

The Current Situation of Human Fetal Exposure to Several Endocrine Disruptors in Japan

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*Introduction

Concerning the endocrine disruptor issues, also known as “environmental hormone issues”, scientists all over the world are now conducting researches to try to discover the mechanisms how endocrine disruptors act in human body, and the causal relations between the substances and the effects. The timing of exposure seems to be intimately related to the effect of environmental hormones on humans. In other words, it is believed that the effect of low-level exposure to chemical substances during the fetal and infant stages appears later on. This paper provides a brief description of to what extent fetuses in Japan are exposed to chemical substances such as environmental hormones, and new attempts to reduce the risk of exposure to such substances.

*Current Situation of Fetal Exposure in Japan

The authors conducted a study of exposure of Japanese fetuses to chemical substances, by measuring the amount of the substances in the umbilical cords and cord serum. Numbers of substances have been detected so far, including dioxins (PCDDs, PCDFs, co-PCBs), PCBs, organochlorine pesticides (DDT, DDE, aldrin, BHC, chlordane, etc.), heavy metals, bisphenol A, and phytoestrogens (genistein, etc.).

A correlation among accumulative substances, whereby when a concentration of one substance is high, others also tend to be high, has been confirmed. Also, the concentration in the umbilical cord tends to rise along with the mothers' age at which she bears her first child. This means that various types of chemical substances pass on from the mother to the fetus via the placenta. In other words, fetuses in Japan are being contaminated by complex mixture of chemical substances. (For more information on the author's study, see FY1999 and FY2000 “Report on continued study of exposure of human umbilical cords to dioxins etc. and study on Japanese testes.” in Japan Public Health Association Magazine.)

*Direction of research for reducing risk of fetuses being exposed to chemical substances

The uterus should be a clean environment by its nature, free of synthetic chemicals. We cannot guarantee that the health of human fetuses will not be affected by low level but multiple chemicals exposures, and it is therefore necessary to devise a new risk management method.

We therefore attempted to establish a new framework (1) as an effective strategy of reducing risk of multiple chemicals exposure to fetuses and a method of reducing risk using “risk communication” embraced by municipal residents, government and industry.

We already know that fetuses are exposed to multiple chemical substances, and we need to assess risk of these substances. If the risk is as evident and serious as that of substances like dioxins and PCBs, the government must respond and industry must voluntarily work to conform to regulations. However, even if there is risk of complex contamination by environmental hormones and minute quantities of chemical substances, the government will not take action and industry will not conform to regulations

concerning those not considered to be a serious threat or those for which risk is unknown or cannot be determined.

Concerning the substances for which the risk is both evident and serious, applying the primary, secondary and tertiary preventive medicines can reduce the risk. At the same time, concerning substances for which the risk is unknown, a completely new concept of “environmental preventive medicine” needs to be adopted. The purpose of this concept is to have society at large reduce the amount of chemicals used and the amount of chemicals to which we are exposed, and it is one step before the primary prevention. This step should be called “pre-primary prevention”. Risk communication can be an effective tool for putting the pre-primary prevention into practical, through which the initiative is ultimately tied to comprehensive risk management.

Risk communication is originally defined as “sharing accurate information concerning environmental risk of chemical substances by government, industry, the public and NGO in order to realize mutual understanding.” If we are going to use risk communication as a tool to reduce the adverse health effect by multiple chemical substances, however, we must make it function as a “comprehensive method of reducing risk of humans to be contaminated by chemical substances.”

Important thing that we must remember is, when technology to analyze genes and chemical substances in the body makes progress in the near future, those who have received the information should be mentally followed up. In specific terms, this means that when it becomes clear that someone is highly susceptible to certain substances by genetic background, or when it is determined that some certain chemical substances highly accumulate in someone’s body, it is not enough if he/she is conveyed the information. The person must also be advised what to avoid eating or what to be careful in daily life, and receive counseling to deal with psychological anxiety. In addition to participation of city residents, municipalities and the industry, the media and researchers of universities and organizations also play an important role in transmitting and conveying information.

Specific contents of risk communication have been omitted here for the sake of convenience.

***Conclusion**

Recent research has revealed that the fetuses in Japan have been exposed to a complex mixture of chemical substances. We have now entered the era for studying the effects and the risk assessment. For this purpose, a new assessment method considering genetic background and complex exposure will probably be needed.

With the arrival of the post-genome age, the concept of “toxicogenomics,” which attempts to determine toxicity of a substance from genetic information, has been adopted for the field involving the problem of environmental hormones. Due to advancements in “bioinformatics,” whereby vital phenomena and reaction are combined with various types of vital data and analyzed by computer, it is expected dramatic advancements in research of risk assessment of environmental hormones (2). In addition to exposure assessment and risk assessment, risk communication including guidance and counseling will probably be needed in order to advance measures to prevent people from being adversely affected.

References

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