DECREASE IN BLOOD LEVELS AND BODY BURDENS OF HIGHLY TOXIC DIOXIN CONGENERS AFTER ONE YEAR INTAKE OF FBRA IN JAPANESE

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Introduction

Our environments including food have been polluted with extremely toxic dioxins which are polychlorinated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and coplanar polychlorinated biphenyls (Co-PCBs) [1, 2]. Consequently, humans also have already been contaminated with these compounds [3, 4].

Adverse health consequences of dioxins have been investigated in the foetus and suckling which are considered the most sensitive stages of human life. In fact, we have already observed their unfavorable effects on thyroid hormone and immune response systems in Japanese infants perinatally and lactationally exposed to them [5, 6, 7, 8].

In order to avoid or prevent their adverse health consequences on foetuses and sucklings, active reduction of their contamination levels in mother's body, particularly for highly toxic congeners, seems quite important. In rats, dietary fiber and chlorophyll have been shown to promote the fecal excretion of PCDDs probably due to the inhibition of their absorption and reabsorption in the digestive tract to some extent, and therefore to decrease their levels in rat liver [9, 10].

In this study, we examined whether such kinds of effect were observed by FBRA, which was the brown rice fermented with *Aspergillus-oryze* and rich with dietary fiber, for two extremely toxic dioxin congeners, 1,2,3,6,7,8-hexaCDD (HxCDD) and 2,3,4,7,8-pentaCDF (PenCDF) or not in Japanese adults.

Materials and Methods

FBRA has been manufactured for 30 years with Genmaikouso Corp., Sapporo, Japan, and over 100,000 people have been taking it as one of health foods.

Nine married couples of 37 to 48 ages voluntarily participated in this study, and were divided into two groups, which were matched for sex and age. One of these groups had taken 7.5 to 10.5g of FBRA after each meal three times a day everyday for 1 year and the other not.

Before starting this study, blood levels of HxCDD and PenCDF in both groups were determined twice at 1 week intervals by high resolution GC/MS method [11], which were expressed as original levels. In order to examine the effect of FBRA on their excretion from the body, their blood concentrations were measured again twice at 1 week intervals 1 year after the intake of FBRA in both groups.

Their mean levels before and 1 year after the intake of FBRA were calculated in each group. Then total body burdens of both groups were computed on the assumption that mean body weight was 60 kg and body fat was 20 % of body weight, that is, 12 kg of body fat and compared each other.

Results and Discussion

Changes in individual concentrations of HxCDD in the blood of FBRA-intake and non-intake groups are shown in Fig. 1. Average original levels of HxCDD in the blood were 25.5 and 18.8 pg /g lipid in FBRA-intake and non-intake groups, respectively. After 1 year, respective mean blood levels of HxCDD were 16.8 and 14.2 pg/g lipid in FBRA-intake and non-intake groups.

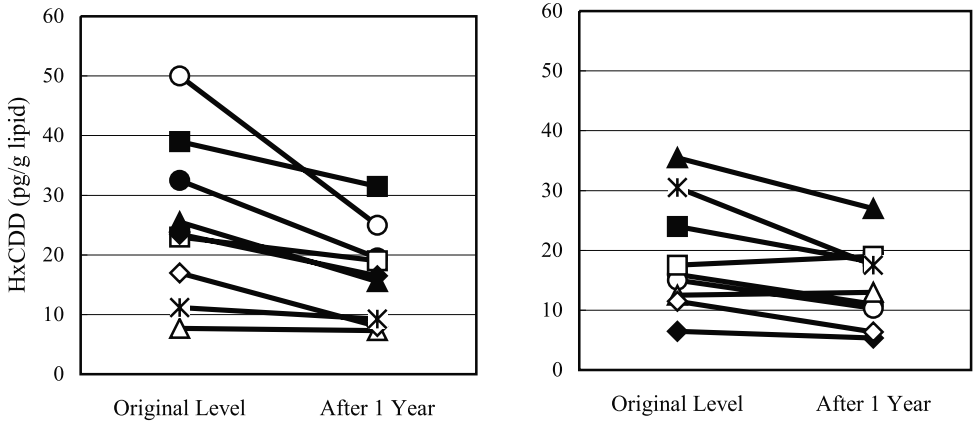

Figure 1. Changes in individual concentrations of HxCDD in the blood of FBRA-intake (left) and non-intake (right) groups

In order to investigate the change in their blood levels more in detail, their individual relative concentrations were computed based upon their respective original ones as the standard (1.0), as indicated in Fig. 2. In the FBRA-intake group, all the relative blood levels were decreased in 9 subjects and the average relative level was 0.70. In the non-intake group, however, relative concentrations in the blood showed a bit increase in 2 subjects, and the mean relative level was 0.77. Therefore, FBRA was considered to promote the excretion of HxCDD from the body, because we have observed very good correlation between their blood levels and those in other tissues such as the liver and adipose tissue [12, 13].

