Improved Technology for the Exposure Assessment of Career Pig Barn Workers

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In order to accurately assess the continuous, personal exposures of career pig barn workers during their work-shifts, it was essential to develop a monitoring system that was both portable and easily disinfected between barns. The Personal Environmental Sampling Backpack (PESB), was designed for such a purpose and was used to monitor the exposures of both pig barn workers and poultry workers. A number of limitations were noted in the original PESB. Modifications were necessary to make the system more acceptable to workers and to incorporate additional sensors and improved technology.

The PESB II. Modifications to the original PESB included: (1) *Data logging capability*. A single data logger unit replaced multiple units in order to increase storage capability and to simplify data downloading. Exposures during an entire workday could therefore be monitored; (2) *Reduced sampling interval*. With improved data logging capability, it was possible to reduce the sampling interval to 10 seconds, allowing changes in exposures to be captured as workers moved quickly from zone to zone; (3) *Reduced weight and size*. The weight of the PESB II was reduced by 4 kg to 4.5 kg (10 lbs). This was achieved by removing on-board data loggers and using smaller and lighter exposure monitoring equipment. These changes also reduced the overall dimensions of the PESB II; (4) *Improved carbon dioxide (CO_2) monitoring*. In a recently completed pig barn worker pilot study, CO_2 exposures of individual workers peaked at 5,000 ppm: the upper detection limit of the CO_2 monitors. Newer CO_2 monitors, with an upper detection limit of 10,000 ppm, enabled the collection of data on the actual peak exposures of CO_2; (5) *Addition of a hydrogen sulfide (H_2S) sensor*. H_2S was identified as a contaminant of interest in the indoor air of pig barns. Personal exposure data for H_2S has not previously been collected.

Implications: The PESB II system is smaller and lighter weight and has become an important research tool for exposure monitoring of pig barn workers. A significant advantage of this system is its biosecurity compliance. Through a stringent biosecurity protocol, the outer hiker's backpack along with associated tubing can be washed and disinfected, allowing for entry into subsequent pig barns.

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