



**Food Contamination by Polynucleic hydrocarbon
concentrations in ambient air in Kuwait (measured from
accumulated dust on HVAC filters)**



**Dr. Abdul Rehman Khan
Consultant**

**Air Quality Program,
Environment and Life Science Department**



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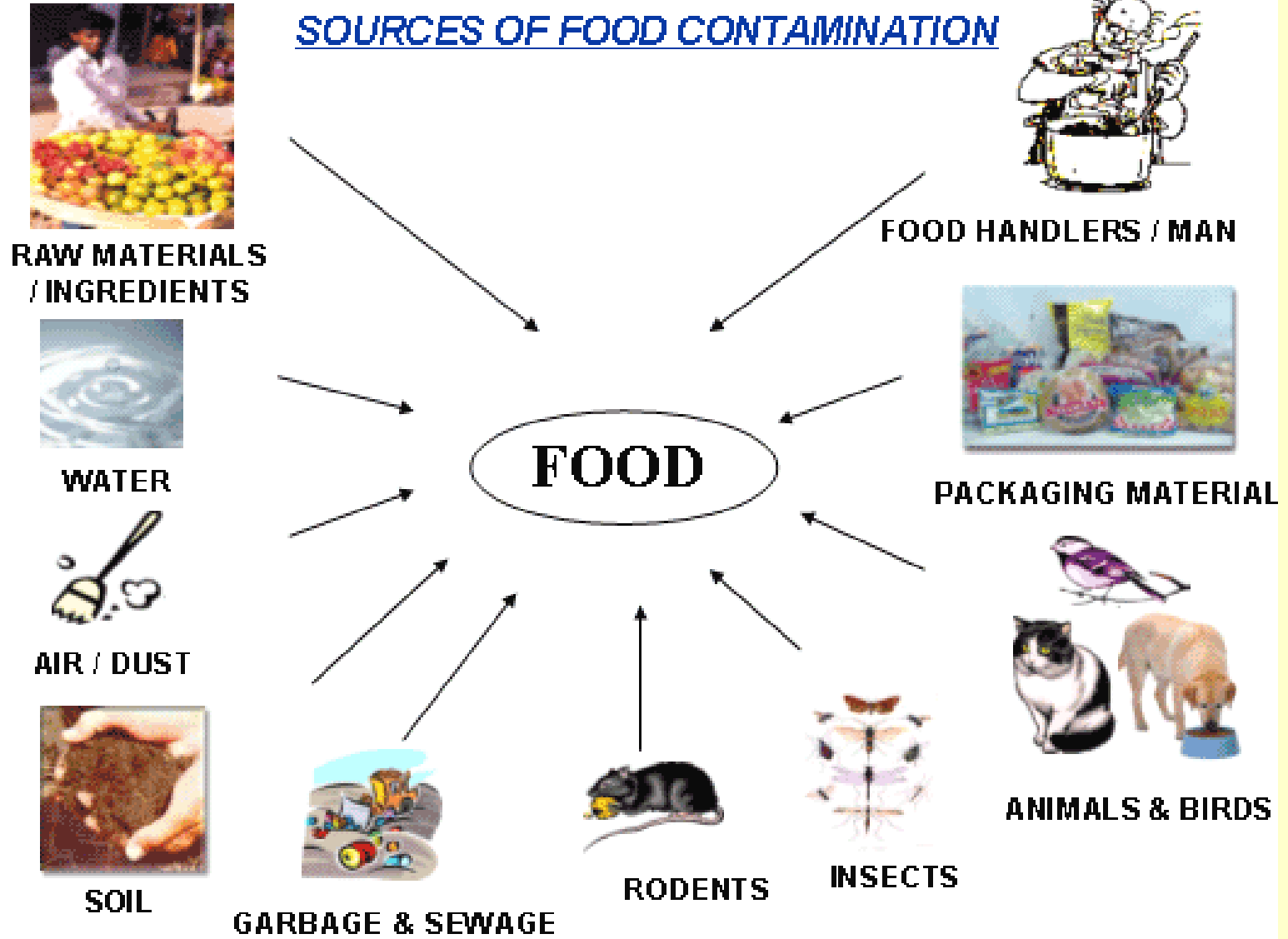


Outline

- **SVOC are adsorbed by fine particles and deposited on open food, cooked or fresh fruit/vegetables.**
 - **The most common hazardous pollutants present are: “Persistent organic pollutants”, POPs**
 - **Poly-cyclic hydrocarbon commonly known as PAHs in dust samples were estimated from AHU of HVAC system**
 - **Concentrations, inhalation, ingestion and dermal diffusion cause health risk and mitigation strategies**
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SOURCES OF FOOD CONTAMINATION



Traffic Emissions Source

Agricultural sources include the following activities:

- Stubble burning
- Open burning of moorland heather for regeneration purposes
- Open burning of brushwood, straw, etc.

