

Fig. 15 2003/1/30 “Neo-paint Thor” (cleaning materials for paint: a high-quality alcohol ester detergent / natural oils detergent / inorganic powder grain) was used for cleaning disk in classroom. After using it, he had a dizziness, nausea, headache. In orthostatic stress test O<sub>2</sub>Hb fell on standing up. Dizziness was occurred on standing. 25 minutes later after sumatrpant0.6mg subcutaneous injection O<sub>2</sub>Hb was improved temporarily. But 30 minutes later after sumatrpant0.6mg subcutaneous injection O<sub>2</sub>Hb turned worse again. Sumatrpant0.6mg subcutaneous injection was added. Sumatrpant0.9mg subcutaneous injection 25 minutes later (65 minutes later after first injection) O<sub>2</sub>Hb was improved. 50 minutes later after sumatrpant0.9mg subcutaneous injection (90 minutes later after first injection), when orthostatic stress test was continued, O<sub>2</sub>Hb fell

Case 1

### Orthostatic stress test

2003/1/30 15years old

“Neo-paint Thor” (cleaning materials for paint : a high-quality alcohol ester detergent / natural oils detergent / inorganic powder grain) was used for cleaning disk in classroom. After using it, he had a dizziness, nausea, headache.

2003/1/31 Inspection was done

2003/1/31

25 minutes later after Sumatrpant0.6mg subcutaneous injection O<sub>2</sub>Hb was improved temporarily

2003/1/31

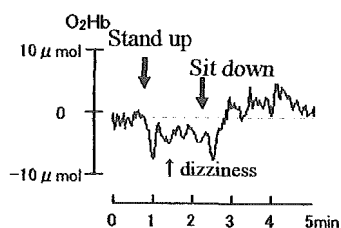
30 minutes later after Sumatrpant0.6mg Subcutaneous injection O<sub>2</sub>Hb turned worse again

2003/1/31

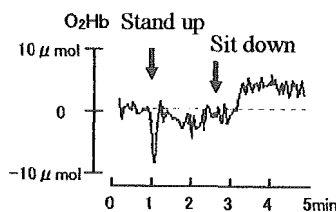
Sumatrpant0.9mg subcutaneous injection 25 minutes later (65 minutes later after first injection) O<sub>2</sub>Hb was improved

2003/1/31

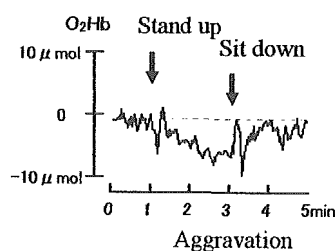
50 minutes later after Sumatrpant0.9mg subcutaneous injection (90 minutes later after first injection) When orthostatic stress test was continued, O<sub>2</sub>Hb fell



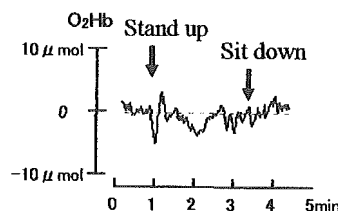
Before Sumatrpant0.6mg subcutaneous injection  
Positive



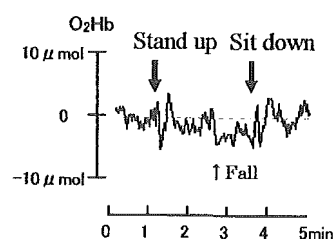
Sumatrpant0.6mg subcutaneous injection 25 minutes later  
Improved



Aggravation



Improved



Aggravation in orthostatic stress of long time

Fig. 16 A change of the views of gas inhalation load test in case 1

A change of the views of gas inhalation load test

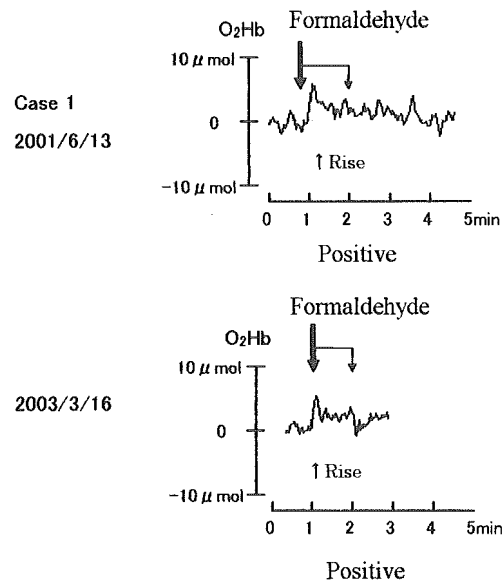


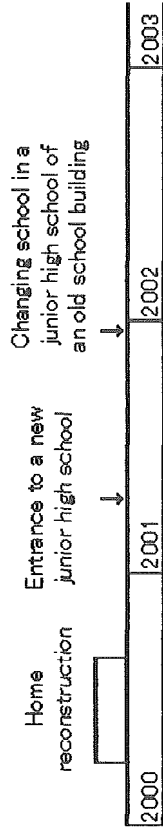
Fig. 17 Clinical course of case 2

## Case 2 Clinical course

Case 2 NSY Male

Born in August, 1987

A.D.

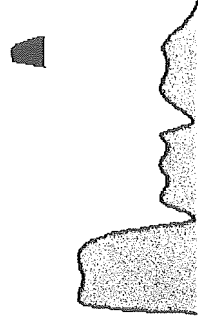


Bronchial asthma

Severe  
Moderate  
Mild

Neurological symptoms  
(Headache, Nausea,  
Dizziness on standing up  
etc.)

