotoxicity. The adverse effects of Colistin are generally transient and include numbness, tingling of the extremities, itching, dizziness, and slurred speech. Amphotericin in therapeutic doses has the potential to cause chills, fever, headache, nausea, and bronchospasm.

There appear to be no specific adverse effects from these drugs directly related to aerosolized administration. Additionally, there are no well-controlled studies examining the effects of these medications when administered during pregnancy. Tobramycin crosses the placental barrier but no adverse effects on the mother or fetus have been reported. Small amounts of Colistin and Amikacin have been found to be excreted in breast milk, but no adverse effects have been reported. None of these drugs have been classified as teratogens.

With aerosolized antibiotics becoming more common, what precautions if any, should be taken to help minimize secondary exposure to health care providers? Should all aerosolized antibiotics be administered with a filtered nebulizer in the same manner as Pentamadine? Should stringent precautions be taken a la Ribavirin? Should the same precautions be followed in the home care setting?

A recent discussion on the AARC perinatal-pediatric listserve revealed that most centers have not implemented any special precautions for the administration of antibiotics. Tobramycin seems to be the most commonly used aerosolized antibiotic.

Precautions or safeguards are actions or steps taken to protect against possible failure or danger. With the lack of evidence on the secondary exposure of these drugs, it seems prudent for institutions to establish multidisciplinary committees to address the potential risks to health care providers, with a goal of establishing guidelines. The inhaled route for medication delivery is becoming more appealing. How will we handle aerosolized Lasix, Morphine, Prostocyclin, etc.? ■

Grant Opportunity: *Allies Against Asthma*

Allies Against Asthma is designed to improve efforts to control pediatric asthma. This national program will provide support to community-based coalitions to develop and implement comprehensive asthma management programs that include improved access to and quality of medical services, education, family and community support, and environmental and policy initiatives. The primary aims of the program are to reduce hospital admissions, emergency room visits, and missed school days; to enhance the quality of life of children with asthma; and to develop a sustainable strategy for asthma management in the community.

Under this program, $12.5 million was authorized in 1999 to be awarded over a four-year period for up to eight community-based coalitions. Grants will be awarded in two stages. One-year organization and planning grants of up to $150,000 will be awarded to up to eight communities. Sites that successfully complete the planning process will be eligible to apply for the implementation grants of up to $450,000 a year for up to three years to support the grants, targeted activities, and evaluation.

More information on this program can be obtained by visiting the following web site: http:www.rwjf.org/grant/jgrant.htm (scroll down the page, and click on Abstracts of CFPs). Deadline for receipt of application is January 14, 2000. ■