Natural Sources





Oilfields in State of Kuwait

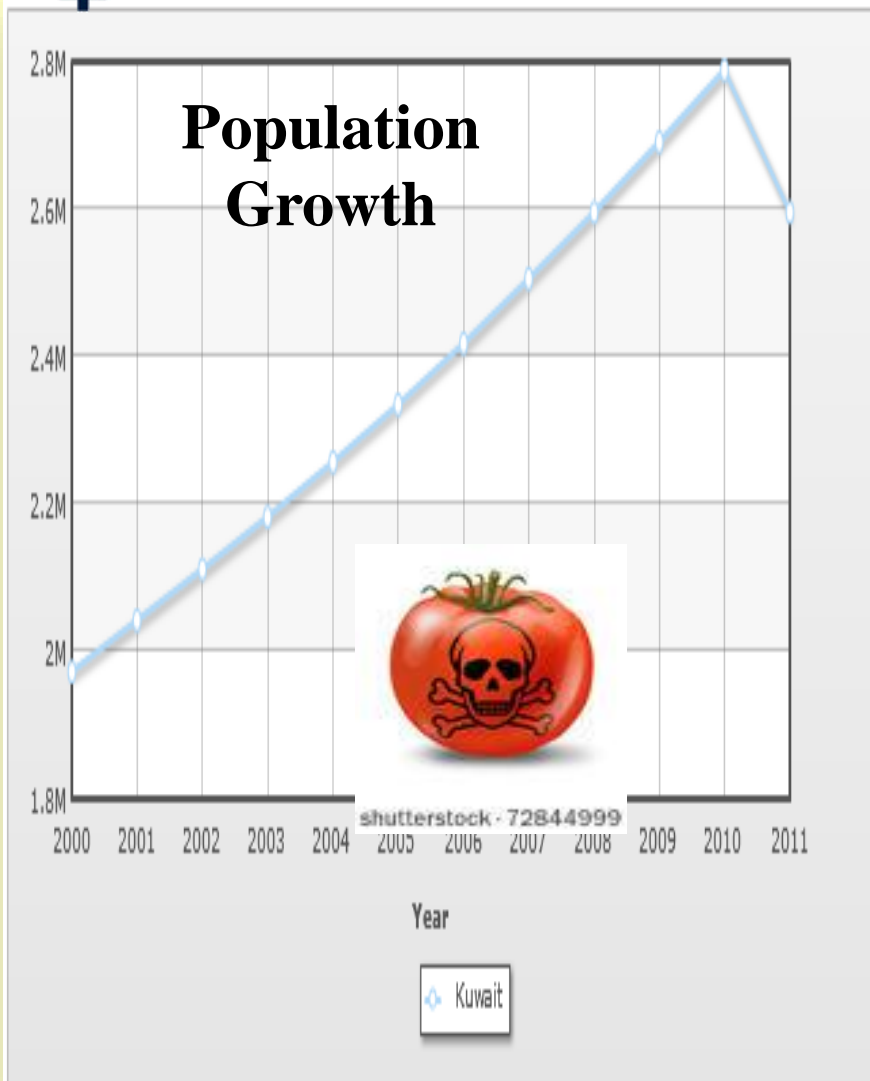
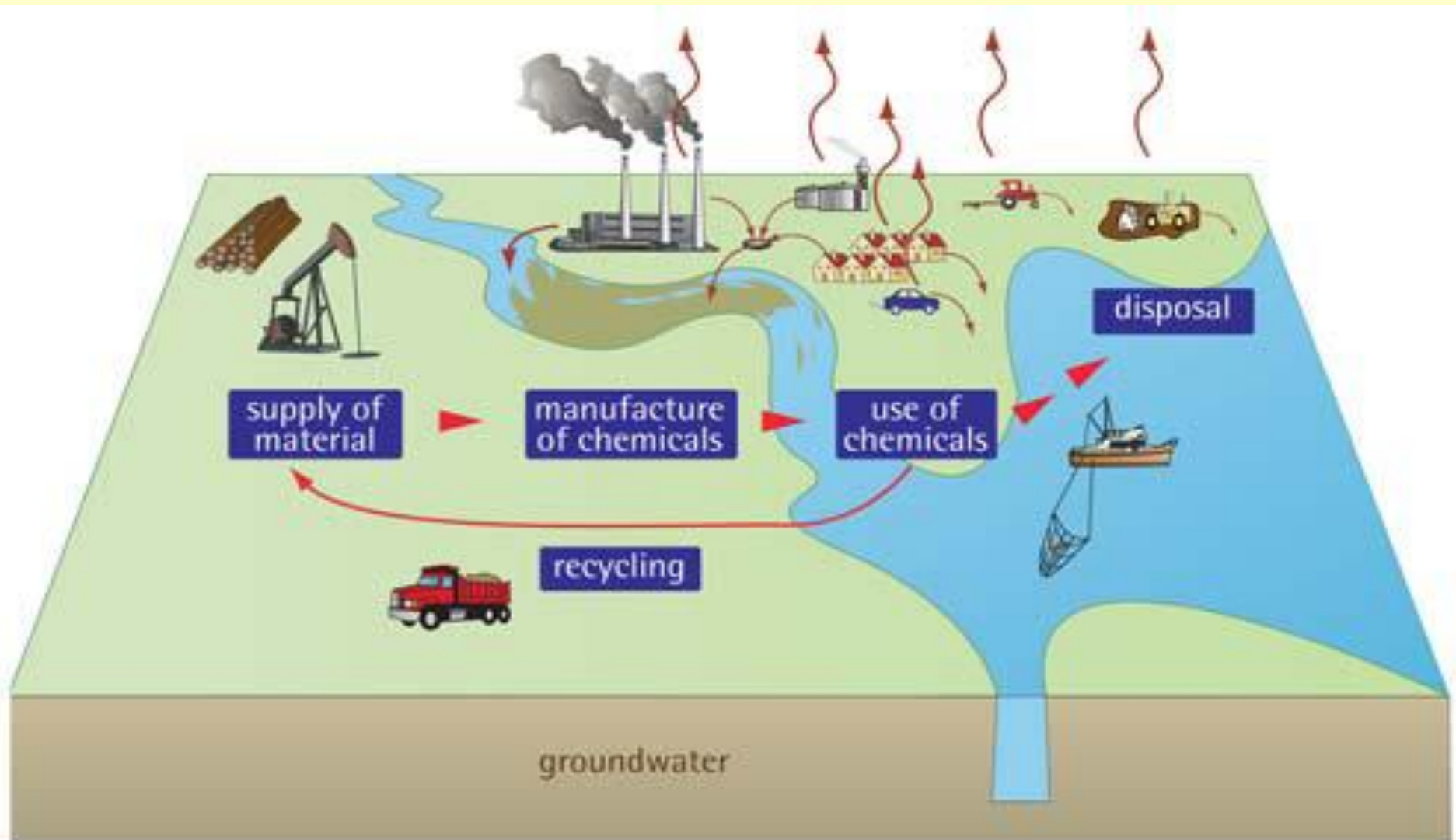




Diagram of the transfer of PAHs in the environment.

Source: www.sepa.org.uk

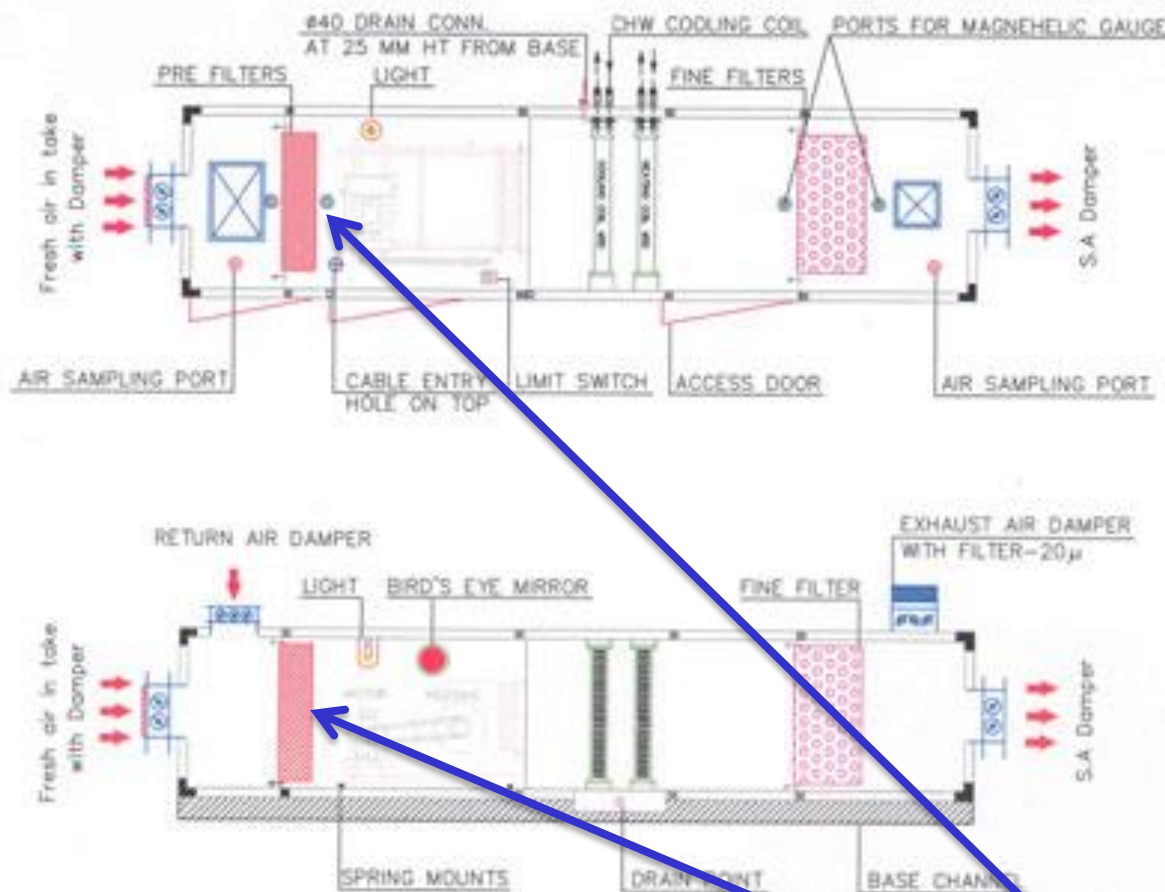




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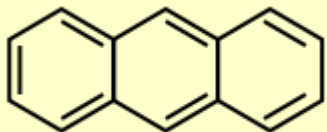