Severe  
Moderate  
Mild



Medication

RBC Cholinesterase (Units)  
Serum Cholinesterase (U/l)  
Igerist (IU/ml)  
Igerast (Class)

|                              |             |
|------------------------------|-------------|
| Pemolast potassium           | 1.8         |
| A butyric acid bacteria drug | 285         |
| Amezinium metilsulfate       | 879         |
| Tsumura no.29 Bakumondo-to   | Mite2Yeast1 |

Toluene (ppm) in A gymnasium of junior high school

↑ ↑  
0.32 0.04

The measurement of  
chemical substance in  
house

TVOC  $\mu\text{g}/\text{m}^3$   
Toluene  $\mu\text{g}/\text{m}^3$   
m,p,o-Xylene  $\mu\text{g}/\text{m}^3$   
Formaldehyde ppm  
Acetaldehyde ppm  
Para dichlorobenzene  $\mu\text{g}/\text{m}^3$

↑  
1005.1  
270.8  
17.1  
0.141  
0.200  
229.4

Fig.17 別 FILE

Fig. 18 The views of gas inhalation load test in case 2

In a gas inhalation load test, O<sub>2</sub>Hb fellated in xylene and toluene inhalation.

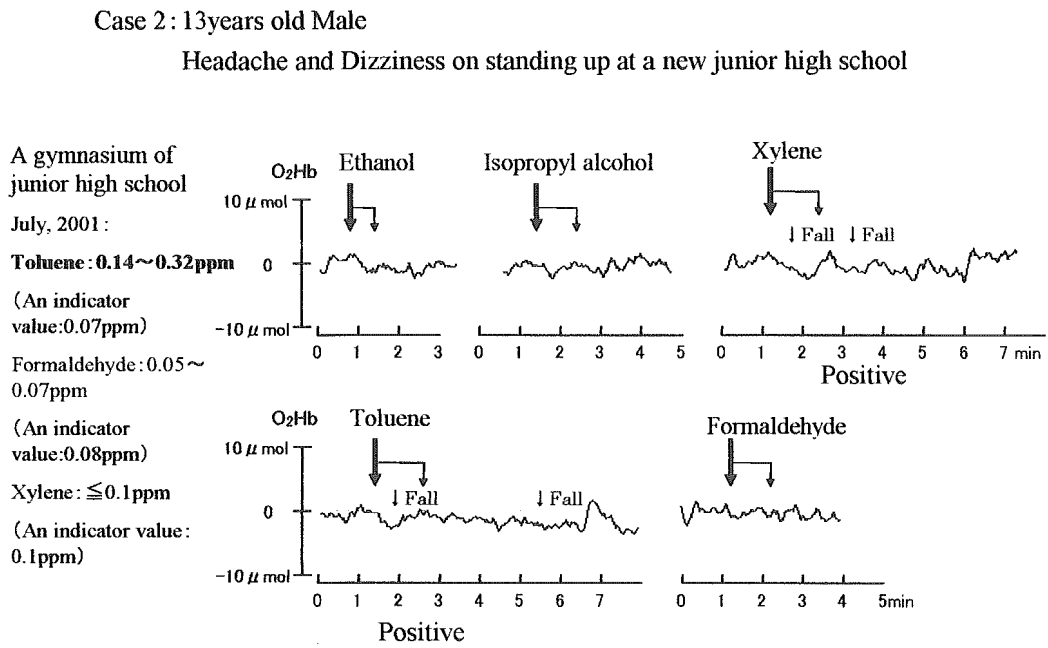


Fig. 19 The views of orthostatic stress test in case 2

By orthostatic stress test, O<sub>2</sub>Hb fell and headache was induced in standing before inhalation load. By orthostatic stress test after gas inhalation load, O<sub>2</sub>Hb fell obviously, and headache and dizziness occurred in standing.

Case 2 Orthostatic stress test before and after gas inhalation load test

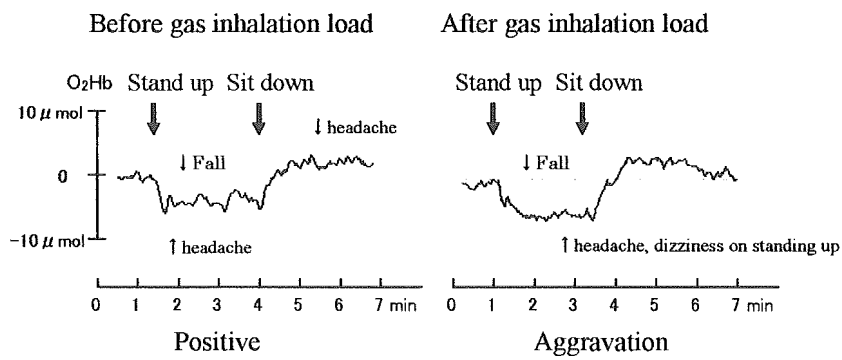


Fig. 20 The change of the view of gas inhalation test after clinical manifestation improvement in case 2

One year later, after clinical manifestation improvement, O<sub>2</sub>Hb fall was not watched in toluene inhalation load test and the symptom was not induced.

