

## Formaldehyde Connection

### Modeled Exposure Linked to Lower Respiratory Infections in Infants

Lower respiratory infections (LRIs) are common among infants, with risk increased by factors such as daycare attendance, older siblings, and parental history of asthma. The incidence of infections can also be exacerbated by environmental pollutants such as tobacco smoke, nitrogen dioxide, and ozone. Formaldehyde, a known respiratory tract irritant, is ubiquitous in indoor environments, but little is known about the effects of chronic exposure in infants. A new study reveals that such exposure is associated with more LRIs during infancy [*EHP* 119(11):1653–1658; Roda et al.].

The current study used data for 2,940 infants enrolled in Pollution and Asthma Risk: An Infant Study (PARIS), a cohort of healthy, full-term babies born at five Parisian hospitals from 2003 to 2006. Parental history of allergic conditions was obtained by interview, while medical records provided additional data on the newborns and their mothers. Multiple mailed questionnaires were used to gather information from parents about recent respiratory infection, wheezing, and eczema in their children at ages 1, 3, 6, 9, and 12 months. Details about home characteristics and family living conditions were collected by phone

interview when infants were 1 month old, and mailed questionnaires captured changes at 3, 6, 9, and 12 months. Aldehyde air sampling measurements were conducted at 1, 6, 9, and 12 months in the homes of a subset of randomly selected infants, and data for 174 homes were joined with interview and questionnaire information to construct formaldehyde exposure models for all cohort infants.

The median value of formaldehyde measured in the subset of homes was 19.5  $\mu\text{g}/\text{m}^3$ , with an interquartile range of 14.4–26.8  $\mu\text{g}/\text{m}^3$ . Overall, more than 45% of the infants experienced at least one LRI, and nearly half of those infections included wheezing. After known risk factors were considered, LRI and LRI with wheezing increased by 32% and 41%, respectively, for each interquartile increase in estimated formaldehyde levels.

Although the models used to predict formaldehyde levels for most of the homes demonstrated adequate performance, they were based on only a few hundred actual measurements. Thus, the associations between formaldehyde and LRIs are based upon statistical estimates of exposure rather than on actual measurements. However, the model performed well for established LRI factors, suggesting that the findings for formaldehyde exposure were likewise valid.

**Julia R. Barrett**, MS, ELS, a Madison, WI-based science writer and editor, has written for *EHP* since 1996. She is a member of the National Association of Science Writers and the Board of Editors in the Life Sciences.

## Poultry Relief?

### Organic Farming May Reduce Drug Resistance

Organic poultry is one of the fastest growing segments of the U.S. organic foods market, and many conventional poultry farms have converted to organic methods to capitalize on this demand. Among other requirements, organic growers are not allowed to use any antibiotics on chickens from hatching to slaughter. A new study indicates organic practices may help reduce the prevalence of antibiotic-resistant bacteria [*EHP* 119(11):1622–1628; Sapkota et al.].

A growing awareness of antibiotic resistance is part of the reason for the increased consumer demand for organic meat. Conventional food animal producers rely on antibiotics not only for treating sick animals but also for nontherapeutic purposes, such as disease prevention and growth promotion. This routine use of antibiotics has been linked to the rise of antibiotic-resistant bacteria, which can be passed along to people from contaminated food and through occupational exposure. According to the World Health Organization, the rate at which bacterial strains are developing resistance to antibiotics far outpaces the rate at which scientists are developing new medicines that can kill the strains.

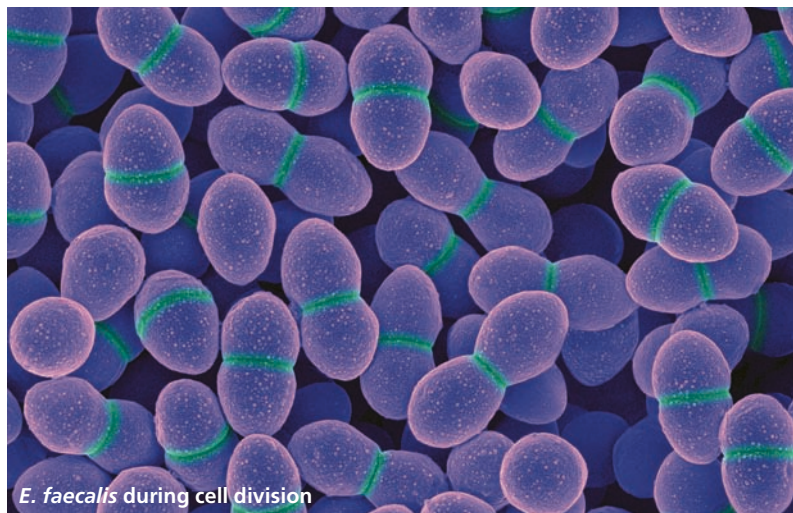
A team of researchers from the University of Maryland School of Public Health isolated *Enterococcus* bacteria from feed, water, and litter collected at five conventional and five organic poultry farms in the mid-Atlantic United States. All the organic farms had recently converted from conventional techniques and were raising their first flock of organic broilers.

Of the *Enterococcus* bacteria collected at the various farms, 46% were *E. faecalis* and 43% were *E. faecium*, with the remainder being three less common species. There were no differences in bacterial prevalence between farm types. After isolating and growing the two primary species on agar, the researchers tested them for susceptibility to 17 antimicrobial agents.

Compared with those collected from conventional farms, *E. faecalis* strains collected from organic poultry houses were less likely to be resistant to 9 antimicrobials, with significant differences for the compounds erythromycin and tylosin. *E. faecium*

strains from organic farms were less likely to be resistant to 11 antimicrobials, with significant differences for 5 compounds: ciprofloxacin, gentamicin, nitrofurantoin, penicillin, and tetracycline. The researchers also documented that the percentages of multidrug-resistant bacteria were significantly lower among bacterial isolates recovered from organic versus conventional farms (10% vs. 42% for *E. faecalis*, and 17% vs. 84% for *E. faecium*).

These promising results suggest that trends in antibiotic resistance may be quickly reversed in some strains by switching to



organic techniques. The researchers speculate that resistant bacteria persist on organic farms because, although organically raised broilers can be given no antibiotics from day 1 of life, the breeder farms where the eggs originate are under no restrictions on antibiotic use and may give mother hens antibiotic-laced feed. Hatcheries that subsequently supply day-old chicks to broiler farms also can inject eggs with antibiotics.

Houston-based writer **Wendee Holtcamp** has written about science and conservation for 15 years, publishing in *Miller-McCune*, *Nature*, *National Wildlife*, and other magazines.