

CHEMI-LESS TOWN PROJECT TO PREVENT SICK BUILDING SYNDROME: FROM THE VIEW OF THE ENVIRONMENTAL PREVENTIVE MEDICINE USING SUSTAINABLE HEALTH TOWN BY DECREASING THE USE OF CHEMICALS

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ABSTRACT

There is increasing number of people suffering from “Sick-building Syndrome” in Japan. Therefore, we started “Chemi-less Town Project”, building a model town in which buildings are constructed with fewer chemicals. In this paper, we introduce the background, concept and current situation of the project. We made the key word, “Chemi-less”, which means “fewer” chemicals. In the model town, there are houses, clinic, school, library and park. At the clinic, we will practice the environmental preventive medicine. While decreasing the harmful chemicals in the town, we will carry out to create better environment in order to prevent possible adverse health effects, and to increase the quality of life of future generations. In five years, we would like to suggest new standards of houses and buildings, so that people can choose materials and technique to make towns according to the target level. Using Chemi-less Town project, we will spread our idea world wide, about the necessity of sustainable health town for future generations from the view of the environmental preventive medicine.

KEYWORDS

Chemi-less town, Environmental Preventive Medicine, Sick-building syndrome, Sustainable health

INTRODUCTION

In modern society, people are exposed to uncountable chemicals (Mori 2001, Mori 2004). Only handful chemicals are clear about its health effects to humans. Almost nothing is clear about the relationship between multiple chemical exposure and human health, especially the effect to children and fetuses (Mori 2001, Mori 2004, Needam and Sexton 2000). Our previous studies showed that fetuses were contaminated by many chemicals from mothers in Japan (Mori 2001, Todaka and Mori 2002, Mori et al. 2003, Fukata et al. 2005, Todaka et al. 2005). Many chemicals which were detected from the umbilical cords of newborn babies did not exist until just 100 years ago, and nobody can say

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that there will be no health effect. As a result of our studies on the health effect of environmental chemicals, we have tried to find a way to solve the problem fundamentally (Mori 2004), and suggested to decrease the chemicals in the environment as preventive medicine (Todaka et al.2005, Omori-Inoue et al. 2005, Todaka et al. 2005, Sakurai et al.2004, Sakurai et al. 2006, Toscano and Mori 2007, Mochida et al. 2007). We call it "Environmental Preventive Medicine"

Stronger attention should be paid to indoor air quality since most of the people stay indoor almost all of the day. In Japan, indoor air quality is now regulated by law, however, it is only about formaldehyde and chlorpyrifos (MLIT 2003) There is a concern about the adverse health effect of various chemicals from building materials to humans, especially to children (Needam and Sexton 2000, WHO 1986). Currently, about 10% of Japanese population is reported to have sensitivities or actually showing some symptoms induced by chemicals indoor air (Research group on "Sensitivity difference among people and among animals" 2005), that is called 'sick-building syndrome' (MLIT 2002). In strategy against sick-building syndrome, it is not practical to find the cause one by one and take actions for each because there exists uncountable chemicals in the environment. Therefore, the authors have tried to apply the strategic method by environmental preventive medicine, and are now building a model town in a university campus. In the model town, houses and buildings are built with materials contain chemicals as few as possible, and it is called "Chemi-less Town". In this paper, we will introduce the background, the concept and the current situation of Chemi-less Town project. The purpose of this paper is to clarify the concept of the "Chemi-less Town" and to spread our idea about the necessity of sustainable health town for future generations world wide.