A change of the views of gas inhalation load test  
after clinical manifestation improvement  
Case2 13 years old male

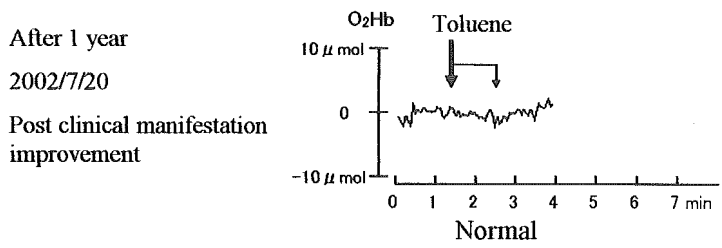
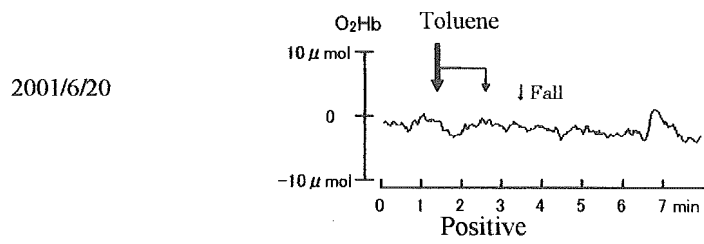


Fig. 21 A change of the views of orthostatic stress test after clinical manifestation improvement in case 2

One year later, the result was positive in orthostatic stress test, but there was not the aggravation after toluene inhalation load. In sitting, O<sub>2</sub>Hb rose temporarily, and pulsating headache was occurred, but improved it immediately.

