

Characterization of polycyclic aromatic hydrocarbons exposure in Portugal by biomonitoring

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What are Polycyclic aromatic hydrocarbons (PAHs)?

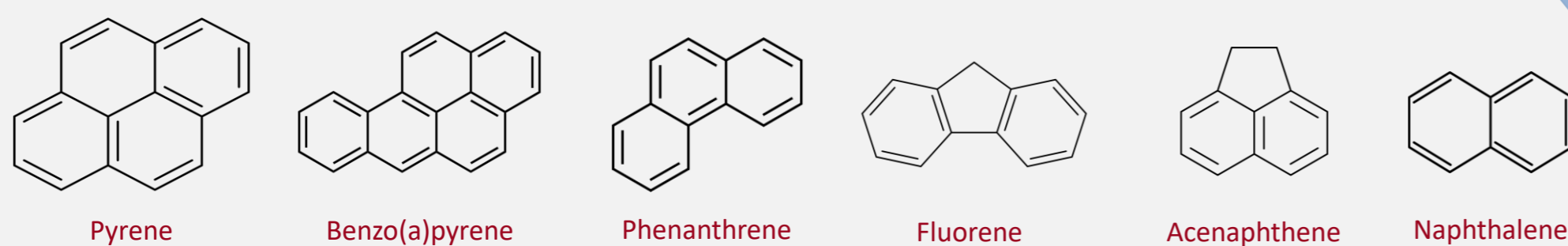


Figure 1: Chemical structures of some PAHs

PAHs are **PERSISTENT** organic molecules structured in more than one condensed ring. There are more than 100 PAHs. Yet **16** of them are considered priority pollutants [1], among which six are shown in figure 1. They are emitted in the air through **PETROGENIC AND PYROGENIC SOURCES** (figure 2). Examples of petrogenic sources are: oil seepage, acute petroleum spillages and waste treatment plants. Examples of pyrogenic sources are: the incomplete combustion of wood and biomass, tobacco smoke and gas cooking.

