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WE036 A novel passive dosing-based PICT detection method reveals no increased tolerance to benzene, toluene, ethylbenzene and xylene (BTEX) in soil bacterial communities exposed to gasoline vapours

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The pollution-induced community tolerance (PICT) approach is used to reveal toxicant-induced adaptation in biotic communities. An uneven species-sensitivity distribution is generally considered as a prerequisite for PICT development, and it may therefore be questioned whether toxicants with non-specific modes of action (e.g. BTEX compounds showing general narcosis) are able to generate PICT responses. However, some specialized groups of bacteria possess several specific resistance mechanisms (e.g. extrusion pumps) for BTEX compounds suggesting that there should be a potential for PICT development. We here provide the first PICT study of soil bacterial communities exposed to various doses of gasoline vapours using a novel via-headspace passive dosing technology to ensure defined toxicant exposure during both PICT selection and PICT detection phases. PICT selection was carried out in sealed, yet oxic, soil microcosms (sandy loam, pH 6.8) exposed to gasoline vapours for a period of 6 weeks under controlled laboratory conditions (15 °C, dark). Inserts containing gasoline mixed in various proportions with miglyol oil were placed inside microcosms. The passive dosing approach ensured reproducible exposure as confirmed by gas chromatography-mass spectrometry analysis of carbon disulphide extracted soil samples taken during the PICT selection phase. Bacterial communities were extracted from soil microcosms after 6 weeks and PICT to gasoline and single BTEX compounds were investigated using a passive dosing [^{3}H]leucine incorporation approach. Bacterial growth activity ([^{3}H]leucine incorporation rate) and cumulated soil microbial activity (soil respiration) were measured throughout the PICT selection phase. Low gasoline exposure dramatically increased both soil bacterial growth and soil respiration rates, whereas high gasoline exposure strongly inhibited both microbial activities relative to unexposed control soil. This indicates that volatile gasoline compounds acted as both growth substrates and toxicants, respectively. Remarkably, bacteria extracted from gasoline exposed soils for 6 weeks did not show increased tolerance neither to gasoline vapours nor to single BTEX compounds. The lacking potential for community adaptation is consistent with the observed toxic effects on microbial activities (i.e. no functional redundancy following toxicant exposure) and may compromise microbial community functioning (e.g. biodegradation) in severely gasoline contaminated soils.