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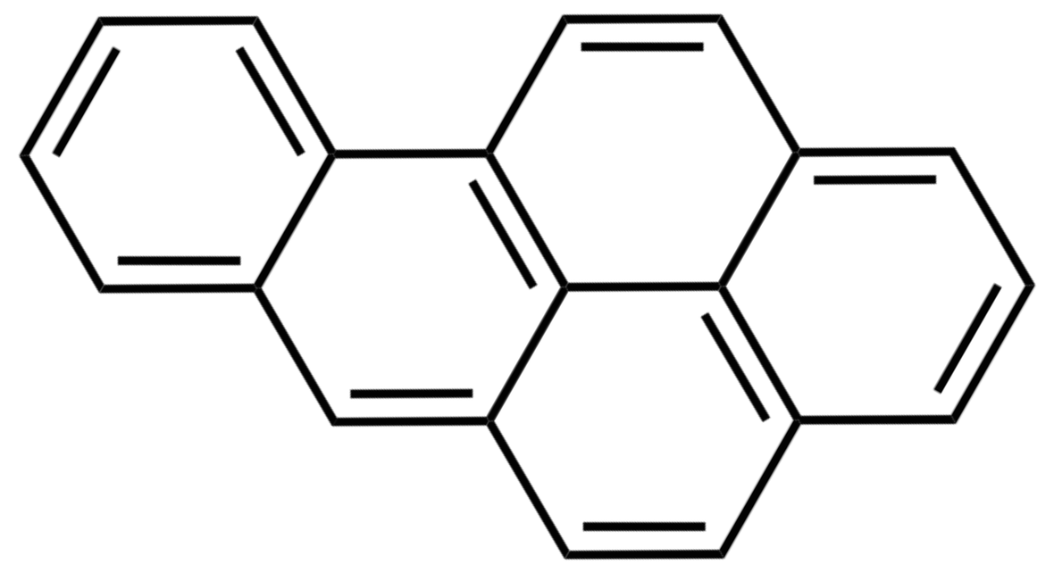
Abstract

Pollutants draining from the road in the form of road runoff are proceeding, untreated, into the soil and nearby bodies of water, like under-ground aquifers. The form of pollutant least filtered through natural means are polycyclic aromatic hydrocarbons (PAHs). These PAHs can have detrimental effect on the ecosystems surrounding the contaminated water bodies. Bioremediation of PAHs is the ideal procedure to solve this issue.

