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Relationship of clinical symptoms and laboratory findings with blood levels of PCDFs in patients with Yusho

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Summary

Background and objective: Since the Kanemi Yusho poisoning incident, patients with Yusho have been followed up for 35 years in annual health examinations for Yusho symptoms by a national Study Group for Yusho. Because of recent advances in the technology for the measurement of dioxins, the determination of blood polychlorinated dibenzofuran (PCDF) levels has become possible with high accuracy. Thus, the purpose of this study was to investigate the relationship between clinical symptoms and dioxins, one of the causal agents, in patients with Kanemi Yusho oil poisoning disease.

Methods: The participants were patients with oil poisoning disease who had undergone general examinations including measurement of PCDF levels, internal medicine, examination sheet (biochemistry, hematology), and dermatological, dental and ophthalmological examinations in 2001 and 2002. We investigated the presence or absence of symptoms in these examinations and the relationship with PCDF levels by methods such as three-way analysis of variance (ANOVA).

Results: Large differences were found between the examination results in 2001 and those in 2002. Items for which the relationship between the symptoms or the results and PCDF levels was currently considered strong were polychlorinated biphenyl (PCB)-related items, and items of a gingival nature and gingival sites.

1. Introduction

Yusho is a food poisoning by rice bran oil (Kanemi oil) that occurred mainly in western Japan in 1968 [1]. Polychlorinated biphenyls (PCBs), used as a heat conductor during the refining process of rice bran oil, were initially believed to be the causal agent.

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Subsequently, dioxins such as polychlorinated dibenzofurans (PCDFs), produced from PCBs under high temperature, were suspected to be involved in the pathogenesis of Yusho [1–6]. At present, Yusho is considered to be a combined poisoning by PCBs, dioxins and their related congeners.

In accordance with the recent technical advances in the measurement of dioxin concentration, the Study Group for Yusho started to assess the blood levels of dioxins in the annual medical check-up from 2001.

In this study, based on data from the medical examinations, we investigated the correlation of blood concentrations of PCDFs with the clinical symptoms and laboratory findings in patients with Yusho.

Table 1 The laboratory examination sheet of the annual medical check-up of Yusho patients

Blood concentration of PCBs and PCB-related compounds	
Total PCB	ppb
Peak 1 (2,4,5,3',4'-pentachlorobiphye	ppb
Peak 2 (2,4,5,2',4',5'-hexachlorobiph	ppb
Peak 3 (2,3,4,5,3',4'-hexachlorobiphy	ppb
PCB pattern	A B BC C
CB ratio	
Total PCQ	ppb

Urinalysis					
Protein	-	±	+	++	+++
Sugar	-	±	+	++	+++
Occult blood	-	±	+	++	+++
Urobilinogen	-	±	+	++	+++
pH					

Hematological examination	
Erythrocyte sedimentation rate (ESR)	mm
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White blood cell count (WBC)	$\times 10^3/\mu l$
Red blood cell count (RBC)	$\times 10^4/\mu l$
Hemoglobin	g/dl
Hematocrit	%
Mean corpuscular volume (MCV)	μm^3
Mean corpuscular hemoglobin (MCH)	pg
Mean corpuscular hemoglobin concentration (MCH	$\times 10^4/\mu l$
Platelet cell count	

Blood chemistry	
Total bilirubin	mg/dl
Direct bilirubin	mg/dl
Glutamic-oxaloacetic transaminase (GO	U/l
Glutamic-pyruvic transaminase (GPT)	U/l
Total protein	g/dl
Albumin	g/dl
A/G	
Zinc sulfate turbidity test	K.U.
Thymol turbidity test	K.U.
Alkaline phosphatase (ALP)	U/l
Leucine aminopeptidase	U/l
γ-glutamyl transpeptidase (γ-GTP)	U/l
Cholinesterase (ChE)	U/l
Lactate dehydrogenase (LDH)	U/l
Creatine phosphokinase (CPK)	U/l
Total cholesterol	mg/dl
High-density lipoprotein (HDL) choles	mg/dl
Triacylglycerol	mg/dl
β-lipoprotein	mg/dl
Blood urea nitrogen (BUN)	mg/dl
Creatinine	mg/dl
Sodium (Na)	mEq/l
Potassium (K)	mEq/l
Calcium (Ca)	mg/dl
Inorganic phosphorus (P)	mg/dl
Amylase	U/l
Blood sugar	mg

Immunological examination			
HBs antigen	-	±	+
α-fetoprotein			ng/ml

CB ratio: concentration ratio of 2,3,3′,4,4′,5-hexachlorobiphenyl/2,3,3′,4,4′,5-pentachlorobiphenyl; A/G: albumin/globulin ratio; HBs: hepatitis B surface; PCB: polychlorinated biphenyl; PCQ: polychlorinated quarterphenyl.