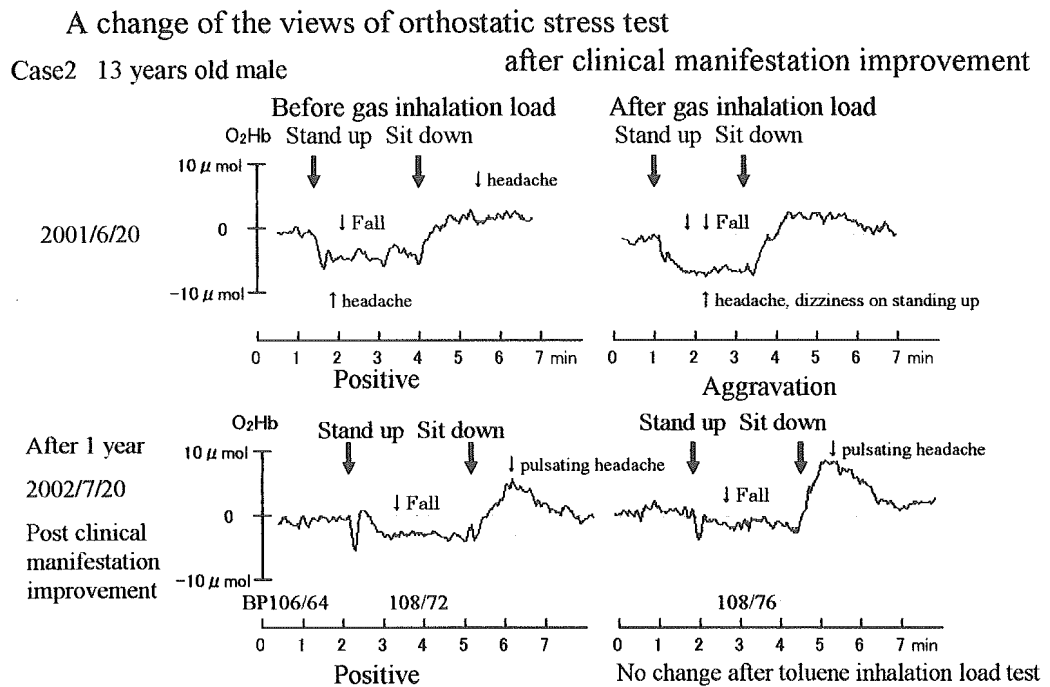


Fig. 22 Clinical course of case 3

## Case 3 Clinical course

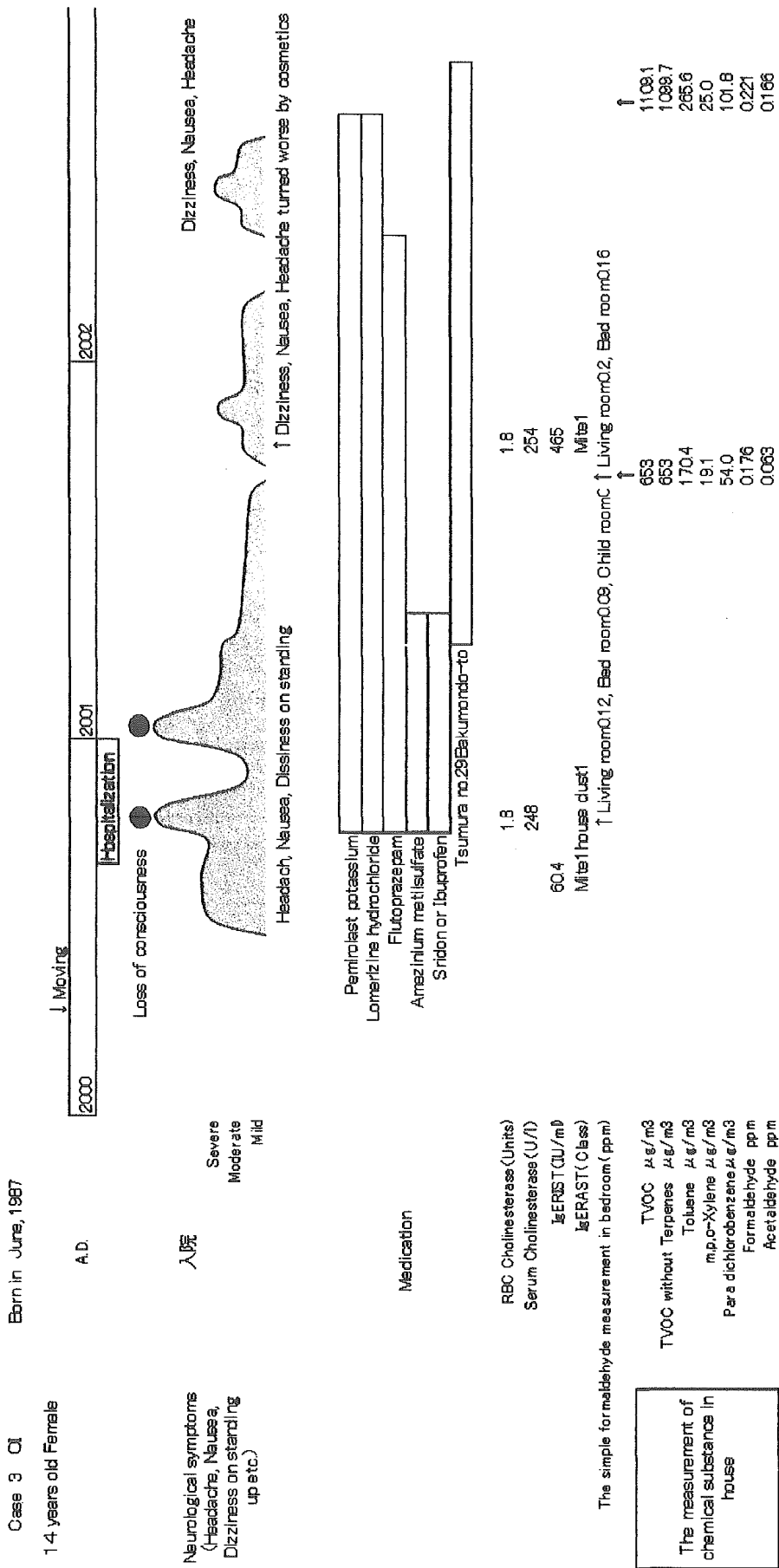


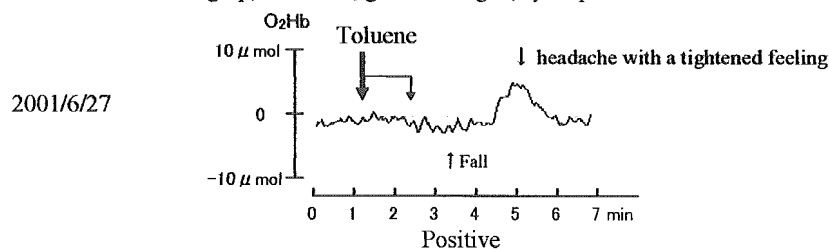


Fig. 23 A change of the views of gas inhalation load test after clinical manifestation improvement in case 3

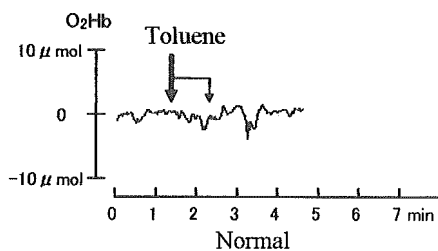
Case 3 was 14 years old girl. After several months from moving to a new house, she became to cause nausea, vertigo, headache, whole body dullness, dizziness on standing up at home. When a symptom was intense, she raised loss of consciousness. In toluene inhalation load test, a fall of O<sub>2</sub>Hb occurred at first, and a sudden rise accompanied with headache was watched. One year later, after the clinical manifestation improvement, the change was not seen.

A change of the views of gas inhalation load test  
after clinical manifestation improvement

Case 3 14 years old Female : After moving to a new house, she had severe nausea, dizziness on standing up, headache, general fatigue, syncope



After 1 year  
2002/7/21  
Post clinical  
manifestation  
improvement



The concentration of toluene in her house was higher 265.6  $\mu$  g/m<sup>3</sup>

Fig. 24 A change of the views of orthostatic stress test after clinical manifestation improvement  
 In orthostatic stress test, a fall of O<sub>2</sub>Hb was watched before gas inhalation load by orthostatic stress. After gas inhalation load, O<sub>2</sub>Hb fell by standing, provocation of headache and a rise of O<sub>2</sub>Hb by sitting were watched. After clinical manifestation improvement, a fall of O<sub>2</sub>Hb in orthostatic stress test was similar, but a rise of O<sub>2</sub>Hb after sitting after gas inhalation load was not watched. The concentration of toluene in her house was higher (265.6µg/m<sup>3</sup>).