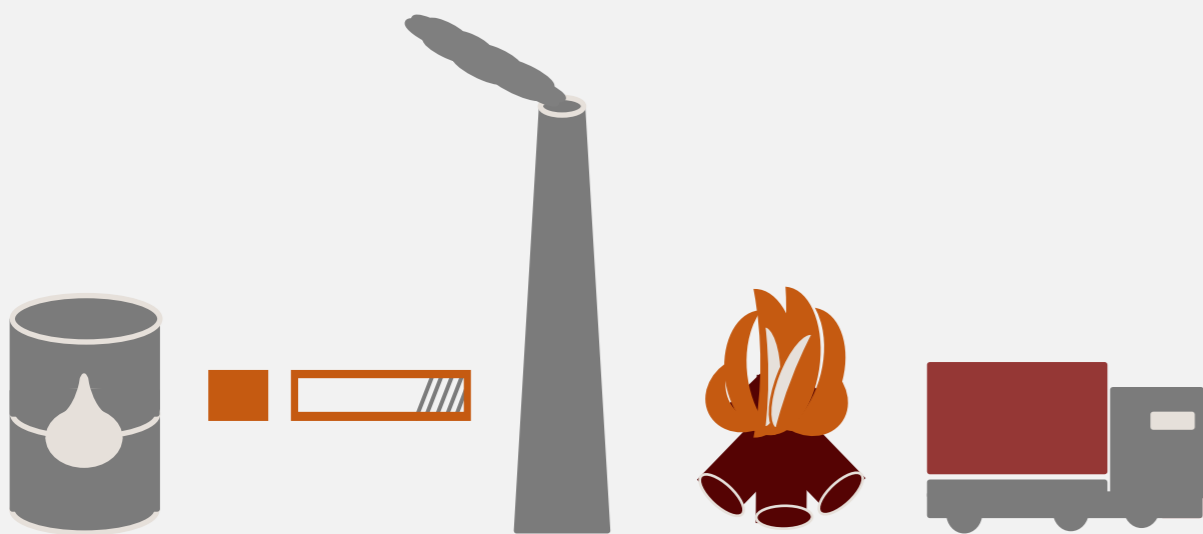


Figure 2: examples of pyrogenic and petrogenic PAH sources