AHU of HVAC System in Kuwait

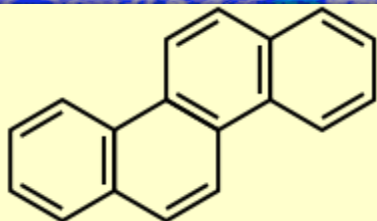




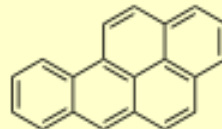
PAH compounds



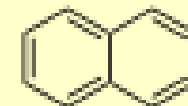
Anthracene



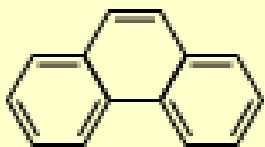
Crysenes



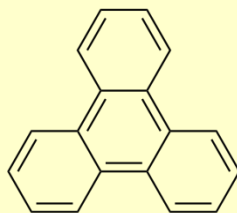
Benzo(a)pyrene



Naphthalene



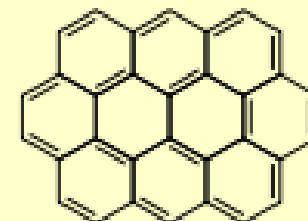
Phenanthrene



Triphenylene



Corannulene



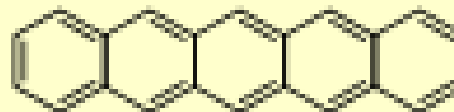
Ovalene



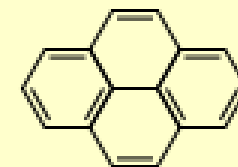
Coronene



Tetracene



Pentacene



Pyrene

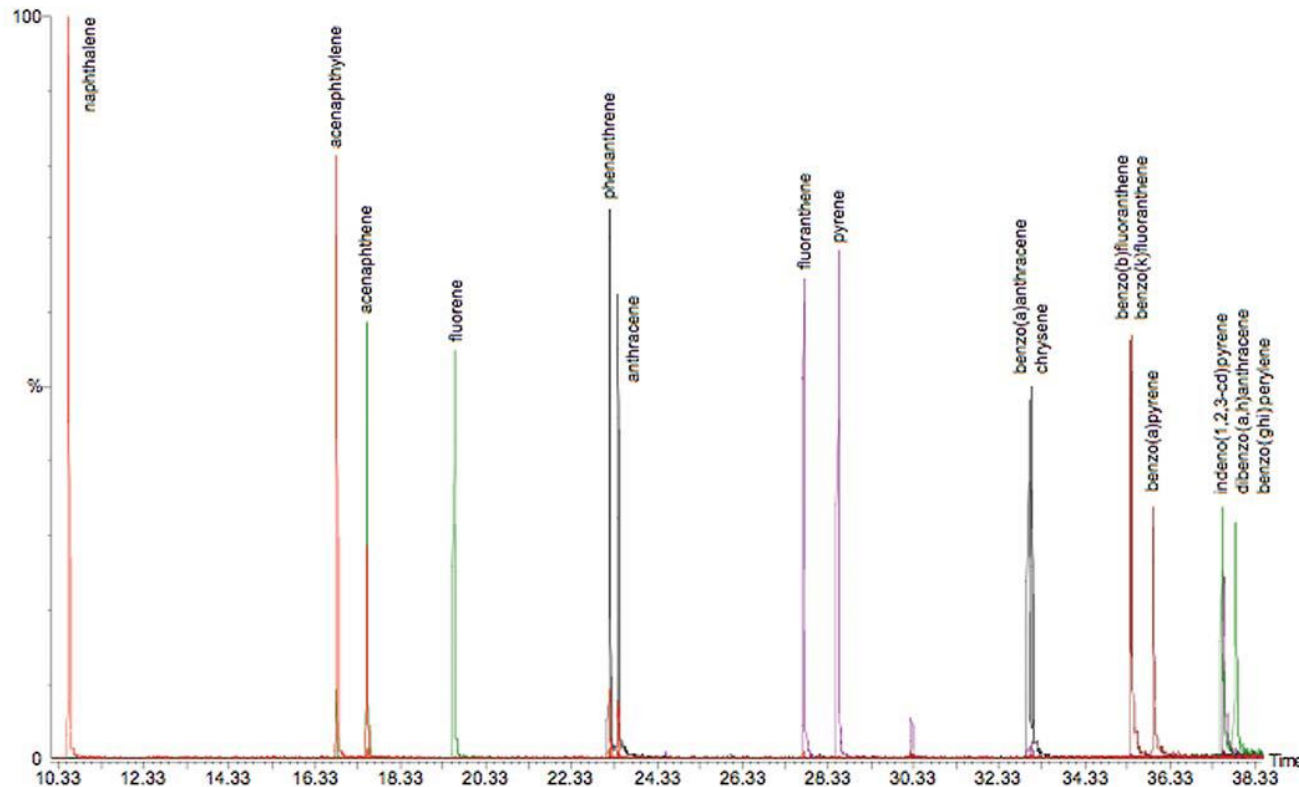


Gas Chromatograph and Mass Spectrophotometer





Polycyclic Aromatic Hydrocarbons



1. naphthalene
2. acenaphthylene
3. acenaphthene
4. fluorene
5. phenanthrene
6. anthracene
7. fluoranthene
8. pyrene
9. benzo(a)anthracene
10. chrysene
11. benzo(b)fluoranthene
12. benzo(k)fluoranthene
13. benzo(a)pyrene
14. indeno(1,2,3-c,d)pyrene
15. dibenzo(a,h)anthracene
16. benzo(ghi)perylene

Column: Rt™-PAH, 12m, 0.25mm ID, 0.15µm (cat.# 19733)

Sample: 16 component EPA Method 610 PAH standard

(20ng/µl of each component in dichloromethane)