A change of the views of orthostatic stress test  
 after clinical manifestation improvement

Case 3 14 years old Female : After moving to a new house, she had severe nausea, dizziness on standing up, headache, general fatigue, syncope

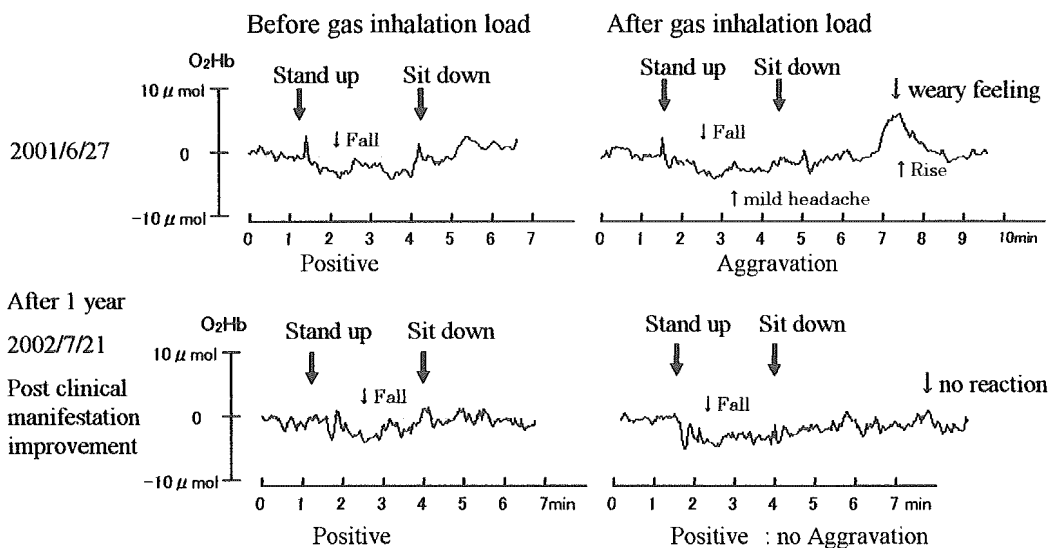


Fig. 25 Clinical course of case 4

## Case 4 Clinical course

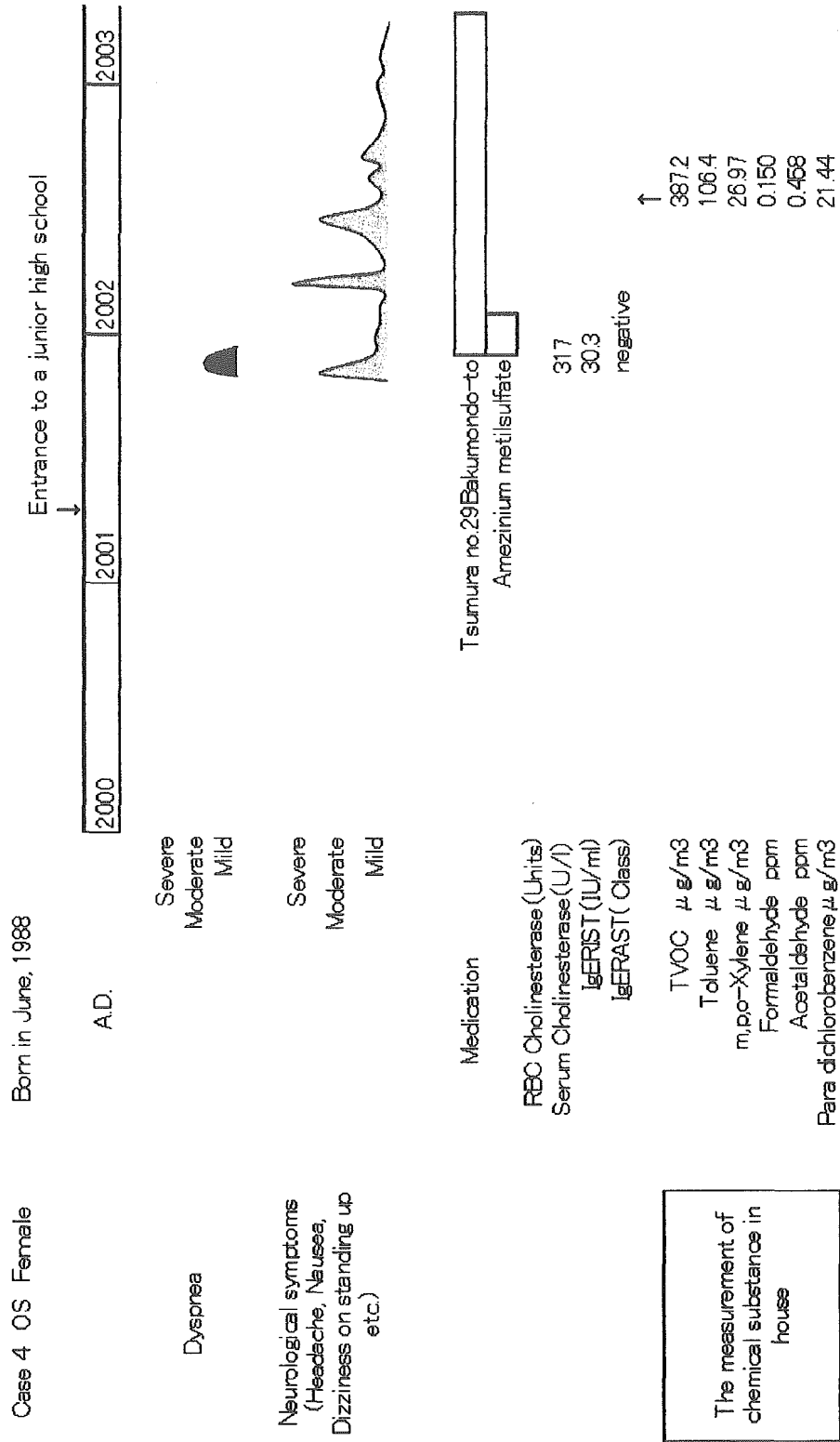


Fig. 26 A change of the views of gas inhalation load test after clinical manifestation improvement in case 4

Case 4 was 13 years old girl. She appealed for headache and dyspnea in a school. She was positive in ethanol and formaldehyde inhalation load. By formaldehyde inhalation load test after one year, O<sub>2</sub>Hb rose slightly.

