CHEMISTRY

Linda Garmon reports from New York, N.Y., at the American Chemical Society meeting

'Breathtaking' study of ovulation

James G. Kostelc is taking women's breath away. He is doing so in an attempt to track a woman's reproductive cycle by monitoring chemicals in her mouth.

Kostelc of the Monell Chemical Senses Center in Philadelphia, Pa., and colleagues have collected daily samples of mouth air from two women through two menstrual cycles each. The researchers found that the concentrations of certain volatile sulfur compounds (VSC) in these breath samples vary cyclically — sometimes increasing as much as 15-fold. Such cyclic variations do not seem to depend on oral health; rather the VSC increases may be due to an increase in the oral bacteria that produce these compounds. The bacterial increase in turn may be due to the availability of more food — perhaps because, as occurs in the vagina when concentrations of the estrogen hormones rise, more cells flake off of the soft tissue. In any event, Kostelc and co-workers are using VSC concentrations to represent all of these cyclic variations in an attempt to pinpoint the time of ovulation.

Now the researchers correlate VSC concentrations with changes in body temperature — a technique to predict ovulation that is "crude at best," one of the researchers admits. So, in addition to studying a larger number of women, Kostelc and colleagues also must seek correlations between concentrations of VSC and the more tell-tale reproductive hormones.

Obtaining data on reproductive hormones is an inconvenient and expensive procedure. Should Kostelc and co-workers successfully match VSC concentrations with this information, women eventually may be able to predict their ovulation period by running a simple color test, for example, for certain organic chemicals in their mouth. This should be of particular help to women who are having difficulty conceiving. In addition, studies of oral organic chemicals eventually may aid in the diagnosis of certain diseases.

Pesticide précis

• Renowned termite man Glenn D. Prestwich (SN: 9/6/80, p. 155) has turned his attentions to tobacco hornworms (larval *Manduca sexta*). Prestwich and colleagues of the State University of New York at Stony Brook have synthesized a new class of sterols (complex, fused carbon-ring systems related to the terpenes of termites) that interfere with both the hornworm's degradation of 29-carbon plant sterols to a 27-carbon cholesterol and its subsequent conversion of that cholesterol to the molting hormones, ecdysteroids. Feeding these new sterols to hornworms "results in stunted growth, difficulty in larval molting and pupation and death in the puparium," Prestwich reports. The chemicals offer "significant potential as selective insecticides" — and selectivity is the name of the pesticide game these days.

• Another pest-control possibility, whose forte also is selectivity, is a newly synthesized class of compounds that trap milkweed bug larvae in their own outer cuticle. "The insects never molt; they never become adult," explains Albert B. Demilo of the U.S. Department of Agriculture. Instead, larvae exposed to the new compounds die, imprisoned in their old cuticle.

The new compounds are a class of substituted thiosemicarbazones. "The thiosemicarbazones are a common class of organic synthetics," says Demilo. "It's the substitutions that make them exciting." Demilo synthesized about 70 variously substituted thiosemicarbazones. Research colleagues then tested their effects on the development of the milkweed bug, *Oncopeltus fasciatus*. About a dozen versions did the trick.

Demilo initially decided to investigate thiosemicarbazones because similar chemicals have antifertility effects in screwworms and boll weevils.

Better drinking through chemistry

• A day without orange juice is also a day without water-extracted soluble orange solids (WESOS). Apparently, federal standards for orange juice permit the addition of some WESOS, an orange-pulp extract that is cheaper but contains slightly less vitamin C than does pure juice. WESOS also can be legitimately used as a clouding agent in fruit drinks. However, reports Russell L. Rouseff of the Florida Department of Citrus at Lake Alfred, there is evidence that some producers have been adding more than the acceptable amount of WESOS, without so noting on their label declarations.

Rouseff and colleague Donald R. Petrus are working on a new chemical analysis that would nab these clandestine orange juice manufacturers. The new method relies on the concentrations of two different flavanone glycosides — plant compounds that can be broken down to sugars. The concentrations of the glycosides in pure orange juice and WESOS differ enough to provide a means of distinguishing between the two.

Until the glycoside method is further developed, though, the chemists will continue to use an older method that involves distinguishing between overall compositions. While this method may one day be abandoned for the more precise glycoside technique, it nonetheless recently was used successfully to confirm reports that orange juice adulterated with WESOS was reaching the market. "In recent months, the FDA has been actively investigating instances of the suspected illicit use of water-extracted soluble orange solids in orange juice products," Rouseff says. "In one of the first investigations, disciplinary action is expected against a Texas manufacturer."

• Shake a bottle of cloudy, carbonated soda. If the cloudiness persists, then the soda probably is contaminated with potentially harmful bacteria. If the cloudiness goes away for 2 to 3 days post shake-up, then the beverage is merely the victim of a harmless haze that soda manufacturers long have known has something to do with the sugar that is added to drinks.

Unfortunately, consumers who do not know the difference often return even the harmlessly hazed soda to their local supermarket that in turn returns it to the soda manufacturer who in turn blames the sugar industry. All of the unnecessary passing of the bacterially *uncontaminated* bottles is due to the fact that researchers have not been able to determine precisely what the haze is all about and what can be done to clear it.

Now, however, Margaret A. Clarke of Sugar Processing Research Inc., of New Orleans, La., along with researchers at the U.S. Department of Agriculture's New Orleans office, report that the bottled haze, or acid beverage floc, can be lifted. Through chemical analyses, Clarke and colleagues have determined that two factors are responsible for its formation. First, it involves some residual sugar cane cell-wall polysaccharide that, under the acidic conditions of carbonated beverages, is negatively charged. Second, the floc contains a positively charged residual sugar cane protein. These two oppositively charged sugar cane leftovers attract each other to form a particle-trapping network. Ergo, a floc is formed. Various filtrations at 60°C can remove this polysaccharide-protein floc, Clarke says, without affecting the taste of the beverage.

• Enhancing a particular source of folacin, a B-vitamin, is Tung-Shan Chen's cup of tea. Chen and Linh D. Nguyen of California State University at Northridge report that up to 25 percent of the daily folacin requirement can be met by drinking five cups of green tea. (Black teas contain slightly less and Oolong, herb and instant teas have about one-third less folacin by comparison.) However, to take advantage of this folacin source, the tea should steep for 20 minutes in a covered pot. The less air space left in the brewing container the better, report Chen and Nguyen, because oxygen destroys the vitamin.