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New Study Measures Personal Exposure to Air Pollution from Indoor, Outdoor Sources

(Boston, November 17) A new study published today by the Health Effects Institute (HEI) and the Mickey Leland National Urban Air Toxics Research Center (NUATRC) has found that both outdoor and indoor air sources can contribute to personal exposure to air pollution. The study, *Relationships of Indoor, Outdoor, and Personal Air (*or *RIOPA),* measured levels of air toxics and particulate matter ($PM_{2.5}$*) in outdoor air, indoor air, and the personal breathing zone for 100 adult subjects and their homes in each of three US cities: Los Angeles, California, Houston, Texas, and Elizabeth, New Jersey. Each city had a different profile of sources: Homes were monitored close to freeways in Los Angeles, near petrochemical facilities in Houston, and amidst a mixture of sources such as freeways, dry cleaners, and gas stations in Elizabeth.

The study, conducted by Drs Clifford P Weisel, Junfeng (Jim) Zhang, and Barbara J Turpin of the Environmental and Occupational Health Sciences Institute at Rutgers University in New Jersey along with scientists in California and Texas, found that, with a few important exceptions, personal and indoor levels of some of the 16 volatile organic compounds and 10 aldehydes measured were higher than outdoor levels. The finding that personal exposure concentrations were higher than outdoor concentrations for most of the species measured indicates that indoor sources contribute to, and in some cases dominate, personal exposure.

In more detailed analyses, the study aimed to quantify the contribution of outdoor sources to indoor (household) air. Using a "mass balance model" to identify species that are primarily generated

* Fine particles smaller than 2.5 microns in diameter

by indoor sources and those primarily generated by outdoor sources, the investigators calculated that the air pollutants with the highest outdoor contributions to indoor air (ie, 90–100% of the levels found in indoor air) were methyl tertiary butyl ether (MTBE), benzene, carbon tetrachloride, and trichloroethylene. For the other species, outdoor air contributed less than 60% of the indoor concentrations. Of these, chloroform, α-pinene, β-pinene, *d*-limonene, formaldehyde, and acetaldehyde indoor concentrations had the lowest contribution from outdoor sources; they appeared to be primarily generated indoors from sources such as cleaning products and off-gassing of building materials.

The study was funded and managed jointly by the HEI, a nonprofit independent research institute funded jointly by the US EPA and industry to provide high quality and impartial science on the health effects of air pollution, and NUATRC, a public–private partnership established by the US Congress in the Clean Air Act Amendments of 1990 to carry out sound, peer-reviewed research on the public health risks of air toxics in urban atmospheres.

The report, *Relationships of Indoor, Outdoor, and Personal Air (RIOPA)*, HEI Research Report 130, Mickey Leland Research Report 7, was published at *www.healtheffects.org* and *www.sph.uth.tmc.edu/mleland/*.

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