A change of the views of gas inhalation load test  
after clinical manifestation improvement

Case 4 13 years old Female : Headache and dyspnea at a junior high school

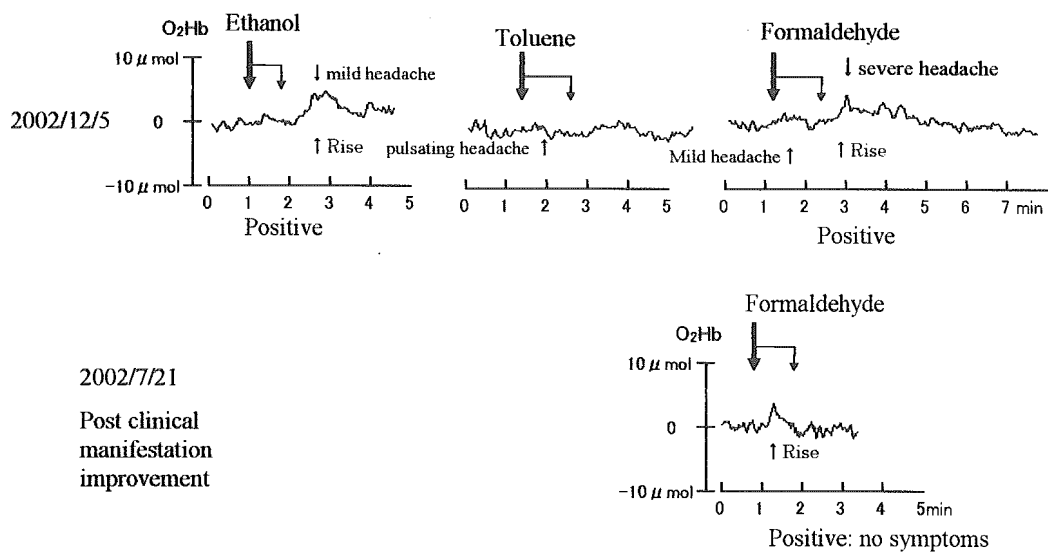


Fig. 27 A change of the views of orthostatic stress test after clinical manifestation improvement in case 4

In orthostatic stress test, O<sub>2</sub>Hb fall was watched. One year later, after clinical manifestation improvement, O<sub>2</sub>Hb became normal. However, O<sub>2</sub>Hb fell after formaldehyde inhalation load.

A change of the views of orthostatic stress test  
after clinical manifestation improvement

Case 4 13 years old Female : Headache and dyspnea at a junior high school

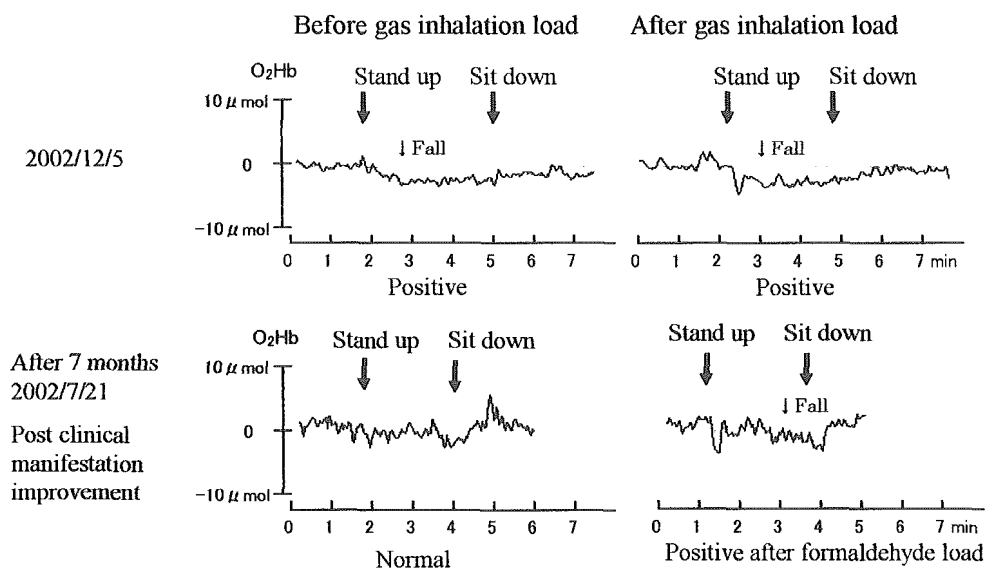


Fig. 28 The efficacy of sumatriptan in headache and nausea which were induced by the inhalation of ethanol gas in case 4

In this case, Sumatriptan did higher efficacy in headache and nausea which were induced by the inhalation of ethanol gas.

March 5, 2002, in a classroom of a junior high school without a ventilation system, a science experiment to observe the volatilizing progress of ethanol that was painted on skin was done. While the experiment was doing, a headache and nausea appeared and did not improve. Then she had visited our hospital. Sumatriptan 1.5mg was injected subcutaneously. A pulsating headache disappeared 15 minutes later, and headache and nausea disappeared several minutes later.

