An Analysis of Toxicity Assessment Methods for Chemicals Management

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1. INTRODUCTION

With the industrial development, environment is polluted by the emission of various chemicals. In the period of high economic growth, Japan experienced serious environmental deterioration caused by toxic substances. After that, laws regarding prevention of environmental deterioration such as the Basic Law for Environmental Pollution Control were enacted. However, there remains the environmental pollution caused by chemicals, and the environmental pollution caused by low level concentration contaminants such as endocrine disrupting chemicals has become an issue.

In this study, aiming the future chemical management, toxicity assessment methods used in the current system for chemical management were surveyed. In addition, the problems of the toxicity assessment methods were discussed and a new concept for the methods was suggested.

2. TARGETS FOR INVESTIGATION

First of all, current framework of chemical management and toxicity testing methods of Japan were overviewed. Due to most of the environmental problems are concerned with chemicals directly or indirectly, chemical management is mentioned in many environmental laws. In this study, laws which regulate the chemicals affecting human health or ecosystem directly were set as targets. Also, because international cooperation for chemical management is occurring in recent years, the international framework for chemical management was also overviewed.

3. DISUCUSSION

(1) Problems of Chemical Management

Many existing chemical substances manufactured before the enactment of the law concerning the permission of producing new chemical substances are used without toxicity information. In addition, the quality regulation for the effluent water and gas targets only the chemicals which have standards. Furthermore, the way to control chemicals emissions is practiced by the concentration measurement whether standards were satisfied or not.

(2) Suggestion for improvements

The existence of unknown toxic chemicals in the effluent water and gas cannot be denied due to the toxicity assessment being not progressing. To reduce the total amount of chemicals in the environment, it is effective to decrease the whole amount of toxicity expression instead of reducing the concentration of certain chemicals. Therefore, it is proposed that the chemical management should adopt the methods of assessing the extent of toxicity discharged into environment, and methods that can detect various kinds of toxicity are preferable. In concrete terms, it is useful that the Microarray which is able to detect the biomarkers indicating each toxicity expression at one time is developed and used for determining the types or existence of toxicity. To develop this device, the experiment for selection of the available biomarkers for the dioxin was performed and several available biomarkers candidates were presented.

4. CONCLUSION

This study revealed that there are great concerns about environmental contamination caused by existing chemicals due to lack of toxicity information. And, to assess the existence of toxicity, bioassays using microarrays containing the biomarkers of many kinds of toxicity is proposed. At the beginning biomarkers for dioxin exposure were determined