

Exhaustive Analysis of Unknown DNA Adducts in the Livers of Wild Species and their Relationship to Biomarkers of Environmental Pollution

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Key Words: Wildlife, Ecosystem Integrity, DNA Adducts, Environmental Pollution Induced Toxicity, Environmental Law, Risk Assessment, Baikal Seal, Great Cormorant, Cytochrome P450

1. Introduction

Many pollution issues caused by anthropogenic activities have been reported and the establishment of appropriate risk assessment procedures is a matter of considerable interest. Environmental pollution is no longer an issue that affects only humans but is an issue that affects wildlife and the relationships between humans, wildlife and the global environment. The purpose of this study is to collect the data in regard to the differential sensitivity of chemicals to cause mutation in different species and to elucidate a possible mechanism(s) for mutation. This study may contribute to the establishment of risk assessment methods for wildlife and may also contribute to human risk assessment. In this study, Baikal Seals and Great cormorant were used as representative wild species. DNA adducts known to be biomarkers of carcinogenesis were methodically analyzed in DNA samples and the correlations between detected adducts and biomarkers of environmental pollution were compared.

2. Summary of Experiments

BPDE-dG derived from benzo[a]pyrene was used as a biomarker to examine the potency of air pollution in the area where the samples were captured. This study was conducted using the ³²P-Postlabeling/PAGE method. Furthermore correlation between the detected adducts and biomarkers was conducted. The adducts with strong correlation to biomarkers were reexamined to determine their molecular mass by LC/ESI-MS/MS.

3. Results

Small amounts of BPDE-dG was detected in the sample of the livers of common cormorant by the ³²P-postlabeling/PAGE method. Correlations between the detected DNA adduct by ³²P-Postlabeling/PAGE and dioxin-like chemicals and AhR mediated CYPs showed strong positive correlation. The DNA adducts were re-examined by LC/ESI-MS/MS and strong positive correlations were shown between the 515.8 molecular mass and dioxin-like chemicals and AhR, CAR or PXR mediated CYPs. The presence of environmental pollution-related DNA damage in the livers of Baikal Seals is suggested by these data.

4. Conclusions

Dioxin-like chemicals which may activate AhR and DNA adducts were formed by AhR mediated CYPs in Baikal Seals. Furthermore, potency of air pollution in the area where samples were captured suggest benzo[a]pyrene exposure to the common cormorant after detection of BPDE-dG in their DNA. DNA accumulation differences between the Baikal seal and common cormorant suggest species specific DNA accumulation. To continue the examination of DNA damage in wild species will be necessary.