Problem - Objective

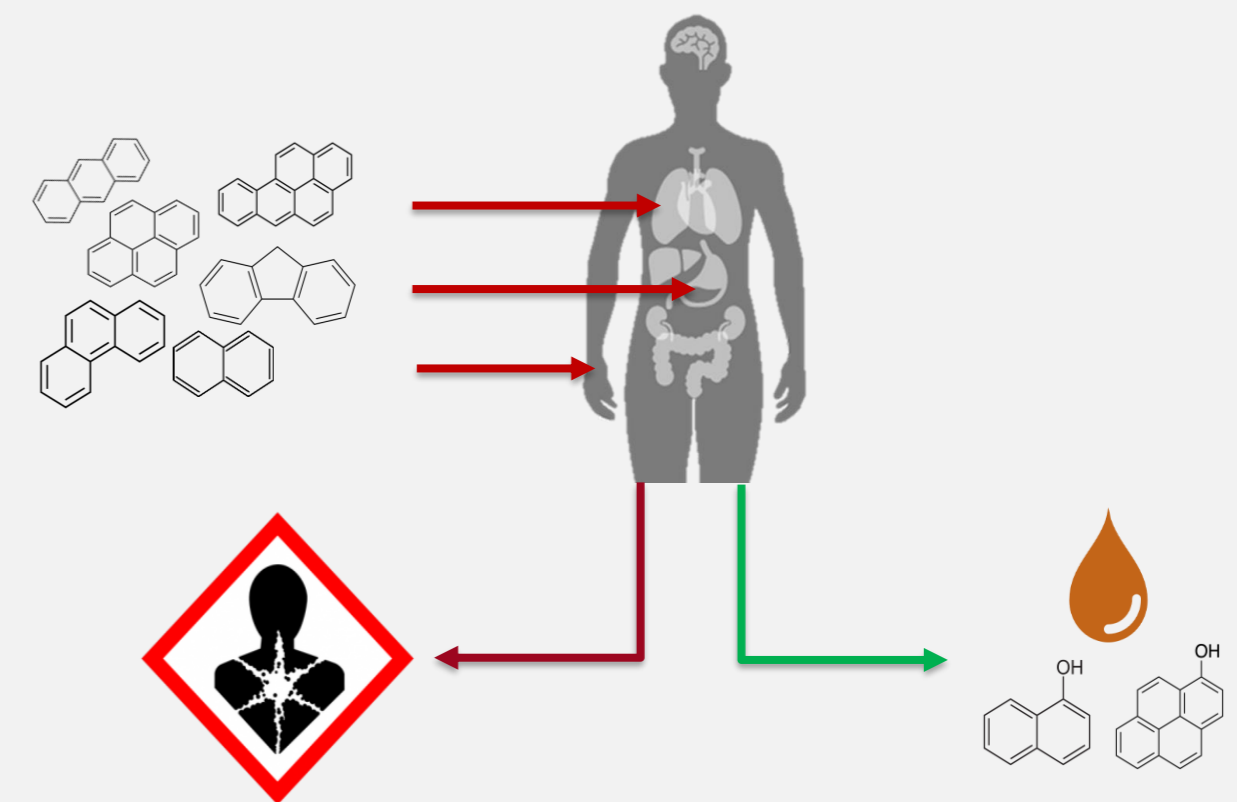
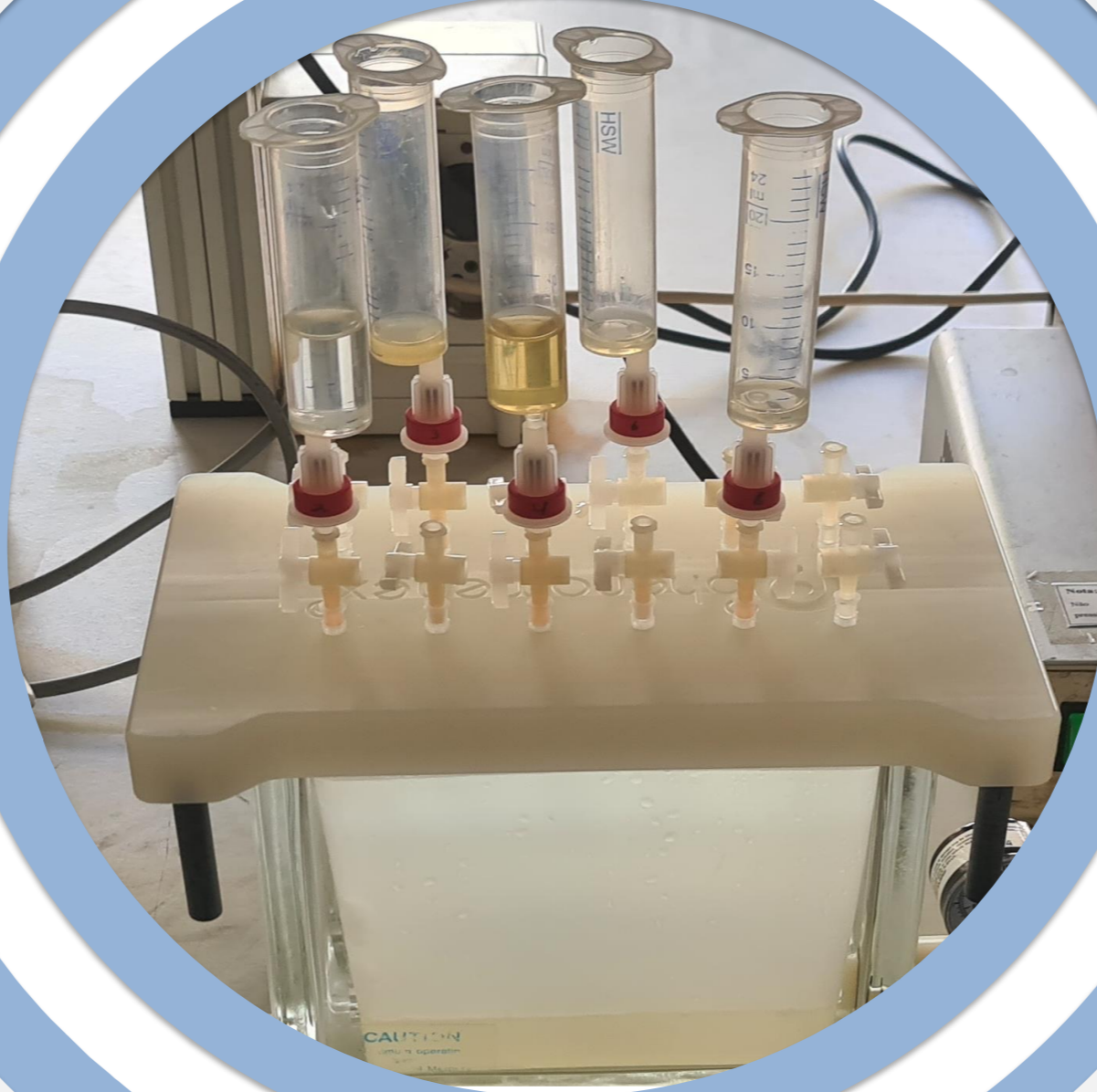


