

Polycyclic Aromatic Hydrocarbons (PAHs) and Mutagenicity of First Flush in Urban Runoff

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Many of polycyclic aromatic hydrocarbons (PAHs), especially benzo (a) pyrene, have been known as carcinogenic agents that are contained in exhaust gas from automobile and industrial incinerator. Recently, some of PAHs also have been suspected as endocrine disrupters. These chemicals are considered to be carried to rivers and seas through rain water drainage and road runoff. Although high concentrations of PAHs could be contained in first-flush from urban runoff, there is little measurement for PAHs in first-flush. Thus, we examined the PAHs by GC/MS and mutagenicity by *umu* test in first-flush of urban runoff.

We selected 5 sampling stations for investigation to first-flush. These stations were consisted of three discharges (St.1, 2 and 3) and two rivers (St.4 and St.5). At St.1, the rainfall discharge from roads was investigated. St.2 and St.3 were selected as sampling points to investigate discharge from agricultural area and town area, respectively. The St.4 is tributary and St.5 is the most downstream point in this survey. Sampling was performed for 120 minutes.

PAHs were measured for all samples by GC/MS. Measured samples were concentrated in 1000-fold by acetone and hexane extraction from 1L of samples. We selected 13 PAHs whose standard chemicals we could obtain.

Samples assayed with *umu* test were concentrated in 1000-fold with C18 solid phase column from the original water samples.

Concentration of PAHs at St.1 was higher than the others (St.2~St.5) where many of PAHs were under the detection limits of GC/MS method. Pyrene was detected at highest concentration among all the PAHs at all stations and ranged 0.20~0.58 μ g/L at St.1. Benzo (a) pyrene ranged 0.02~0.06 μ g/L at St.1 and were almost same concentrations as at the other stations. Asada and Ohgaki (1996) have already reported that the concentration of benzo (a) pyrene in the road runoff are 20 μ g/L at maximum in Tokyo area.

Comparing with the Asada's measurements reported in 1996, our data were lower. It may seem that difference of the concentrations may be due to strength of rainfall, intervals from the previous rainfall and difference of urban area.

We estimated mutagenicity of the rainfall by *umu* test. Mutagenicity of St.1 was only positive in all the stations. But at St.1, although PAHs concentration in all the sampling time were almost same, mutagenicity was positive before 60min of the sampling and was negative after 60min. Ono et. al. have reported high mutagenicity of the road runoff by using *umu* test that has highly sensitive to nitroarenes (Ono 1999). The differences of the mutagenicity may be due to strength of sensitivity in bacteria used to *umu* test.

This result suggests that there are mutagens of higher activity than Benzo (a) pyren in the rainfall and that low concentrations of measured PAHs couldn't cause mutagenicity.

References

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