Inj.: 1.0µL split (split ratio 10:1), Inj. temp.: 225°C

Carrier gas: helium, 110kPa column head pressure

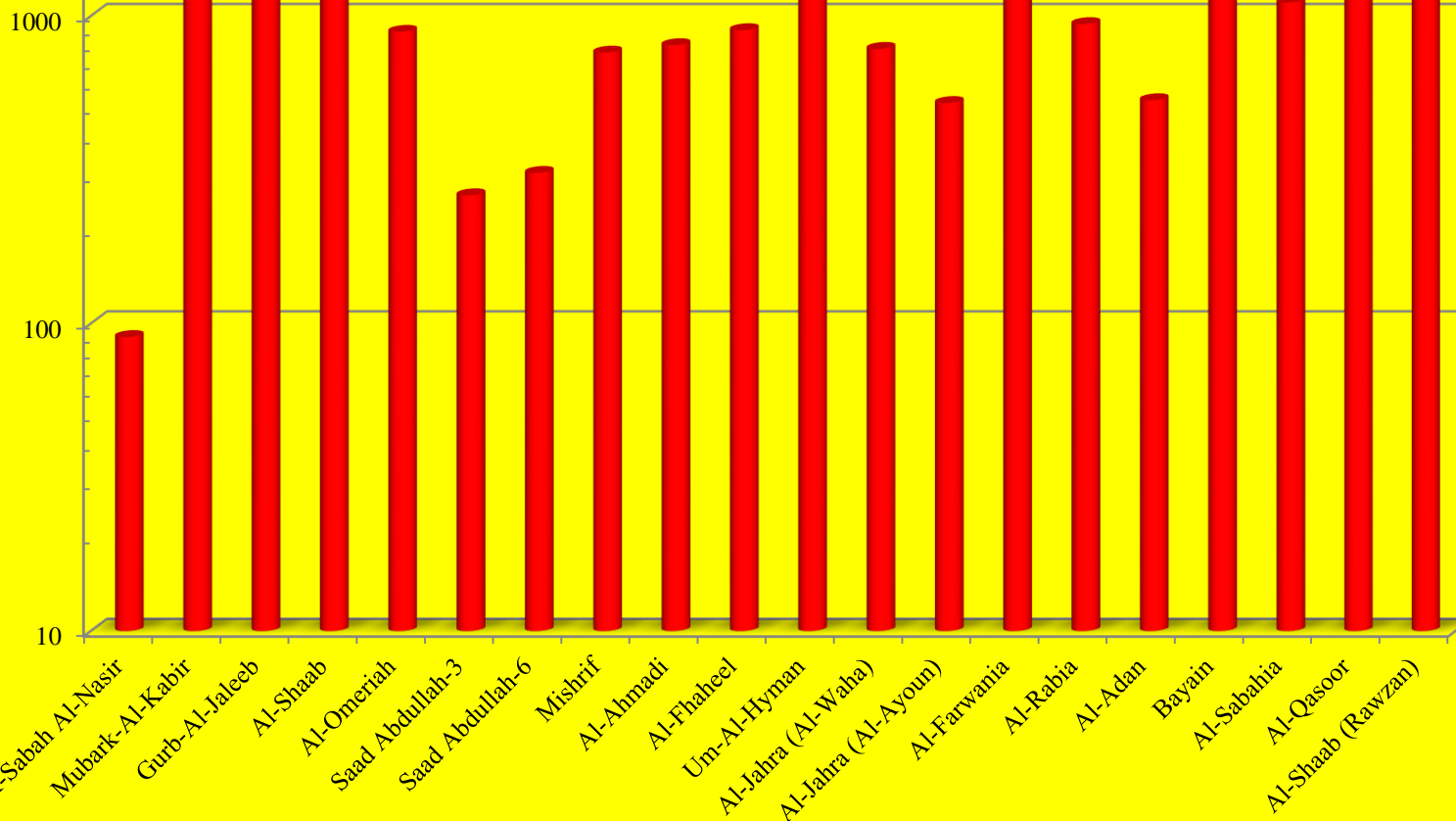
Oven temp.: 80°C to 220°C @ 40°C/min., 220°C to 285°C @ 8°C/min. (hold 5 min.)

Detector: FID @ 290 °C.