Figure 3: PAH process in the human body

PAHs can be absorbed by the human body through ingestion, inhalation and dermal contact (figure 3). After this, PAHs are metabolised in **HYDROXYLATED PAHs (OH-PAHs)** and excreted through the urine, faeces, but they can also be found in saliva and blood [2]. However, small quantities of the PAHs remain in the body and can cause **HEALTH ISSUES** [3].

Despite the potential health issues of PAHs, there is a **LACK OF PUBLISHED STUDIES** in Europe that focusses on the PAH problem in children. Hence, present study **CHARACTERISES THE EXPOSURE OF PORTUGUESE PRESCHOOL CHILDREN TO PAHs BY BIOMONITORING (6 OH-PAHs)**.



OH-PAHs were extracted out of urine according to the method shown in figure 4 [4]. Before extracting the metabolites out of the urine, enzymes are added to hydrolyse the urinary conjugated metabolites. In that way they are easier to detect by the fluorescence-detector of the **HIGH-PRESSURE LIQUID CHROMATOGRAPH**.

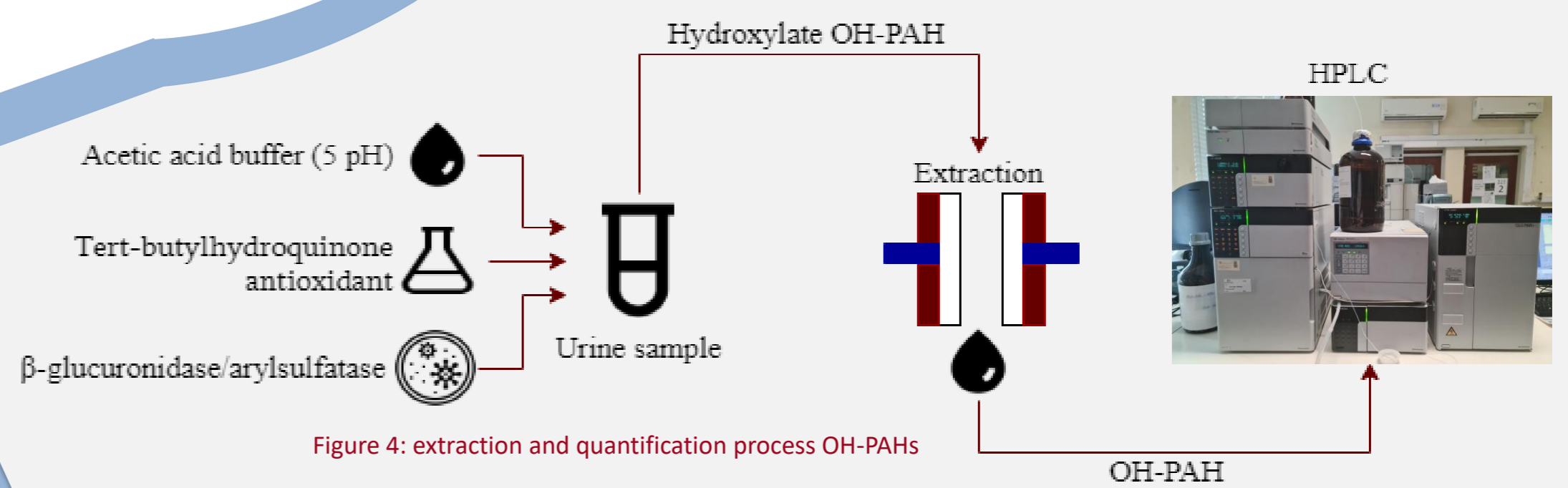


Figure 4: extraction and quantification process OH-PAHs

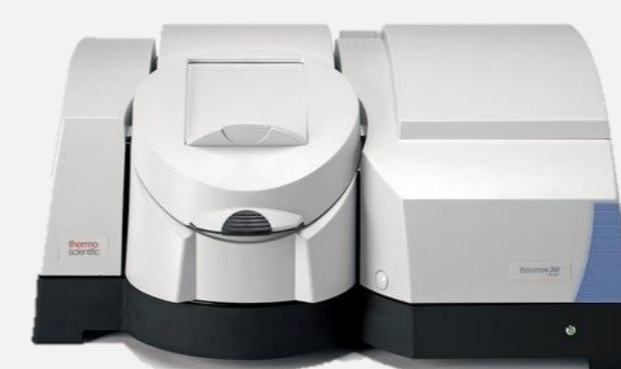


Figure 5: UV-VIS spectrophotometer

In addition, **URINARY CREATININE LEVELS** were measured by means of colorimetry; (figure 5), to normalize the urinary OH-PAHs concentrations in the samples [5].