Case 4 Sumatriptan did higher efficacy in headache and nausea which were induced by the inhalation of ethanol gas

March 5, 2002

In a classroom of a junior high school without a ventilation system, a science experiment to observe the volatilizing progress of ethanol that was painted on skin was done. While the experiment was doing, a headache and nausea appeared and did not improve. Then she had visited hospital.

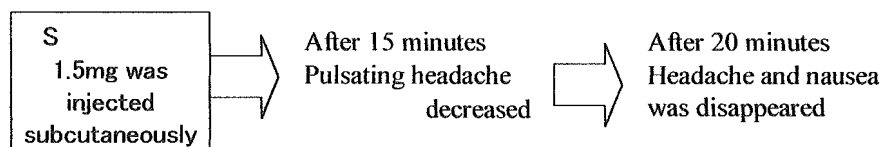


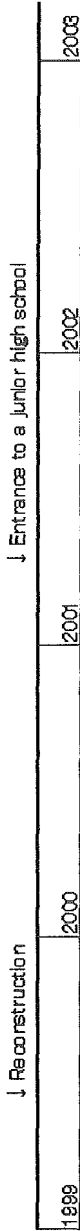
Fig. 29 Clinical course of case 5

## Case 5 Clinical course

Case 5 WT Born in July, 1988

13 years old Male

A.D.

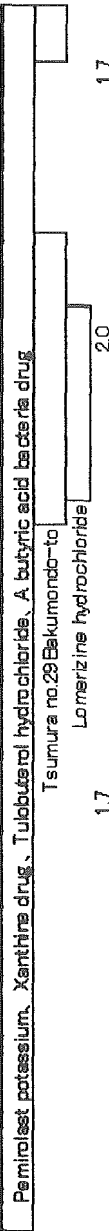
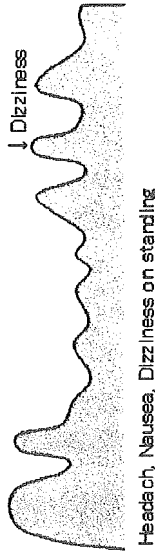


Bronchial Asthma

Severe  
Moderate  
Mild

Neurological symptoms  
(Headache, Nausea,  
Dizziness on standing up  
etc.)

Severe  
Moderate  
Mild



Medication

REC Cholinesterase (Units)  
Serum Cholinesterase (U/l)  
IgE RAST (IU/ml)  
IgE RAST (Class)

1.7  
251  
1745

↑ Living room 0.08 ppm Child room 0.1 ppm  
↑ Class room 0.15 ppm Reading room 0.16 ppm

TVOC  $\mu\text{g}/\text{m}^3$   
VOC without Toluene  $\mu\text{g}/\text{m}^3$   
Toluene  $\mu\text{g}/\text{m}^3$   
m,p,o-xylene  $\mu\text{g}/\text{m}^3$   
Para dichlorobenzene  $\mu\text{g}/\text{m}^3$   
Formaldehyde ppm  
Acetaldehyde ppm

878  
874  
95.1  
47.0  
1180  
0.094  
0.00

Class room  
<0.007 ppm  
<0.02 ppm  
0.008 ppm  
0.255

The measurement of chemical substance in house

Fig. 30 A result of orthostatic stress test at case 5 who did not improve

Case 5 was 14 years old boy. After entering a junior high school, headache, nausea and dizziness occurred in his school. Formaldehyde inhalation load test was positive. In orthostatic stress test, O<sub>2</sub>Hb deteriorated before inhalation load, and symptoms were induced after inhalation load. After one year, his symptoms continued. In the formaldehyde inhalation load, O<sub>2</sub>Hb fall turned worse, and the degree became stronger than that at the last time.

A result of orthostatic stress test at case who did not improve

Case 5 14 years old Male : Headache, Nausea, Dizziness on standing up at a junior high school

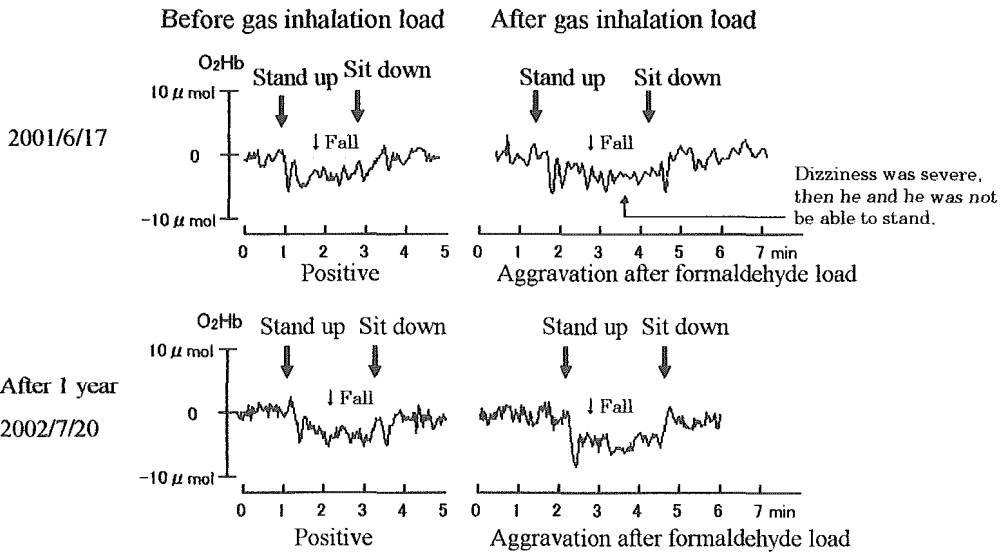




Fig. 31 Clinical course and the results of Gas inhalation load test and Orthostatic stress test  
 In 5 cases of sickhouse syndrome inspection was carried out two more times.