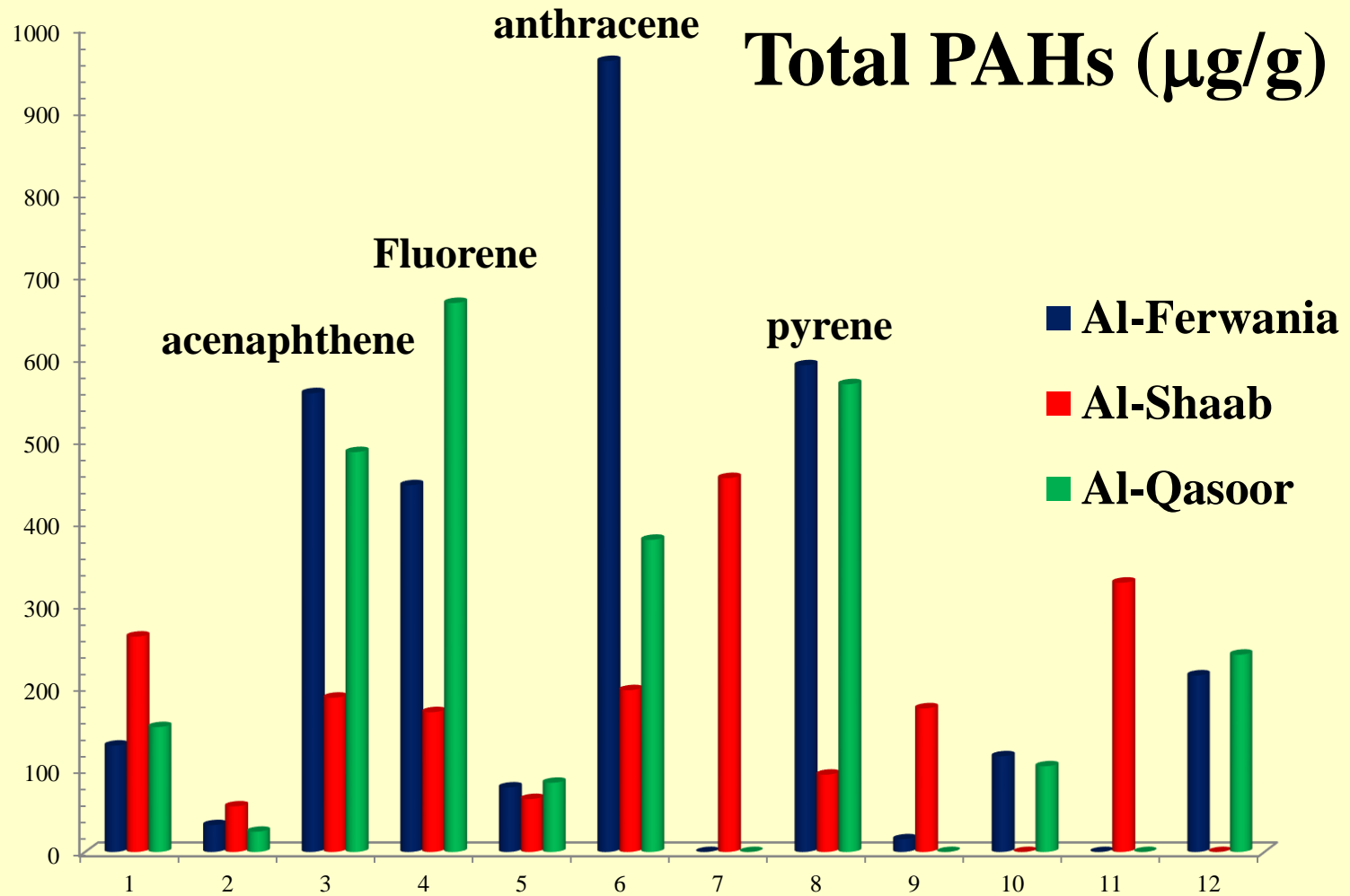
PAHs in different places in Kuwait

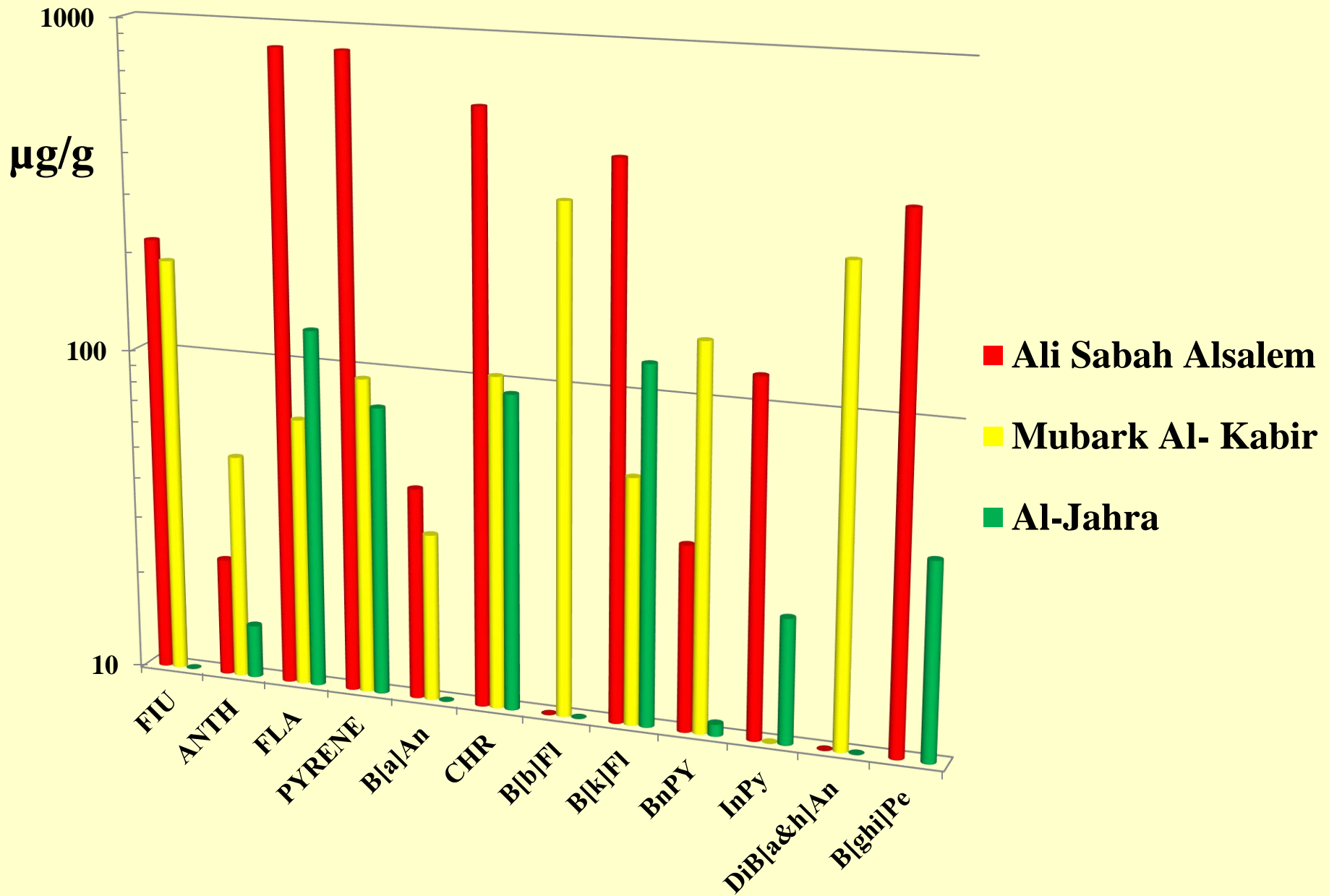
Total PAHs ($\mu\text{g/g}$)





