# Microbial Fe(III) reduciton coupling dechloriantion of organochlorine pesticides in paddy soil

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Iron reduction is a key step to influence the biogeochemical cycling of iron and plays a vital role in the reductive dechlorination of organochlorine pesticides (OCPs) in paddy soils. The interplay between iron reduction and OCP dechlorination in paddy soils is particularly important due to the high abundance and reactivity of iron, together with the high residual levels of OCPs. However, the linkage between iron reduction and reductive dechlorination of OCPs in paddy soils are not fully understood. In this study, a set of experiments for soil iron reduction and pentachlorophenol (PCP) reductive dechlorination were conducted to fill up the gap between iron reduction and PCP transformation on the view of biogeochemistry. Iron reduction occurred concurrently with PCP reductive dechlorination in paddy soils and the addition of PCP led to the decrease of iron reducibilities (≈ 16.33%) , which indicated that both Fe(III) and PCP may compete for the available electrons. However, positive correlations between the reduction rates of Fe(III) and PCP (pearson correlation coefficients r = 0.921) suggested the crucial effect of iron reduction on PCP dechlorination in soils. *Clostridium* and *Veillonella* genus, which were reporteded containing the bacteria with iron-reducing and dechlorinating abilities, were identified as the main species in the reactions. Furthermore, the typical iron-reducing bacteria (*Shewanell*a sp. and *Geobacter* sp.) and dechlorinating bacteria (*Dehalobacter* sp. and *Desulfitobacterium* sp.) were detected during the reduction of Fe(III) and PCP. The addition of PCP could enhance the abundance of these bacteria (16S rRNA gene copies increased up to $10^3$), which illustrating that reductive dechlorination of PCP could stimulate iron reduction. In conclusion, microbial iron reduction is an important reaction in soil biogeochemistry processes, which can couple with and even accelerate the reductive transformation of OCPs in anoxic paddy soils.