

CHEMISTRY

The best seller list

Each year, CHEMICAL AND ENGINEERING NEWS reporters pore over government data, trade association figures and industry estimates to prepare their lists of the top 50 chemical products — ranked by the previous year's production volume — and the top 50 U.S. producers of chemicals — ranked by the total sales of their chemicals, not the total sales of all types of their products. According to this year's lists — published in the May 4 C&EN — sulfuric acid, ammonia, lime, oxygen and nitrogen lead the chemical pack, and Du Pont, Dow Chemical, Exxon, Union Carbide and Monsanto are the five front-runners in the production of chemicals.

Of TDA, DNT and sperm counts

A worker at a chemical plant in Brandenburg, Ky., was worried that his exposure to chemicals was related to his wife's several miscarriages. Seeking clinical evaluation, this worker found that he had an elevated number of abnormally shaped sperm — specifically, tapering forms. Upon this discovery, other male workers requested evaluation, and the National Institute for Occupational Safety and Health (NIOSH) stepped in. NIOSH's preliminary findings, published in the May 8 MORBIDITY AND MORTALITY WEEKLY REPORT, suggest that exposure to toluenediamine (TDA) and dinitrotoluene (DNT) — two chemicals needed to synthesize a flexible polyurethane foam ingredient — may result in lowered sperm counts. "The findings of this study are suggestive of male reproductive toxicity from exposure to TDA and/or DNT," the MMWR states. "The population size is small, and a large number of additional individuals must be investigated to corroborate the findings of this plant."

PEC power: Gaining on silicon

Elizabeth Gross and colleagues turn to their gardens for electricity: The researchers make photoelectrochemical (PEC) cells — devices that use light energy to drive chemical reactions or to generate electricity — from spinach chloroplasts. At the American Chemical Society regional meeting last week in Dayton, Ohio, Gross reported achieving improved energy conversion efficiency with her spinach chloroplast cells.

In plants, chloroplasts convert the energy of sunlight into energy-rich chemicals. In the PEC cell, the chloroplasts convert light energy into electricity: Light causes the chloroplasts to give up electrons that in turn travel in a circuit composed of a solution, electrodes and a wire.

Gross's latest spinach PEC cell has a power-conversion efficiency of 1.7 percent. Should it ever reach a 5 percent efficiency, this energy-storing PEC battery could compete with the now popular silicon photovoltaic (or solar) cells, which cannot store energy. But certain obstacles stand in the way of efficient spinach batteries, says Gross of Ohio State University. For example, the cells now use electrodes made from platinum — one of the world's most valuable metals.

A room freshener high

If Ronald W. Wood has his way, room odorizers will bear warning labels and be sold in child-resistant packages. Wood, of the University of Rochester Medical Center, suspects that odorizers containing alkyl nitrites — mainly hydrogen and carbon compounds that have a nitrite group (NO_2) in place of one hydrogen — are being inhaled for possible euphoric effects. In a petition for inquiry sent to the U.S. Consumer Product Safety Commission, Wood cites two adult male deaths following ingestion of butyl nitrite ($\text{C}_4\text{H}_9\text{NO}_2$).

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BIOLOGY

Plant responses to wounding

What happens when plants are cut, punctured, abraded or otherwise wounded? Some interesting new answers are reported in the April PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES by Eric Davies and Anne Schuster of the University of Nebraska at Lincoln. There is a decline in ribosomes (cell machinery necessary to make new proteins) in nongrowing tissues, but at the same time wounding prompts the growing tissues to issue a signal to the nongrowing ones. This signal makes ribosomes in the nongrowing tissues hook up with messenger RNA molecules and produce an increased number of proteins. What's more, while the signal is more intense near the site of injury than in tissues farther away, it is generated rapidly and in both directions away from the wound.

But what is the signal? Davies and Schuster speculate that it might be a hormone, a reduction in hydrostatic pressure or an electrical change in the membranes of cells in the plant tissues and thus an alteration in ions through these membranes. Results from other labs suggest that novel proteins might be synthesized by ribosomes and mRNA in nongrowing plant tissues in response to the wounding.

What advantages, if any, do plants' responses to wounding confer upon them? "It is impossible to answer this question yet," Davies and Schuster conclude, "although it would appear highly unlikely that an organism would expend the energy needed to double its protein-synthesizing capacity within one hour of wounding... unless the response conferred some advantage."

The queen in a foreign beehive

If a honeybee queen is placed in a colony of bees where the workers are not her own, the workers will attack her. Michael D. Breed, a population biologist with the University of Colorado at Boulder, wanted to find out why. As he reports in the April PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, it's not because the queen and foreign workers do not share the same environmental odors. Rather, it's because they do not share the same genes and also because the workers have not learned to pay homage to this particular queen.

Breed found that environmental odor differences did not explain why the workers attacked a foreign queen when he kept environmental sources of odor, such as food and water, constant among them. The workers still attacked the queen. Yet he discovered that genetic differences partially explained why the workers attacked a foreign queen, because the workers were more likely to accept a foreign queen if she was more closely related to them than if she was not. And he found that learning cues also partially explained why workers rejected a queen not their own when he exposed them to carbon dioxide narcosis, which is well known to disrupt honeybees' memory of what they have learned. After the workers had their memories knocked out, 90 percent of them accepted a foreign queen.

Drugs from sea squirts

For the past decade or so, certain biologists have been hard at work screening oceanic plants and animals for chemical compounds that might make valuable new pharmacological agents (SN: 9/23/72, p. 204). Some of the more promising compounds they have discovered of late are didemnins, from sea squirts. Didemnins, Li Hsieng Li of the University of Illinois in Urbana and his colleagues reported at the recent annual meeting of the American Association for Cancer Research in Washington, attack a wide variety of DNA and RNA viruses in the test-tube, from cold and flu viruses to herpesviruses. They have also doubled the life-expectancy of animals with leukemia.

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