Total PAHs in different areas in Kuwait

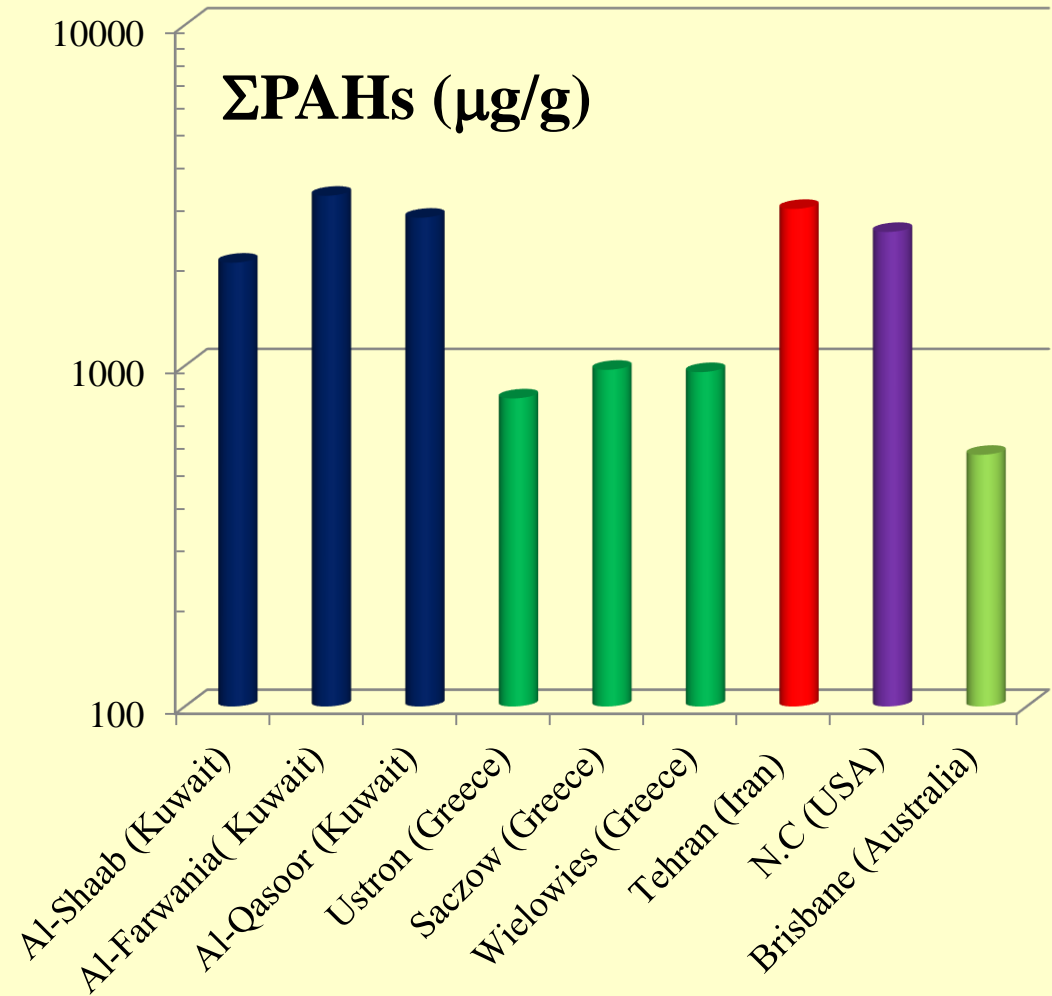
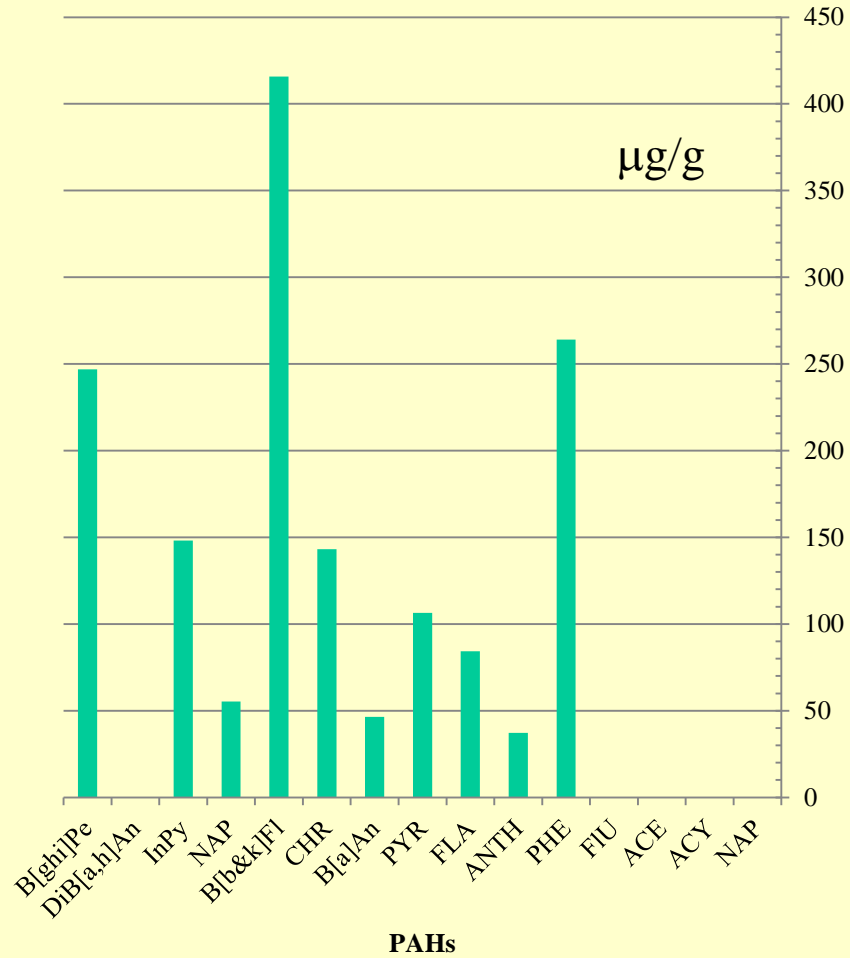