1. BACKGROUND

Our group has investigated human fetal exposure to multiple environmental agents in Japan by analyzing umbilical cords and cord blood (Mori 2001, Mori 2004, Todaka and Mori 2002, Mori et al.2003, Fukata et al. 2005, Todaka et al. 2005). Human umbilical cords, a part of the fetal tissue, were collected from normal newborns. Our human fetal exposure assessment revealed that at least twenty environmental pollutants have been transferred from mothers to their fetuses through placenta (Mori 2001, Mori 2004, Todaka and Mori 2002, Mori et al.2003, Fukata et al. 2005, Todaka et al. 2005). The detected chemicals and toxicants were polychlorinated biphenyls (PCBs), dioxins, DDTs, DDEs, pesticides, phytoestrogens and heavy metals (Cd, Pb). All of these chemicals and toxicants were detected in about 100% of the umbilical cords investigated in our studies. Our fetal exposure assessment shows that human fetuses are actually contaminated by multiple pollutants (Mori 2001, Mori 2004, Todaka and Mori 2002, Mori et al.2003, Fukata et al. 2005, Todaka et al. 2005). In the above studies, only about twenty pollutants were detected because of the analytical difficulties, however, it is easily estimated that the actual contamination is much severer.

Our results of fetal exposure assessment led us have tried to find a way to protect future generations by establishing the environmental preventive medicine (Mori 2004, Todaka et al. 2005, Omori-Inoue et al. 2005, Todaka et al. 2005, Sakurai et al. 2004, Sakurai et al. 2006, Toscano and Mori 2007, Mochida et al, 2007). The health effects by these chemicals are not clear because the exposure level is different each person, and the sensitivity to chemical contamination is also different. There is no scientific proof to insist these contamination actually affect children (Needam and Sexton 2000, WHO 1986).

However, many chemicals which were detected from the umbilical cords of newborn babies did not exist until just 100 years ago, and nobody can say that there will be no health effect. To solve this problem fundamentally, we proposed the application of environmental preventive medicine based on precautionary principle and started the project of environmental preventive medicine for future generation in Chiba University in 2003 (Figure 1) (Mori 2004, Todaka et al. 2005, Omori-Inoue et al. 2005, Todaka et al. 2005, Sakurai et al. 2004, Sakurai et al. 2006, Toscano and Mori 2007, Mochida et al, 2007). As the first target disease which is prevented to be effective by application of our environmental preventive medicine projects, we picked up 'Sick-building syndrome' in our practical study.

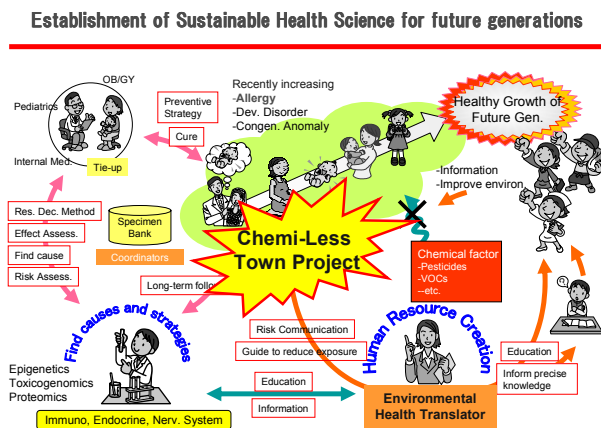


Figure 1. Our challenging framework to establish environmental preventive medicine

2. CONCEPT OF CHEMI-LESS TOWN PROJECT

Currently, about 10% of Japanese population is reported to have sensitivities or actually showing some symptoms induced by chemicals indoor air, that is called 'Sick-building syndrome' (MLIT 2003, Research group on "Sensitivity difference among people and among animals" 2005, MLIT 2002). It is a series of symptoms such as dizzy, headache, asthma, throat ache, caused by volatile organic compounds (VOCs) in newly constructed or reformed buildings. It is called "Sick-house syndrome" in Japan, and if it happens in school, it is called "Sick-school syndrome". As about 10% people are potentially sensitive to those chemicals, sensitive adults and children tend to show the symptoms if they stay in newly constructed buildings (Research group on "Sensitivity difference among people and among animals"2005). However, the symptoms disappear if the environment is improved. In other words, sick-building syndrome is comparatively easy to prevent.

At present, only formaldehyde is regulated by the national law to be under 0.08ppm, however, other chemicals are not legally regulated (MLIT 2003). The number of patients suffering from the syndrome is increasing, and urgent management of harmful chemicals is required. However, it is extremely

difficult to find what chemicals actually cause the syndrome. It is not practical to find the cause one by one and take actions for each because there exist uncountable chemicals in the environment. We suggested building a town in which buildings are constructed with fewer chemicals, and the greens such as gardens and trees are managed with fewer chemicals.

