

## **CANCER RISK ASSOCIATED WITH THE INHALATION OF PM-BOUND PAHS FROM THE GRILLING PROCESS**

Artur Jerzy BADIYA<sup>1,7</sup>, Wioletta ROGULA-KOZŁOWSKA<sup>2</sup>, Grzegorz MAJEWSKI<sup>3</sup>, Przemysław OBERBEK<sup>4</sup>, Kamila WIDZIEWICZ<sup>5</sup>, Izabela JURECZKO<sup>6</sup>, Mariusz ROGULSKI<sup>1</sup>

<sup>1</sup>Warsaw University of Technology, Faculty of Building Services, Hydro-and Environmental Engineering, Department of Informatics and Environment Quality Research, Warsaw, Poland

<sup>2</sup>The Main School of Fire Service, Faculty of Fire Safety Engineering, Warsaw, Poland

<sup>3</sup>Warsaw University of Life Sciences, Faculty of Civil and Environmental Engineering, Warsaw, Poland

<sup>4</sup>Central Institute for Labour Protection – National Research Institute, Warsaw, Poland

<sup>5</sup>Polish Academy of Sciences, Institute of Environmental Engineering, Zabrze, Poland

<sup>6</sup>Power Research & Testing Company “ENERGOPOMIAR” Ltd, Gliwice, Poland

<sup>7</sup>Polish Federation of Asthma, Allergy and COPD Patients’ Associations, Warsaw, Poland

**Objective:** The main goal was to assess cancer risk from the exposure to PM-bound PAHs generated during grilling process. The exposure of the grill master and people witnessing the grilling process has been measured.

**Materials and Methods:** The investigation encompassed 4 types of grill/fuel: lump charcoal (LC), charcoal briquettes (CB), as well as grills powered by liquid propane (LP) and electric energy (E). 3 separate samples of respirable fraction (PM<sub>4</sub>) has been collected: during the combustion of fuel itself, while grilling vegetables and meat dishes. 16 polycyclic aromatic hydrocarbons (PAHs) congeners were extracted and measured quantitatively using GC chromatograph. A probabilistic risk model was developed to assess the incremental lifetime cancer risk (ILCR) in people exposed by breathing carcinogenic PAHs.

**Results:** The inhalation-ILCR followed a lognormal distribution with a geometric mean of  $2.99 \times 10^{-2}$ - $2.71 \times 10^{-1}$  in case of exposure to PM<sub>4</sub>-bound PAHs emitted by unloaded grills,  $6.40 \times 10^{-2}$ - $5.54 \times 10^{-1}$  while grilling vegetables and  $4.98 \times 10^{-2}$ - $6.08 \times 10^{-1}$  when grilling meat. The highest values concern the grill powered by CB. Personal exposure risk of people participating in the grilling process but not being grill masters was lower and varied from  $1.55 \times 10^{-2}$  to  $2.52 \times 10^{-2}$  and in the control area from  $5.33 \times 10^{-3}$  to  $8.61 \times 10^{-3}$ .

**Conclusion:** CB is most dangerous concerning PAHs inhalation exposure from barbecue exhausting gases. PAHs exposure while grilling meat dishes is higher than in case of vegetables. The risk of grill emission gases inhalation exceeded  $10^{-3}$  suggesting high probability of cancer occurrences due to PAHs exposure.