Mean concentrations of HxCDD in the blood are shown in Fig. 3 before and 1 year after the clinical trial in FBRA-intake and non-intake groups. In the former group, 34 % reduction in the blood level of HxCDD was observed 1 year after the intake of FBRA. In the latter group, however, the reduction rate was 25 %. Consequently, the difference of the two groups in concentrations of HxCDD in the blood was only 2.6 pg/g lipid, which was about 2.6 times less than that in the initial one. Based upon those blood levels, as shown in Fig. 4, total body burdens of HxCDD in FBRA-intake group were calculated 305800 and 202067 pg, respectively, before and after the trial. Respective these figures in non-intake group were 225267 pg and 170000 pg. As a result, 103733 pg of HxCDD was considered to be evacuated from the body, as indicated in Fig. 5. In the same manner, decrease in the total body burden of 55267 pg was computed in non-intake group. Accordingly, HxCDD excretion from the human body seemed about 1.9 times more promoted by FBRA.

We observed the same kind but more pronounced effect of FBRA on PenCDF levels in the blood of the FBRA-intake group and the body burden was 2.1 times more decreased in FBRA-intake group than in non-intake one. Therefore, FBRA seemed to promote the excretion of extremely toxic dioxins such as HxCDD and PenCDF from the human body and effectively decrease their body burden.

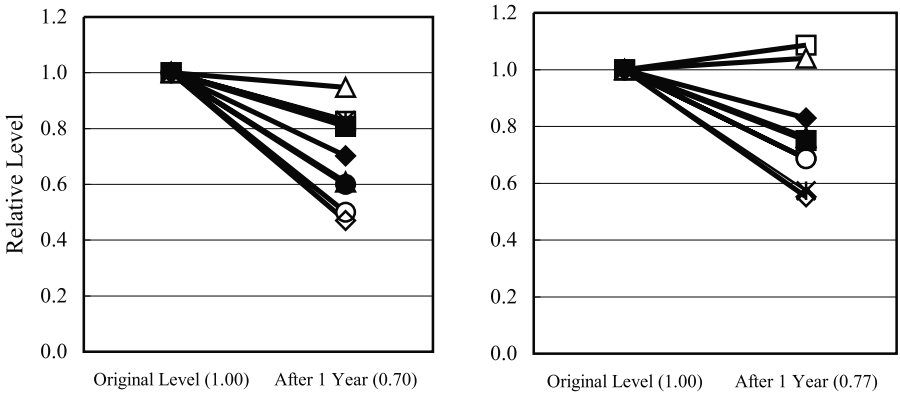

Figure 2. Relative changes in the concentrations of HxCDD in the blood of FBRA-intake (left) and non-intake (right) groups 1.0; Original blood levels in respective groups (the standard)

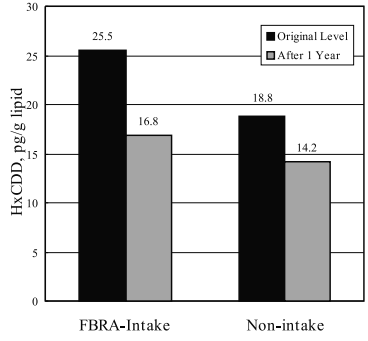

Figure 3. Average concentrations of HxCDD in the blood of FBRA-intake and non-intake groups FBRA-Intake Group ; -34 %, Non-Intake Group ; -25 %

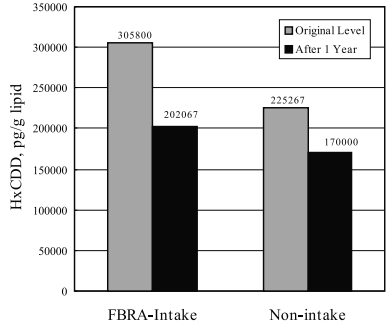

Figure 5. Decrease in total body burdens of HxCDD in FBRA-intake and non-intake groups

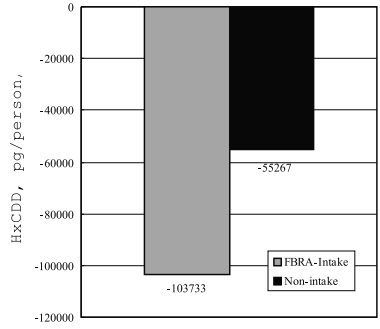

Figure 4. Changes in total body burdens of HxCDD in FBRA-intake and non-intake groups

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