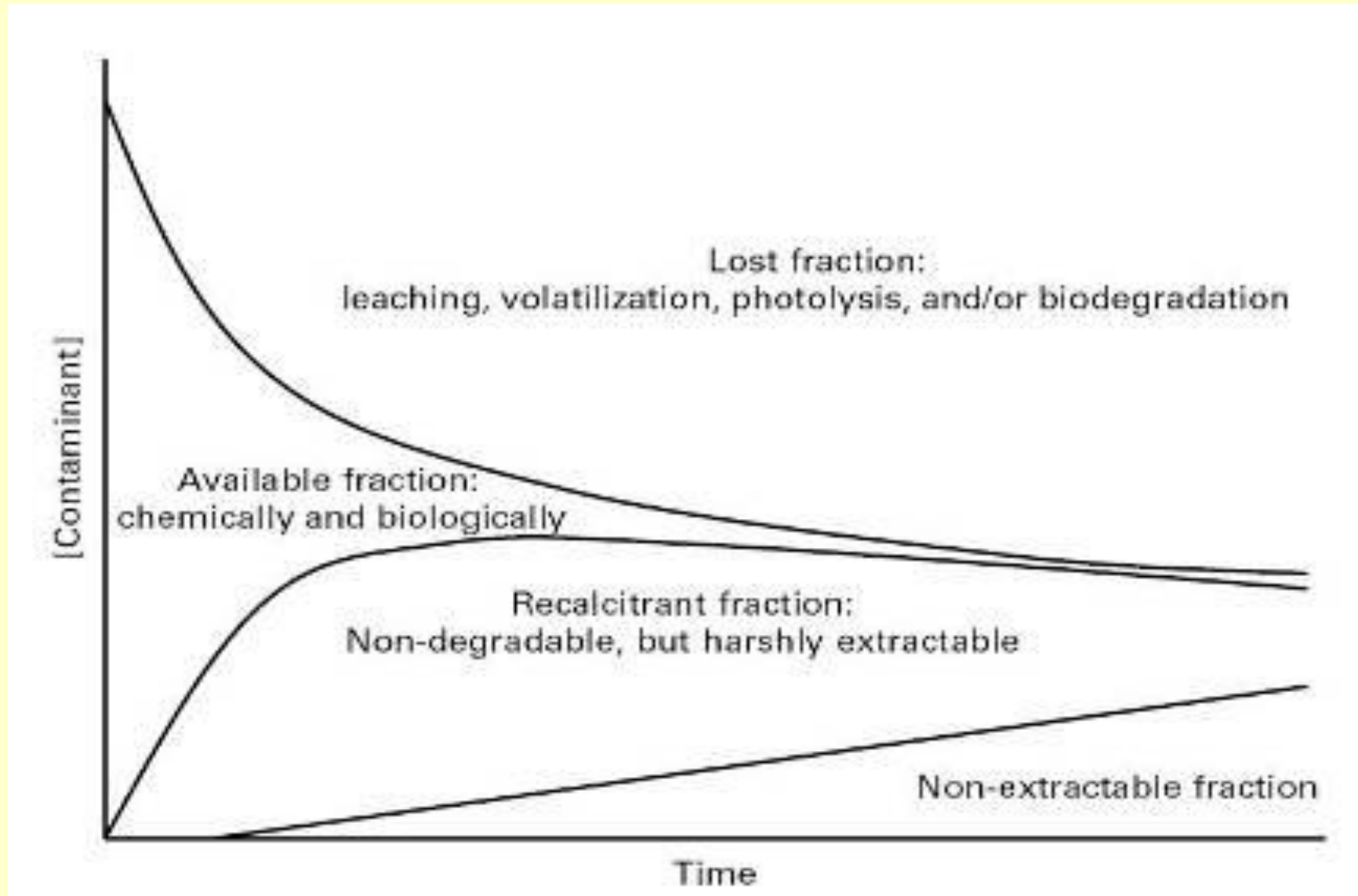


Average PAHs in Hawalli Province

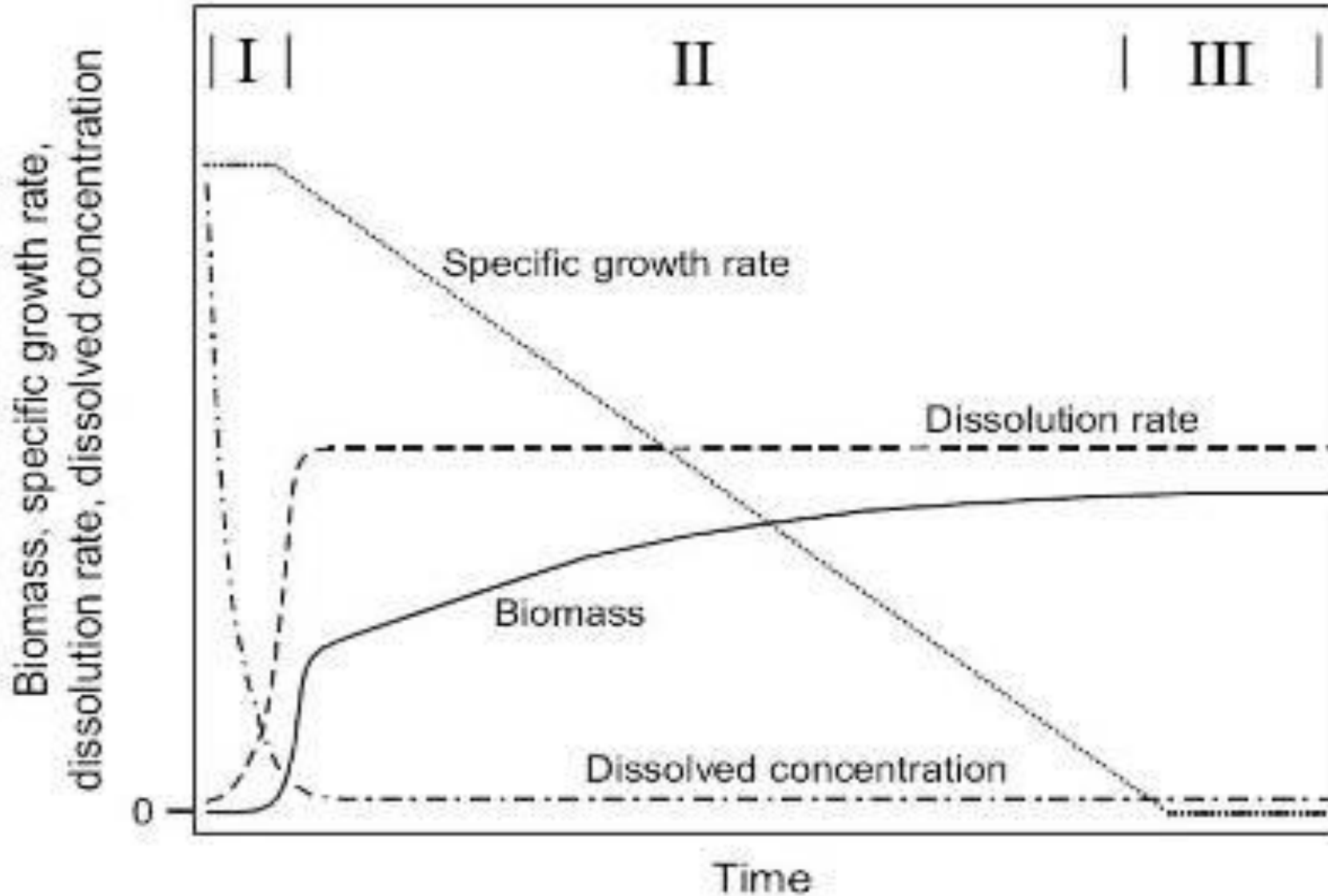
Worldwide comparison



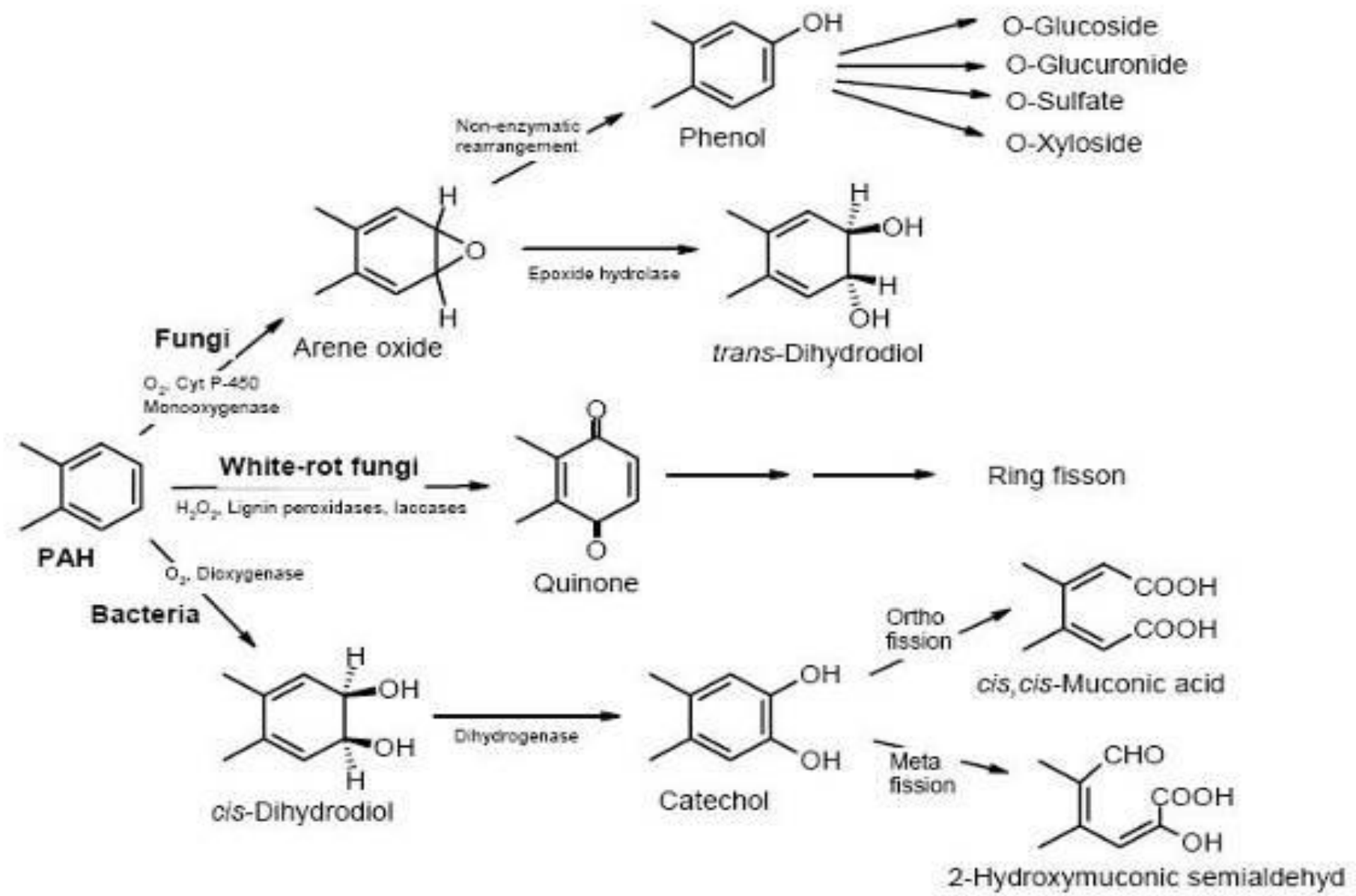
**Relative PAH concentrations with time under the following processes:
transfer (lost fraction), degradation (available fraction) and sequestration
(récalcitrant fraction) (Stokes et al., 2006).**



