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Contact: Dennis Tartaglia

dennist@mbooth.com

212-481-7000

[M Booth & Associates](#)

High-tech ventilation fails to control secondhand smoke

Study shows nonsmoking sections of smoking bars and restaurants still get significant doses of carcinogens, particulates

BALTIMORE, MD – What happened when James Repace, one of the world's leading experts on secondhand smoke exposure, teamed up with Dr. Ken Johnson, a top authority on secondhand smoke epidemiology, to investigate claims that new high-tech "displacement" ventilation systems could protect non-smokers from toxic tobacco smoke in restaurants and bars?

The hospitality industry promoted these expensive ventilation systems in desperation and convinced some city councils to allow smoking in dining establishments where it would normally have been banned. In a new study, Repace and Johnson found that these high-tech systems were no match for secondhand smoke and may, in fact, perform worse than standard "dilution" ventilation. The study looked at air quality before and after a smoking ban in a restaurant/bar in Toronto, Canada, and compared the level of smoking-related cancer-causing chemicals and toxic particles in the air of non-smoking and smoking sections of two dining/drinking establishments in Mesa, Arizona.

"This study proves that dining in a restaurant or bar's non-smoking section does not significantly reduce exposure to smoke-related pollutants, even in those few establishments that use these sophisticated, expensive ventilation systems," says Repace, who is Adjunct Professor at Tufts University School of Medicine and a secondhand smoke consultant. "Smoking bans remain the only viable option that protects the health of non-smokers and hospitality workers."

Since a hospitality industry-funded study was being heavily promoted to ventilation engineers as proving the efficacy of these systems, Repace and Johnson decided to publish their contrary results in a ventilation society journal devoted to discussion of practical solutions to indoor air quality problems. The study is the lead technical article in the Fall 2006 issue of IAQ Applications, a peer-screened journal of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (published online October 31).

Johnson, Research Scientist/Epidemiologist with the Centre for Chronic Disease Prevention and Control, the Public Health Agency of Canada, is one of the world's leading experts in breast cancer from secondhand smoke. His work provided the foundation for a report by the State of California, which found that secondhand smoke nearly doubles breast cancer risk. Repace,

whose groundbreaking research on secondhand smoke led to the Environmental Protection Agency's policy interest in indoor air pollution, recently published a widely quoted study demonstrating that the level of cancer-causing particles in smoke-filled bars is much higher than it is on diesel truck-choked highways.

Displacement ventilation has been proposed as a way to allow non-smokers and smokers to co-exist, because it does not recirculate smoky bar air and theoretically removes pollutants from restaurant non-smoking sections. It has been promoted by hospitality industry associations and tobacco interests as part of a strategy designed to thwart the adoption of smoking bans. This study is one of the first to look at whether these systems provide sufficient protection.

"These exotic ventilation systems give restaurant and bar owners a false sense of security," says Repace. "They feel they are protecting their employees and customers, even though deadly respirable toxins from tobacco smoke remain in the air."

Repace and Johnson measured particulate polycyclic aromatic hydrocarbons (PPAHs), common carcinogenic byproducts of tobacco smoke, and respirable suspended particles (RSPs), disease-causing substances found in tobacco smoke in the three restaurant/bars' smoking and non-smoking sections. In the Toronto establishment (Black Dog Pub), measurements were taken before and after its owner banned smoking; the Black Dog abandoned reliance on its expensive non-recirculating system after operating it for years and voluntarily went smoke-free.

RESULTS: Smoking Ban Decreased Pollutants by 60- 80% in Non-smoking Section The researchers found that the Pub's smoking ban decreased PPAH carcinogens by 96% in the smoking bar area and by 80% in the non-smoking dining room. Particulates (RSPs) decreased by 83% in the bar and by 60% in the dining room. Despite proper design, operation and ventilation rate, the Pub's pre-ban smoking section showed RSP levels 25% higher – and PPAH levels 40% higher -- than in six pre-ban smoking bars in Delaware previously studied by Repace. The Delaware bars all used dilution ventilation, which recirculates polluted air, while displacement ventilation does not.

In both Mesa establishments (Macaroni Grill and TGI Friday's), RSP levels were actually higher in the non-smoking restaurant than smoking bar sections, as were PPAH levels in the Macaroni Grill, a sign that the systems were poorly operated. While PPAH levels in the TGIF non-smoking section were 15% as high as in smoking areas during part of the study, the relatively low level was attributed to a propped-open outside door. During the one-hour period when this door was closed, PPAH levels rose to 24% of those in the smoking area.

"When we look at the findings from all three establishments, we see that even when these systems are operating properly they don't do the job they are purported to do," says Repace. "We also see that restaurant and bar owners do not appear to know how to properly operate or maintain these complex systems."

The Mesa restaurants were selected for study because they were exempted from the city's indoor air ordinance based on their managers' claims that they could meet smoke-free standards by using displacement ventilation. The Black Dog Pub was chosen for study because earlier industry-sponsored research purported to demonstrate that the Pub's ventilation system achieved non-smoking-area secondhand smoke concentrations that were equivalent to levels in venues

with smoking bans. The earlier Black Dog study, however, was flawed because its control venues had measurable nicotine contamination – making the comparisons invalid -- and employee exposure to smoke in the smoking area was ignored. Repace and Johnson's findings come against a backdrop of renewed criticism of the tobacco industry and undeniable proof of the dangers of secondhand smoke. A major report by the Surgeon General in summer 2006 concluded that there is no safe level of exposure to secondhand smoke and that smoking bans are the only effective way to reduce its dangers. Evidence of a concerted tobacco industry campaign to "undermine and discredit the scientific evidence that environmental tobacco smoke causes disease," was also cited in U.S. District Judge Kessler's recent racketeering ruling against the tobacco industry (U.S. vs. Philip Morris, et. al.).

The Repace study is expected to be a topic of discussion on Election Day, as voters decide on smoke-free ballot initiatives in Arizona, Ohio and Nevada. Arizona and Ohio each have competing referenda sponsored by hospitality industry groups and funded by R.J. Reynolds, which will return smoke pollution to thousands of restaurants where it is now banned. The tobacco giant is investing \$40 million to roll back smoke-free workplace legislation and defeat cigarette tax increases in these states.

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In 2002, Repace received a Robert Wood Johnson Foundation Innovators Combating Substance Abuse award for his work in this area. Funds from the award helped make this study possible. Measurements were made in each city by Repace, Johnson and volunteers, whom the authors thank. Views in the paper do not necessarily represent those of the Public Health Agency of Canada.

Innovators Combating Substance Abuse is a national program of The Robert Wood Johnson Foundation. The program's mission is two-fold: to recognize individuals who have made noteworthy contributions to what is known about controlling and preventing substance abuse with an award of \$300,000 to continue their efforts in addiction control; and to drive innovations in addiction control by extending and facilitating the innovators' efforts through its National Program Office, which is part of the Department of Psychiatry and Behavioral Sciences at The Johns Hopkins University School of Medicine. For more information, please visit <http://www.innovatorsawards.org/>.

The Robert Wood Johnson Foundation, based in Princeton, NJ, is the nation's largest philanthropy devoted exclusively to health and health care. It concentrates its grantmaking in four goal areas: to assure that all Americans have access to quality health care at reasonable cost; to improve the quality of care and support for people with chronic health conditions; to promote healthy communities and lifestyles; and to reduce the personal, social and economic harm caused by substance abuse - tobacco, alcohol and illicit drugs. To this end, the Foundation supports scientifically valid, peer-reviewed research on illegal and underage substance use, and the effects of substance abuse on the public's health and well-being.