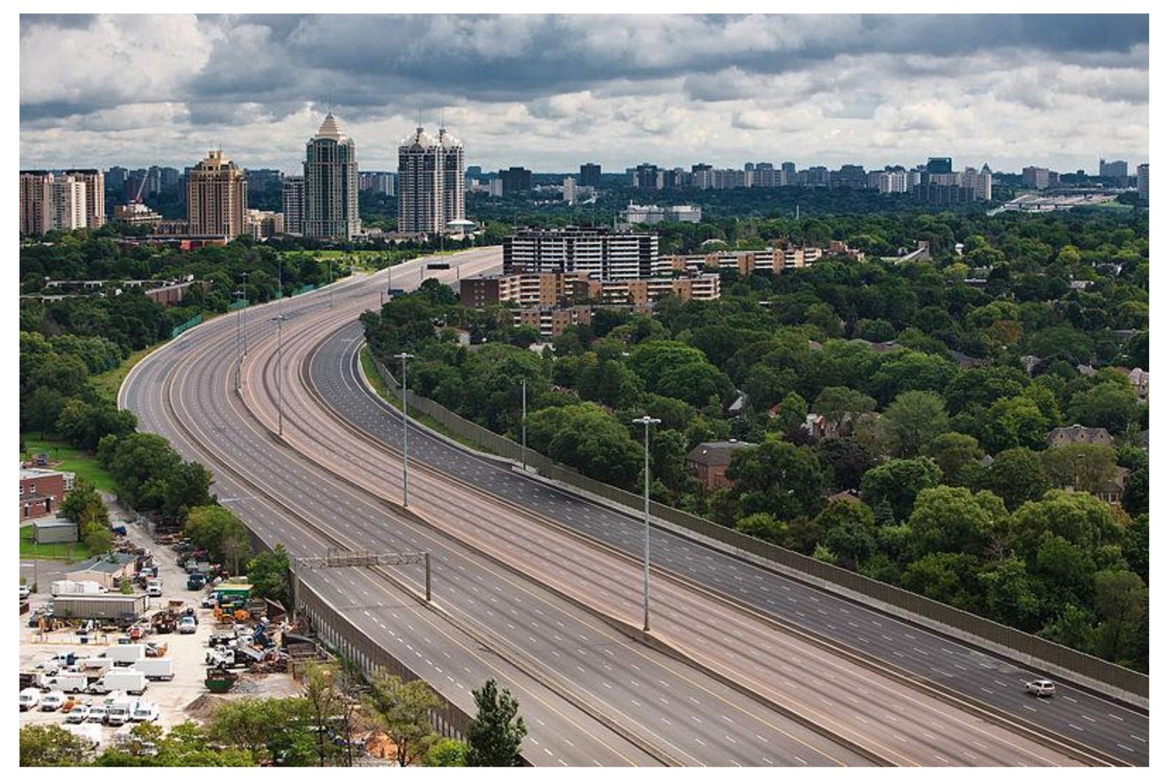
Background

- Polycyclic aromatic hydrocarbons (PAHs) are known carcinogens and mutagens.
- PAHs can cause serious allergic reactions and cancer in humans and animals after repeat exposure.
- Only 0.00001% of the composition of a watershed needs to be PAH for the watershed to be categorized as strongly contaminated.



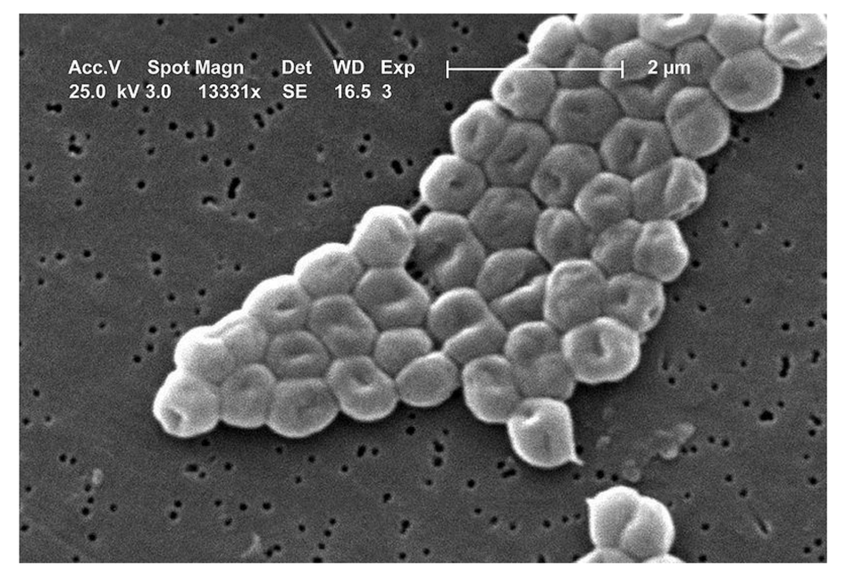
Pictured above is Benzo(a)pyrene, a highly toxic PAH with indirect links to cancer. It is one of the PAHs which can come from the burning of fuel.

Below is an image of a large highway, on which this system would have a significant effect.



Objectives

- Removing hydrocarbons from road runoff
- Developing a low impact solution
- Implementing a cost-efficient solution
- Establishing a maintenance system for the system



Acinetobacter baumannii (left) and *Pleurotus ostreatus (right) are two of the organisms which would be used in the system to maintain a healthy environment.*

Methods/Process

We examined numerous methods of filtering hydrocarbons from water including carbon filters, sand filters, and the process of bioremediation. The only process which made a significant impact on the amount of PAH contaminant was bioremediation.

Bacteria and Fungi would both be used to decompose the PAHs. Although studies have shown that bacteria are more effective, the mycelia of fungi are capable of permeating more of the soil matrix, enabling fungi to clean more area while bacteria clean more thoroughly.

Notice the structure of the fungal mycelia (pictured right). This complex fractal pattern gives fungi more surface area to interact with hydrocarbons, eliminating the pollutant.

Solution

The solution would entail the implementation of bioremediation using several different species of fungi and bacteria. The best bacteria to use *Acinetobacter, Arthrobacter,* and *Pseudomonas* spp. and the fungi are *Trichoderma, Mortierella* spp., and *Pleurotus ostreatus.* Benefits of both bacteria and fungi are necessary to make an ideal system. Monitoring of system efficacy includes water quality and microbial diversity assessment.

Conclusions

- Conventional filters cannot effectively remove hydrocarbons from road runoff
- Bioremediation is an effective and viable method of mitigating hydrocarbons
- A system utilizing the metabolisms of fungi and bacteria to break down the contamination is ideal
- In order to verify that the system is working to full potential, testing would be continuous in the form of "first flush" mechanisms and measurements of microbial diversity

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