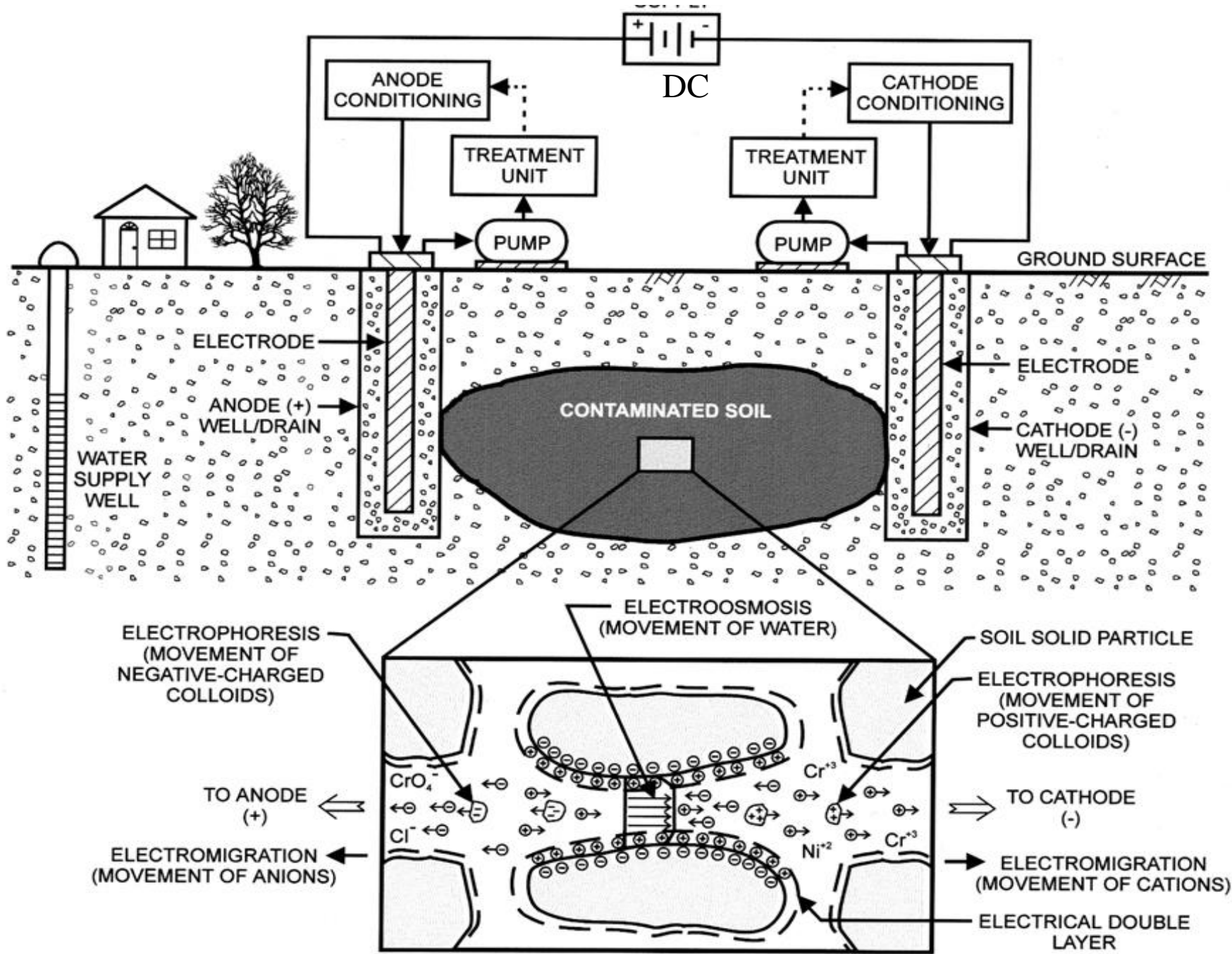
Schematic diagram for microbial biomass, specific microbial growth rate, PAH dissolution rate and dissolved PAH concentration of bacterial batch grown on solid PAHs (Johnsen et al., 2005).



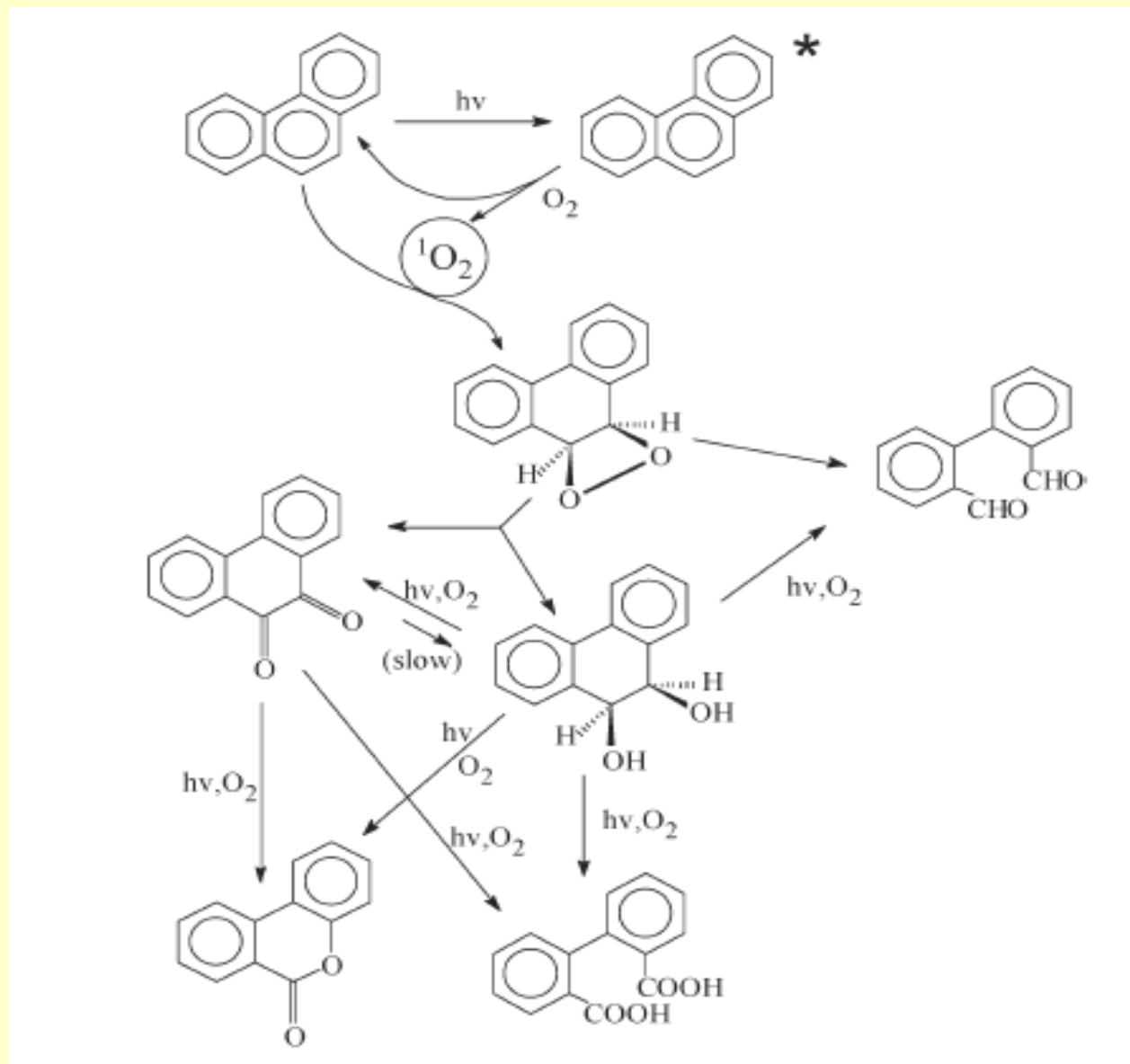
Aerobic degradation of PAH by general fungi, white-rot fungi and bacteria (Cerniglia, 1992)



Schematic of integrated electrokinetic technique (Saichek & Reddy 2005)



Possible mechanism for direct photo-oxidation of PAHs (Vione et al., 2006)



Conclusion remarks

- 1. This study was limited including some locations for a short period of time. And show the PAH levels on the accumulated dust in HVAC filters.**
 - 2. Seasonal variation has to be explored in greater depth to identify the sources.**
 - 3. Food contamination in Kuwait is an important issue in educational institutions, (schools, colleges, vocational, private, public etc.), residential homes, mosques, sports clubs, wedding halls and shopping malls and official buildings is of great importance.**
 - 4. One has to use proper mitigation methods to abate the worsening air quality for productive and healthy environment for successful, intelligent and hardworking progressive nation for sustainable growth.**
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