According to our project of environmental preventive medicine for future generation, we decided to practice environmental preventive medicine at our university campus, and we are now constructing a model town, called "Chemi-less Town" under the concept of "Environmental Preventive Medicine" (Figure 2).

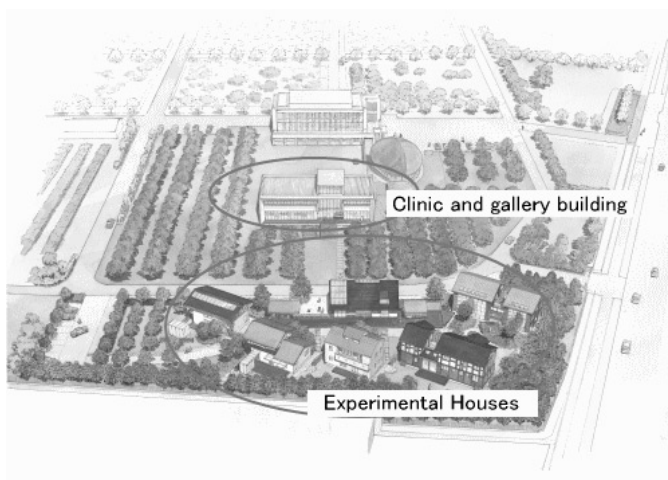


Figure 2. Scheme of Chemi-less Town

The word "chemi" means "chemicals", and "less" means "fewer". It is not a right English, but we named it because it is easier for Japanese people to pronounce.

In this project, not only medical science, but also engineering, architectural, agricultural sciences gather transdisciplinary, for one purpose, for the health of the future generations.

In the model town, there are houses, clinic, school, library and park. In five years, we would like to suggest three categories of houses and buildings, so that people can choose materials and technique to make towns according to the target level. the project of environmental preventive medicine for future generations. The town itself is sustainable health town and people can enjoy better quality of life there. Also, we will suggest other countries to use the data when they plan to build a town.

3. CURRENT SITUATION OF CHEMI-LESS TOWN PROJECT

In Chiba University, Chemi-less Town is now under construction in the campus. Four Experimental Houses (EH) have been already built in April, 2007 (Figure 3). The characteristics of the EHs are as follows:

EH1 was built by using the materials of which VOCs concentration was as low as possible when measured (Fig. 3A).

EH2 is based on the commercial house including some new materials that decrease existing VOCs (Fig. 3B).

Figure.3. Experimental houses in Chemi-less Town



A: Experimental House 1



B: Experimental House 2

EH3 was built under the concept of "classic" Japanese house (Fig. 3C).

EH4 was built using volcanic ashes that decrease VOCs in the indoor air (Fig. 3D).



C: Experimental House 3



D: Experimental House 4

Construction of other buildings including clinic for environmental medicine and information library will be finished in December, 2007. We have measured the concentration levels of VOCs in the EHs and started researching how people feel while staying in the EHs, by using questionnaires. Further medical researches will be followed in the future. The target of the researches is fetuses and children, and the target diseases are child allergy and sick-building syndrome.

The current project was introduced as one of the new technologies to prevent allergy in daily life by the Ministry of Economy, Trade and Industry of Japan in 2006. The results of the project will be open to public all over Japan, and we will suggest as one of the possible future towns for future generations, and we hope this idea will spread to Asian countries and all over the world.

CONCLUSION

Rapid economical growth based on mass production, mass consumption and mass disposal has caused health disorders originating in the environment. Twenty-first century is an era of preventive medicine. Recently, we have investigated the relationship between environment and health from a scientific perspective and develop new academic fields that will contribute to create healthy environment for future generations. In this paper, we summarized our studies on fetal exposure assessment and our social activity on environmental preventive medicine, and introduced our recent challenge project "Chemi-less Town project". Using the results of the project, we will spread our idea world wide about the necessity of sustainable health town for future generations from the view of the environmental preventive medicine since the multiple contaminations of future generations are not confined only to Japan.

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