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Dynamics of white phosphorus transformation by a culture of black aspergill

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Abstract

Previous works of our research cycle on biodegradation of white phosphorus has demonstrated a number of new and interesting results, yet unknown to the scientific world. Results revealed that microorganisms from various taxonomic groups, such as prokaryotes and eukaryotes, are able to grow and multiply in culture media in which the only source of the biogenic element of phosphorus (without which vital activity is impossible) is the extremely toxic and non-naturally occurring xenobiotic white phosphorus. A greater implication is that this substance is capable of being incorporated into biomass and utilized by the biosphere. It is imperative that the described phenomenon be studied in more detail. For example it is still unknown if the microorganisms play active role in the detoxification of white phosphorus or only utilize the products of its abiotic oxidation; as to whether the components of the culture media play a significant role in this process and whether the final product of the transformation is a harmless phosphate or a mixture of substances which include a phosphate compound.

Without an explicit answer to these questions, it will be impossible to generate a technology for the biological neutralization of white phosphorus. In this work presented, we used the methods of NMR and ESI MS to study the dynamics of the transformation of white phosphorus in a culture medium containing colonies of *Aspergillus niger* AM1 in comparison with sterile culture medium. Results revealed that the product of white phosphorus conversion is a mixture of phosphate, phosphite and hypophosphite. Despite the fact that Aspergillus is unable to oxidize phosphite and hypophosphite, it is completely resistant to these compounds, which are known to possess pronounced fungicidal properties. Nevertheless, it is still early to announce the absence of biodegradation. Further studies are required under different conditions (especially, culture media with different compositions) and with other microbial cultures. A very interesting and unexpected result was the discovery of a mutant *A. niger* AM1. In comparison with an ancestral strain this mutant possesses an unusual morphology and grows more intensively in culture medium with white phosphorus.

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