

Biological treatment of benzene and toluene contaminated of soil was investigated in laboratory microcosm of 16 different types for degrading benzene and toluene by indigenous bacteria. At the experimental conditions of the microcosms fast degrading benzene and toluene, moisture contents were 30% and 60% in a soil gap and content of powdered- activated carbon (PCA) for adhesion of benzene and toluene-degrading bacteria was 1% in total soil mass. At the conclusion of the shifted bacterial community, the number of benzene and toluene-degrading bacteria of indigenous bacteria considerably increased in microcosm condition of rapidly degraded benzene and toluene in comparison with microcosm condition of slow degraded benzene and toluene throughout a period of 10 days (approximately 85%~95% of total culturable bacteria). Species of benzene and toluene degrading bacteria in microcosm changed from species of Gram negative bacteria before soil exposed to benzene and toluene to species of Gram positive bacteria after soil exposed to benzene and toluene.

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**Denitrification in Carbon-Limited Real Wastewater using Pure- and Co-Culture of Bacteria from Activated Sludge**

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We selected two completely denitrifying bacteria, N6 and N23, and one partially denitrifying bacterium, R13, among culturable bacteria from control activated sludge in carbon-limited real wastewater by PCR with nirS gene primer and chemical test

with the Griess Ilosvary reagent and zinc powder. The nitrate uptake ability of the pure-culture of three selected strains in carbon-limited real wastewater was excellent compared to control activated sludge and to control strain, *Pseudomonas aeruginosa* ATCC 10145, respectively. The nitrite removing ability of the pure-culture of two dissimilatory denitrifying strains was also remarkably good, respectively. The maximum denitrifying capacity of a pure-culture among selected strains in carbon-limited real wastewater was over 170-fold of that of control activated sludge. We investigated the nitrate uptake and the nitrite removing ability of the combination co-culture of the selected strains in carbon-limited real wastewater. As opposite as we expected, the nitrite removing ability of a combination co-culture of selected strains was almost disappeared in the same condition. In addition, the denitrifying capacity of control activated sludge modified their dominant population to the selected powerful denitrifying bacteria, N6, in continuous reactor was also as poor as like that of control activated sludge. This result suggests that the denitrifying capacity of an activated sludge depends on proper distribution of bacteria to environment.

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**Analysis of Bacterial Community in Activated Sludge Amended with 1-Chloro-4-Nitrobenzene by Terminal-Restriction Fragment Length Polymorphism**

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The changes of bacterial community structure in activated sludge were monitored

by terminal-restriction fragment length polymorphism (T-RFLP). A microcosm of activated sludge was added with 1-chloro-4-nitrobenzene (1C4NB). When the sample was incubated for 1 week, the concentration of 1C4NB was reduced from 0.15 mM to 0.06 mM by indigenous bacteria. The 16S rRNA genes isolated from the bacteria in the sample was amplified by PCR and biotinylated primer. The terminal restriction fragments (T-RFs) visualized by polyacrylamide gel electrophoresis. Characteristic T-RF bands showed the 2 major and 70 minor bands in the sample without 1C4NB. On the other hand, the 8 major and 30 minor bands were appeared in the 1C4NB-amended activated sludge. In parallel, 7 strains were isolated from the activated sludge by minimal media contained 1C4NB as the sole carbon source. The 4 isolates of them revealed the 8 major T-RF bands. One of the dominant strains was closely related to genus *Acinetobacter* in the T-RF profiles.

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#### O-Serotypes and Antibiotics Susceptibility of *E. coli* Isolated from Marine Products.

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This study was practiced to investigate O-serotypes and antibiotics susceptibility to 179 isolates of *Escherichia coli* isolated from 2561 fishery samples sold in Garak agricultural and marine market from Jan to Sep, 2000. It showed 5.65% average *E. coli* isolation rates for the tested samples, highest on Aug(14.88%) but lowest on Jan(6.93%). Following the fishery groups, it showed in fish(10.51%), in mollusca(8.77%), in

crustacea(6.06%), in shellfish(4.02%) and in aquarium water(3.69%). Following the areas, in Je-Ju (13.04%) highest, but in Chung-Nam (3.93%) lowest. O158 were 28(17.3%) isolates, highest of the 162 strains which were determined among 179 *E. coli* isolates. Results in 12 kinds of antibiotics susceptibility test, every strains had antibiotics resistances at least one kind of antibiotics and of the 146 isolates had the multiple resistance at least two kinds.

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#### Isolation and identification of biofilm-forming bacteria on glasses exposed in sea water

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To isolate biofilm-forming bacteria from marine samples, glass surfaces were exposed to seawater in Dae-ho dike located in Chungcheong Province. For screening of biofilm-forming bacteria, all isolated strains were cultured for 1 day in 50 ml conical tube supplemented with filtered aged sea water and 1 glass slide. After washing with distilled water, the glass slides were stained with 0.3% methylene blue and observed with light microscope. 8 strains, which showed relatively high attached bacterial numbers, were selected for further characterization. By analysis of 16S r DNA sequences, 4 strains were identified as *Micrococcus luteus*. The others were identified as *Bacillus megaterium*, *B. thuringiensis*, *Staphylococcus saprophyticus* subsp. *saprophyticus*, and *Sulfitobacter pontiacus*, respectively. Among the isolates *B. megaterium* revealed as a potential producer of exopolysaccharide.