Degradability of Chemicals by Microorganisms in Pond Water

KIYOMATSU HASHIZUME, MASANORI NOZAWA, CHITOSE TODA, TERUYO YASUI, HIDEYUKI FURUKAWA and HIDEO NAGANO
Faculty of Pharmacy, Meijo University, Tenpaku, Nagoya 468, Japan

We investigated the microbial flora of pond water and the capacity of the water to degrade several chemicals. Water samples were collected from four ponds — which had little flow-in and flow-out and were thus thought to well reflect the regional characteristics — each located in a different environment of the city of Nagoya.

1) Water samples: Surface water was collected from the following four ponds; Tatsu (T) pond was in a park in the center of the city; Shin (S) pond was in a hilly district eastern part of the city; Ara (A) pond was in a field with small factories here and there nearby; and Makino (M) pond, the largest pond in the city, located between a residential district and a golf course. 2) Physicochemical tests were made: pH, SS, DO, BOD, COD, Cl⁻, T-N and T-P. 3) Microflora tests: Water from each pond was cultured on NB agar medium and each isolate from the water was subjected to Gram staining, motility test, oxidase test, catalase test and O/F test; classification of the isolates was carried out by the method of Cowan *et al.*¹⁾ 4) Biodegradation tests: Pond water and suspension of the isolates were used as the microbial sources, and aniline, anthracene, ethylthiometon, fenitrothion, isoxathion and simazine were employed as the test chemicals. Experiments were performed according to the Osaka University method,²⁾ and the amount of remaining chemicals was determined by gas chromatography (FID and FPD).

I. Physicochemical and microflora tests: Values of SS, T-N, T-P, BOD, COD and the viable microbial count were generally high. The genera and the count of the microflora differed among each of the four ponds, and distribution of the microflora in the same pond varied with seasonal

changes (temperature).

II. Biodegradation test: Biodegradability of aniline was 80–100% in the T, S and M ponds in September and October. Degradability of anthracene was 32% in the A pond in December, 36% in the T pond in September and October and 82% in the M pond in October. In the case of agricultural chemicals, the degradability of ethylthiometon was 69% in the M pond in July, and isoxathion and simazine were generally low, but degradability of isoxathion in the M pond in November was a high 80%.

The isolates obtained from the M and T ponds were incubated with aniline, ethylthiometon and fenitrothion, respectively. *Micrococcus* species, which were isolated at a relatively high percentage, showed the highest degradability of aniline. However, most microbes of this genus did not participate in the degradation of ethylthiometon and fenitrothion. Thus it was found that the capacity of microbes to degrade the tested chemicals differed among the species isolated.

References

- 1) S.T. Cowan, "Manual for the Identification of Medical Bacteria", 2nd ed., Cambridge Univ. Press, England, (1974).
- 2) M. Kondo, T. Nishihara, T. Shimamoto, K. Watabe and M. Fujii, *Eisei Kagaku*, **34**, 115 (1988).