CHEMISTRY

Linda Garmon reports from Las Vegas, Nev., at the meeting of the American Chemical Society

Infant RDS: Insulin more or less?

A newborn whose mother is diabetic is at a higher than normal risk of developing a condition called respiratory distress syndrome — a condition that, along with its complications, causes 8,000 to 10,000 neonatal deaths per year in the United States. The syndrome is characterized by a collapsing of the lung airways because of insufficient amounts of phospholipids (a group of fatty compounds sometimes used for structural purposes) lining the alveoli. It has been suggested that the synthesis of those phospholipids is inhibited by elevated fetal concentrations of insulin — presumably produced by the fetal pancreas in response to the high fetal blood sugar concentrations caused by the maternal diabetes. Now, Rodney Ulane and colleagues of the National Institute of Child Health and Human Development in Bethesda, Md., question that theory.

Ulane and colleagues made pregnant rats diabetic with streptozotocin — a drug that destroys pancreatic cells responsible for synthesizing insulin. Because streptozotocin is a large molecule and cannot cross the placenta, it "can be injected into pregnant rats, destroying the maternal pancreatic cells, but not those of the fetal pancreas," Ulane says.

Ulane and colleagues then compared the concentration of insulin in rat fetuses from control and diabetic pregnancies. "It was found that the fetal serum insulin concentrations of the fetuses from diabetic pregnancies were identical to the fetal serum levels in control pregnancies," Ulane says. "These findings suggest that contrary to the mechanism proposed, diabetic pregnancies in rats do not produce elevated levels of fetal insulin."

Moreover, the researchers discovered that the rodent fetal lungs of diabetic pregnancies had fewer insulin receptors than did the rodent fetal lungs of control pregnancies. "As insulin is generally regarded as a growth-stimulating hormone," Ulane says, "the possibility arises that the retarded fetal lung maturation seen in infants of diabetic mothers may in fact be due to a *decreased* insulin effect."

Citrus seeds: Bitter bug battler

Grapefruit seeds have been uncovered in the continuing search for environmentally safe pesticides. The seeds contain limonoids — a group of related, bitter-tasting chemicals found in citrus juices, seeds and rinds. In "leaf choice" laboratory tests conducted by Isao Kubo of the University of California at Berkeley, these citrus limonoids were found to deter agricultural pests — the fall armyworm, *Spodoptera frugiperda,* and the cotton bollworm, *Heliothis zea* — from eating treated leaves. Moreover, starving larvae that had no choice but to eat cotton leaves treated with the chemicals exhibited lower growth rates.

A limonoid from another source — the neem tree of the Meliacea plant family — previously was shown to be toxic to many pests. But that chemical is inconvenient to obtain and too complex to synthesize on a large scale. Large amounts of the citrus limonoids, on the other hand, are potentially available, Kubo says. More than 300 metric tons of limonoids can be extracted annually from grapefruit seeds alone, he says.

They can see clearly now

Transparent coating material used to keep spectacles, windows and windshields resistant to fogging should be scratch-resistant as well. That no available formulation appears to be able to effectively handle that double duty is little surprise — chemically, the two properties are virtually incompatible. But Masaaki Funaki and colleagues of Nippon Sheet Glass Co., Ltd. in Japan believe they may have found a winning combination: a derivative of malamine (a substance used in leather tanning) plus polyhydric (having at least three hydroxyl, or OH, groups) alcohol that contains chains of propylene oxide (CH_2CH_2O). Together the chemicals form crosslinking structures that resist scratching. In addition, the formulation's hydrophilic (water-binding or -absorbing) OH groups contribute to an antifogging ability. Still, says Funaki, further research is needed to attain an optimum balance between antifogging and scratch-resistant properties.

This chemical ought to be in pictures

The trouble with some "instantly" processed color photographs is that their images fade when exposed to sunlight and fluorescent lights. Maroon can fade to beige, olive green can lighten to ivory and purple can turn to white. Now, however, University of Dayton researchers have found that a complex chemical called dinonylphenyl isophthalate inhibits such color transformations in Eastman Kodak Co.-type instant color prints.

In Kodak-type instant photographic material, cyan, magenta and yellow dyes are attached to immobile carriers that are incorporated into layers of silver-containing compounds. The layers are sensitized to different wavelengths of light. After exposure, an activator pouch ruptures, spreading a developing agent and alkali (KOH) among these layers. That agent and alkali cause the dye carriers to release their goods: Yellow and magenta dyes are released if the film is exposed to red, cyan and magenta dyes if to blue and cyan and yellow dyes if to green.

While much effort has been directed toward finding chemicals to protect these dyes from UV light attack, the effectiveness of various proposed UV stabilizers varies considerably from dye to dye, says Arthur M. Usmani of the University of Dayton in Ohio. Usmani and research colleague I.O. Salyer therefore set out to develop an improved formulation.

"We discovered that dinonylphenyl isophthalate incorporated into an 'overprint' varnish coating material is very effective in stabilizing [Kodak-type] instant color prints toward UV light," Usmani reported. Dinonyl isophthalate (see structure below) not only is compatable with the other film chemicals, he said, but also is somewhat of a plasticizer, or a material that increases flexibility. In addition, it is believed that upon exposure to UV light, the isophthalate rearranges to substituted versions of the effective UV-absorbing compound called benzophenone — which consists of a carbonyl group (C=O) joined to two benzene rings.

The Ohio researchers tested two different coatings that contained 2 percent of the presumed precursor of the UV light-absorbing benzophenones. The coatings were applied to prints that in turn were subjected to a UV lamp that provided the equivalent of one year of exposure to natural sunlight in 24 hours.

The researchers found that while unprotected "control" prints faded almost completely in 70 hours or less, Kodak-type coated prints showed only minor fading after 170 hours under the UV lamp. "Our work showed that dinonylphenyl isophthalate provided an unexpectedly high degree of improvement in stability of Kodak instant photographs against undesirable UV light effects such as color fading," Usmani reported. "Similar results can be expected if the stabilizer is incorporated in an external or internal coating on photographic film prior to its exposure in a camera." Moreover, he says, incorporated into fibers or paint pigments, the coating also can be used to protect wall coverings, fabric and artwork from fading.