Low on the Hog

The Quality of Life near Swine Farms

North Carolina's swine industry is among the largest in the nation, second only to that of Iowa. By far, most of the hogs produced in North Carolina are raised in large industrial facilities with thousands of animals each. These operations have prompted concerns about noxious odors and potentially hazardous air emissions. Steve Wing, an associate professor of epidemiology in the School of Public Health at the University of North Carolina at Chapel Hill, and Suzanne Wolf, a research associate in epidemiology at the same university, evaluated adverse health effects and reduced quality of life among residents living close to intensive livestock operations in rural North Carolina [*EHP* **108:233–238**].

Performed in February 1999 at the request of the North Carolina Department of Health and Human Services, the study evaluated 155 people from three communities: one in the vicinity of a livestock operation with approximately 6,000 hogs, another in the vicinity of two intensive cattle operations, and a control community situated at least two miles from any animal operation with a liquid waste management system such as a lagoon (cesspool). The inclusion of a cattle-neighboring community allowed for a comparison of health effects related to different kinds of livestock facilities.

Participants in the study were given a questionnaire asking them to estimate the number of times they had experienced respiratory, gastrointestinal, skin, eye, or other miscellaneous symptoms during the previous six months. In addition, questions thought to be medically unrelated to livestock emissions were included to control for tendencies to report excesses of all symptoms because of negative feelings about livestock operations. Quality of life was evaluated by asking participants how many times they were unable to go outside or open windows on pleasant days. To prevent bias in the results, none of the questions referred specifically to livestock operations or odors; furthermore, participants were told the questionnaire was part of a rural health survey rather than a livestock and health survey.

Wing and Wolf found that symptoms including headache, runny nose, sore throat, excessive coughing, diarrhea, and burning eyes were reported more frequently by residents of the hog-neighboring community compared to residents of the other two communities. (These symptoms also appeared in previous studies of livestock workers.) By far, the greatest differences among the communities were found in their quality of life. Over half of the respondents living near the hog operation reported being unable to go outside or open windows on pleasant days, compared to only one-fifth of respondents in the other two communities. Furthermore, in answering a series of open-ended questions about the general quality of their environment, people living near the hog operation described hog odors as a significant issue.
–Charles W. Schmidt

Not in my backyard. Two new studies look at the effects on people's health of living near a hog farm.

Not Very Neighborly

The Injustice of Hog Farm Siting

During the last 15 years, North Carolina's swine industry has become dominated by corporate mega-producers that handle all aspects of production, from raising the hogs to marketing and distribution. Much of the production is concentrated in eastern North Carolina, a relatively poor region of the state with a large rural African-American population. This has led to mounting concerns that the environmental health impacts of hog production are being borne disproportionately by the poor and by people of color, a situation known as environmental injustice.

Fuel for thought. A better measure of exposure to jet fuel shows that some military personnel may be at increased risk for adverse health effects from breathing noxious fumes.

In this issue, Steve Wing, an associate professor of epidemiology in the School of Public Health at the University of North Carolina at Chapel Hill, and colleagues investigate environmental injustice in North Carolina's swine industry by analyzing the location and characteristics of confined animal feeding operations (CAFOs) for hogs in relation to racial, economic, and water source factors [*EHP* **108:225–231**].

Using data for census block groups (corresponding to areas of approximately 500 households), Wing and colleagues investigated hog production according to three variables: incidence of poverty, racial composition, and dependence on well water. Cities with 1990 populations greater than 100,000 and counties known to not border areas with CAFOs were excluded, leaving 4,177 block groups with a combined estimated population of 4.9 million people for analysis. For comparison, the distribution for each variable was divided into quintiles of increasing incidence of poverty, nonwhite population, and well use. For example, the lowest poverty quintile referred to the fifth of the block groups with the lowest incidence of poverty, whereas the highest poverty quintile referred to the fifth of the block groups with the highest incidence of poverty.

Wing and colleagues found that increasing prevalence of hog production was associated with increases in all three variables. While the increasing percentages of nonwhite people and poverty each related strongly to the location of hog facilities, it was the combination of these two variables that was most strongly associated with large numbers of CAFOs. Both the number of CAFOs and the steady state live weight (calculated as a function of the number of each type of hog and their corresponding weight) rose steadily with quintiles of the distribution for each variable. Over 800 hog operations were found in areas corresponding to the fourth and fifth quintiles of the poverty distribution, compared to only 43 hog operations in the first. Furthermore, almost half of all CAFOs were located in block groups where 85% or more of the households rely on wells as their primary source of water.

Wing and colleagues found that corporate operations were more concentrated in poor and nonwhite areas than were independent operations. Recent growth of corporate operations paralleled by declines in independent operations suggests that the environmental injustices associated with hog production in North Carolina may increase in the future. **–Charles W. Schmidt**

Every Breath You Take

A Better Way to Measure Jet Fuel Exposure

JP-8 jet fuel is currently used by the U.S. Air Force in its entire inventory of aircraft and in most of the military vehicles and auxiliary ground equipment found at Air Force bases. Consequently, virtually all personnel on Air Force bases encounter some level of exposure to JP-8, whether through direct occupational exposure or through incidental contact with personnel or locations related to fuel work. Because JP-8 is a complex chemical mixture containing thousands of hydrocarbons as well as some enhanced performance additives, there is concern over potential health hazards with long-term exposure. The Air Force has previously studied occupational exposure to the fuel's vapors. However, those studies focused on measuring JP-8 concentrations in the ambient air in work areas, which limited the analysis to an indirect assessment of exposure via inhalation and could not address total body burden from all exposure routes, including dermal contact.

In this month's issue, Joachim D. Pleil and colleagues report the results of their more detailed study of JP-8 exposure, in which they used recently developed technology to collect samples of exhaled breath from various groups of Air Force personnel [*EHP* **108:183–192**]. These samples were analyzed in the laboratory for the presence of certain JP-8 constituents that constitute a so-called JP-8 fingerprint. These breath measurements indicate the amount of JP-8 circulating in the subject's blood, much like the common Breathalyzer test indicates a subject's blood alcohol level. By analyzing the breath samples and comparing them to ambient air samples and to control air samples from urban and suburban civilian settings, the authors were able to quantify human exposure levels including not only inhalation but also dermal and ingestion exposures. Data were collected to reflect several forms of potential exposure on an Air Force base: occupational exposure to JP-8 fuel vapor, occupational exposure to JP-8 exhaust, and incidental exposure, which can include vapor inhalation due to contact with personnel who have residual fuel on their clothing or skin.

The methodology also allowed comparisons among a variety of subgroups. For example, JP-8 exposure in the two types of fuel system workers—tank entry personnel, who work inside the fuel tanks, and attendant personnel, who work near but not in the tanks—was found to be equivalent, despite a 40-fold greater potential for exposure inside the tanks. The authors conclude that this was because the respirators worn by the tank entry personnel were highly effective and that their exposure was primarily from their activities in the vicinity of the tanks, when they were not wearing protective equipment.

Further study is suggested, including assessment of the risk of similar exposures in the commercial airline industry. **–Ernie Hood**