A cotton tale: Disease and decrees

With delegates converging in the heart of Dixie, it was fitting that one of the major symposia of the recent meeting in Atlanta of the American Chemical Society concerned the perils of cotton dust. The symposium was especially appropriate in light of the recent government decision to reexamine rules designed to protect workers against those perils.

The cotton dust rules were issued by the U. S. Occupational Safety and Health Administration to decrease the incidence of byssinosis, or brown lung disease — a pulmonary illness of cotton workers, characterized by wheezing and tightness of the chest. The disease can significantly shorten the lifespan of its victim. While the cause of brown lung disease is unknown, a major theory states that pulmonary reaction is triggered by toxins produced by microorganisms present in the cotton dust, Preston E. Sasser of Cotton Incorp. in Raleigh, N.C., reported at the ACS meeting. Other symposium participants, Janet J. Fischer and colleagues of the University of North Carolina at Chapel Hill, have been investigating the various microorganisms associated with the cotton dust and plant parts in an attempt to isolate the hypothesized toxin. Says Fischer, identifying such a toxin "could lead to handling cotton in such a way as to reduce its endotoxin content and reduce the incidence of pulmonary symptoms in cotton mill workers."

Research indicating that the incidence of such symptoms continues long after exposure to the dust ends was reported by Gerald J. Beck of Yale University in New Haven, Conn. The Yale study involved determining the lung function (measured by forced expiratory volume in one second) and the incidence of chronic bronchitis in 646 active and retired cotton textile workers in Columbia, S.C., and in controls who had never been exposed to cotton dust. Beck says the study is the first to consider long-term effects of cotton-dust exposure.

Stringent rules governing cotton dust exposure issued in 1978 by OSHA include requirements for respirator use among workers and the eventual installation of vacuum-type machines to control dust levels. The textile industry not only had postponed those standards until March 1980 via various legal challenges, but also continues its challenge with a suit before the U. S. Supreme Court. The latest development in the cotton controversy, though, is OSHA's request that the Supreme Court hold off on the case while the agency subjects the standards to a cost-benefit analysis. OSHA's move follows an executive order requiring such analyses of all standards that would cost industry more than $100 million. □

The 'head strong' insects will die

Univ. of Calif.

This electron micrograph shows a starving, three-headed fall armyworm that has been fed a molting-process inhibitor in a pest-control experiment. The heads — each about the size of a pinhead — bury the insect's functional mouthparts.

The fall armyworm caterpillar can keep its head while all about it other caterpillars are molting theirs. When fed compounds from *Ajuga remota* — an East African medicinal plant under scrutiny in a U. S. laboratory for its pesticide potential — this common cottonfield pest fails to shed its helmet-like moltings. The result is fatal.

Isao Kubo of the University of California at Berkeley reported his work with *Ajuga* at the recent meeting in Atlanta of the American Chemical Society. He had noticed the plant while studying locust migration: The pests steered clear of it. Grinding up the bitter-tasting leaves and roots, Kubo first identified African insect antifeedant activity in the plant. Kubo now reports he also has isolated two compounds — phytoecdysones — that inhibit ecdysis, or outer-layer shedding, in the fall armyworm, silkworm and pink bollworm. During this molting cycle failure, the pests retain up to three heads that bury their functional mouthparts, causing them to starve.

A pest control method that specifically attacks an insect's molting rather than its nervous system could be the basis for a safe pesticide, Kubo says. □

Iron studies: Foods that fool

A grocery shopper concerned about the family's iron intake scoops from the shelf cans of spinach, iron-enriched flour and iron-fortified frozen waffles. No iron-poor blood in this family.

Not necessarily, says Kenneth Lee of the University of Wisconsin at Madison. At the recent American Chemical Society meeting in Atlanta, Lee reported that not all of the iron in food is available for the human body to use.

The body needs iron to carry oxygen in molecules of hemoglobin (SN: 12/13/80, p. 378). An iron deficiency results in fatigue, because the victim's cells and tissues do not get enough oxygen. Studies of the availability of iron from food attempt to explain the persistence of iron deficiency and its associated anemia throughout the world. While various iron intervention programs — ranging from educational projects to a nationwide effort to fortify bread — have drastically reduced iron deficiency occurrence in the United States, it continues to persist in 20 percent of the population, says Jack L. Smith of the University of Nebraska at Omaha.

Lee says the persistence of iron deficiency probably is due not to the lack of iron in food, but rather to the lack of the right forms of it. The iron in food can be in the elemental (Fe^0), ferrous (Fe^{+2}) or ferric (Fe^{+3}) form. Ferrous — often added to foods as ferrous sulfate — is the most soluble form of iron and therefore the most available for absorption by the intestinal mucosa. While elemental iron — sometimes called "reduced iron" — also is considered soluble, Lee has found that heat can render it insoluble, or unavailable. As a result, the iron in elemental iron-enriched frozen bakery goods may not be available. Elemental iron included in freeze-dried breakfast drinks, on the other hand, is highly available: The vitamin C converts it to the highly soluble ferrous form.

Whether an iron form is complexed — chelated, or grabbed, by another molecule — and how it is complexed also determines its availability, Lee says. For example, when three molecules of oxalic acid — a naturally occurring compound in vegetables such as spinach — chelate with iron, the complex is so strong that the iron becomes unavailable.

Another substance that may inhibit iron absorption is soy protein, according to controversial research results presented by James D. Cook of Kansas University at Kansas City. Cook's research could have implications for the use of soy as a meat extender in school lunch programs, Lee says. Food ingredients and processing, he says, should "be optimized to yield the most desirable forms of iron in the final product." □