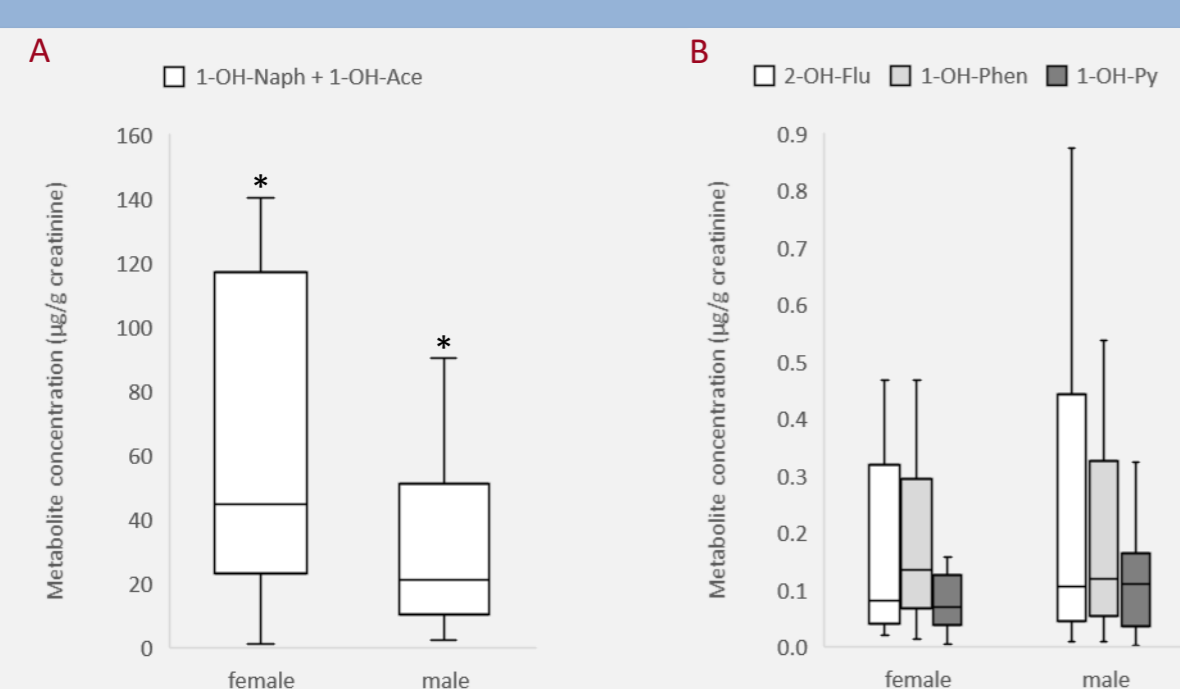


Figure 6: Boxplot of the OH-PAH concentration of male and female children: (A) 1-OH-Naph + 1-OH-Ace concentrations of these two groups; (B) 2-OH-Flu, 1-OH-Phen and 1-OH-Py concentrations. * Data are significantly different at $p < 0.05$ Mann-Whitney U test.

Independently of the age or gender, 1-OH-Naph + 1-OH-Ace was the most abundant metabolite followed by 1-OH-Phen, 2-OH-Flu and 1-OH-Py. Overall, female children showed similar OH-PAH levels as males. However, significantly higher 1-OH-Naph + 1-OH-Ace values were present girls (figure 6). This suggest that PAHs metabolism may be influenced by gender. Also, no relation between OH-PAH levels and age or distance from the industry was perceived. More research with a larger population is needed to comprehensively characterize children exposure to PAHs.

Results and Discussion

Materials and Methods

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