# Chronic pulmonary exposure to traffic-related fine particulate matter causes brain impairment in adult rats

Chi-Hsiang Shih1, Jen-Kun Chen2, Li-Wei Kuo2, Kuan-Hung Cho2, Ta-Chih Hsiao3, Zhe-Wei Lin1, Yi-Syuan Lin1, Jiunn-Horng Kang4,5, Yu-Chun Lo6, Kai-Jen Chuang7,8, Tsun-Jen Cheng9, Hsiao-Chi Chuang1,7,10\*

1School of Respiratory Therapy, College of Medicine, Taipei Medical University, Taipei, Taiwan

2Institute of Biomedical Engineering & Nanomedicine, National Health Research Institutes, Miaoli, Taiwan

3Graduate Institute of Environmental Engineering, National Taiwan University, Taipei, Taiwan

4Department of Physical Medicine and Rehabilitation, Taipei Medical University Hospital, Taipei, Taiwan

5Department of Physical Medicine and Rehabilitation, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

6The Ph.D Program for Neural Regenerative Medicine, College of Medical Science and Technology, Taipei Medical University, Taipei, Taiwan

7School of Public Health, College of Public Health, Taipei Medical University, Taipei, Taiwan

8Department of Public Health, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

9Institute of Occupational Medicine and Industrial Hygiene, College of Public Health, National Taiwan University, Taipei, Taiwan

10Division of Pulmonary Medicine, Department of Internal Medicine, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan

**\* Corresponding Author**

*Hsiao-Chi Chuang, PhD*

Taiwan CardioPulmonary Research (T-CPR) Group, School of Respiratory Therapy, College of Medicine, Taipei Medical University, 250 Wuxing Street, Taipei 110, Taiwan.

Telephone: +886-2-27361661 ext. 3512. Fax: +886-2-27391143. E-mail: r92841005@ntu.edu.tw

**Table S1. Meteorological and gaseous data measured by the traffic-related EPA Yonghe air quality monitoring stations during the study period**

|  |  |
| --- | --- |
| Meteorological and gaseous data (unit) | Mean ± SD (Min~Max) |
| Temperature (°C) | 20 ± 4 (12~29) |
| Relative humidity (%) | 72 ± 9 (47~92) |
| NOx (ppb) | 32.9 ± 16.4 (8.4~86.6) |
| SO2 (ppb) | 2.5 ± 1.0 (0.2~5.0) |
| O3 (ppb) | 29.7 ± 11.0 (6.7~58.2) |

NOx: nitrogen oxides; SO2: sulfur dioxide; O3: ozone.

**Table S2. Instruments used to characterize the exposure conditions for rats**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Instrument | Pollutant (unit) | Flow rate (lpm) | | Time resolution | |
| TEOM, Thermo Scientific 1400a | PM1 (µg/m3) | 3 | 5 min | |
| SMPS, TSI 3080 | PNC (#/cm3) | 0.6 | 5 min | |
| APS, TSI 3321 | PNC (#/cm3) | 5 | 5 min | |
| NSAM, TSI 3550 | LDSA(µm2/cm3) | 2.5 | 5 min | |
| Magee, AE-33 | BC (ng/m3) | 5 | 1 min | |
| AIO Weather, Climatronics | RH (%)  Temperature (oC) | ̶ | 1s | |

TEOM: tapered element oscillating microbalance; SMPS: scanning mobility particle sizer; APS: aerodynamic particle sizer; NSAM: nanoparticle surface area monitor; AE: Aethalometer; PM1: particulate matter less than 1 μm in aerodynamic diameter; PNC: particle number concentration; LDSA: lung deposition surface area; BC: black carbon; RH: relative humidity.

C:\Users\Hsiao-Chi Chuang\Desktop\system.tif

**Figure S1. Characterization of particle size and penetration distribution (between outdoor and whole-body exposure system) determined using a scanning mobility particle sizer (SMPS, TSI 3936; upper size limit: 710 nm). (a) The exposure cages (yellow marked: 1-1, 1-3, 1-5, 2-3, 3-1, 3-3 and 3-5) were measured for size-penetration distribution. (b) The individual cage for animal exposure showed a consistent size-penetration distribution. The geometric mean diameter (GMD) was 50 nm.**