Clinical course and the results of Gas inhalation load test and Orthostatic stress test

| No | Age at first inspection (years) | Sex    | Causative agent                                    | After 1-1.5 years |                               |                                   |  |
|----|---------------------------------|--------|--|-------------------|-------------------------------|-----------------------------------|--|
|    |                                 |        |  | Clinical course   | Result of Gas inhalation test | Result of orthostatic stress test | Result of orthostatic stress test after gas inhalation |
| 1  | 13                              | Male   | Formaldehyde<br>Organophosphorus<br>Toluene Xylene | Improved          | Not improved                  | Improved                          | Not improved   |
| 2  | 13                              | Male   | Toluene Xylene                                     | Improved          | Improved                      | Not improved                      | Improved   |
| 3  | 14                              | Female | Toluene Xylene                                     | Improved          | Improved                      | Not improved                      | Improved   |
| 4  | 14                              | Female | Formaldehyde<br>Ethanol                            | Improved          | Improved                      | Improved                          | Improved   |
| 5  | 12                              | Male   | Formaldehyde                                       | Not improved      | Improved                      | Not improved                      | Not improved   |

Fig. 32 Hyper-reactivity of a nervous system and an immune system by chemical substance  
 In epidermal mucosa damaged by infection of a microbe, allergic inflammation and physical irritation, the chemical substance acts on the end of exposed sensory nerve C fiber, and hypersensitiveness of a sensory irritation receptor is activated by physical absorption, a chemical change of a membrane, and an agitation of a sensory nerve are produced. Neuronal excitement conducts axial filament in afferent, but one part advances in an efferent by axon reflex and the reaction is waked up in each internal organ such as blood vessel, gland tissue, bronchus and bowel, and causes symptoms (Bascom, 1997). On the other hand, substance P that secreted from the nervous system by nervous system stimulation connect to receptor of substance P on a membrane of mast cell and discharge mediator ( for example, histamine etc.) from mast cell ,and it produce allergic reaction (Meggs, 1999). In addition, substance P is discharged from various immunocyte, and neurogenic inflammation and activatation of immune system spread.

Hyper-reactivity of a nervous system and an immune system by chemical substance

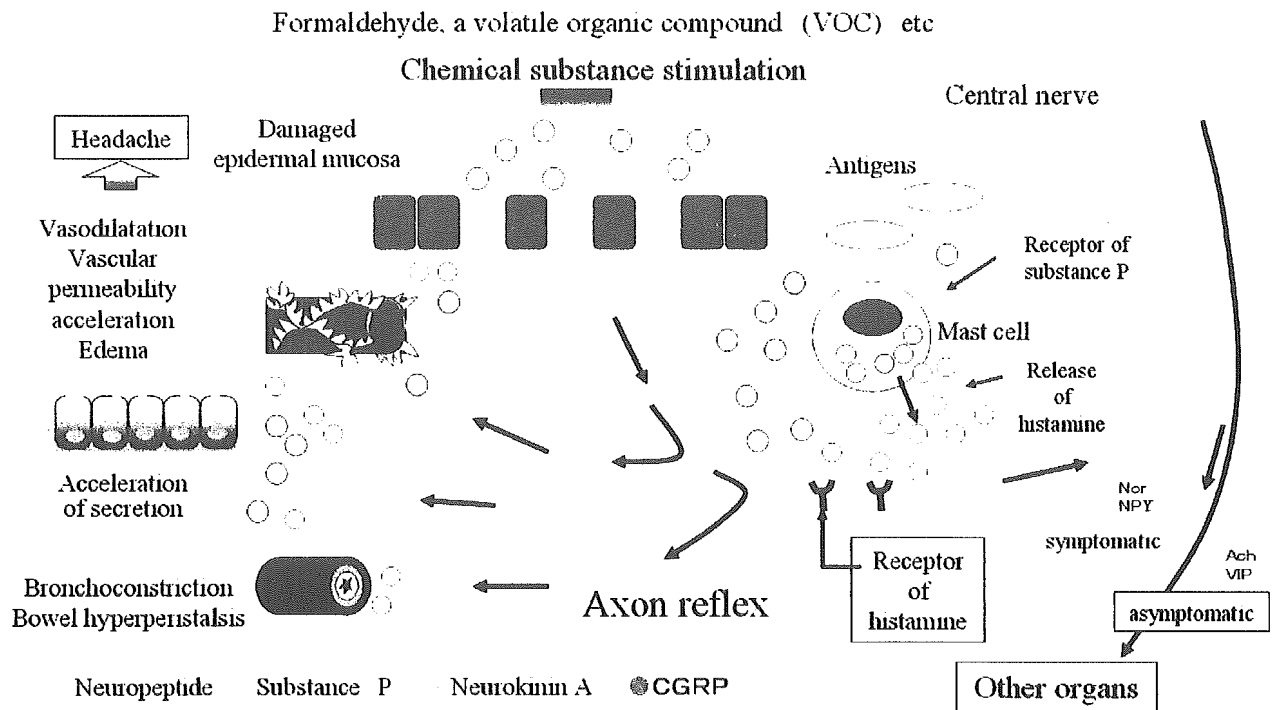
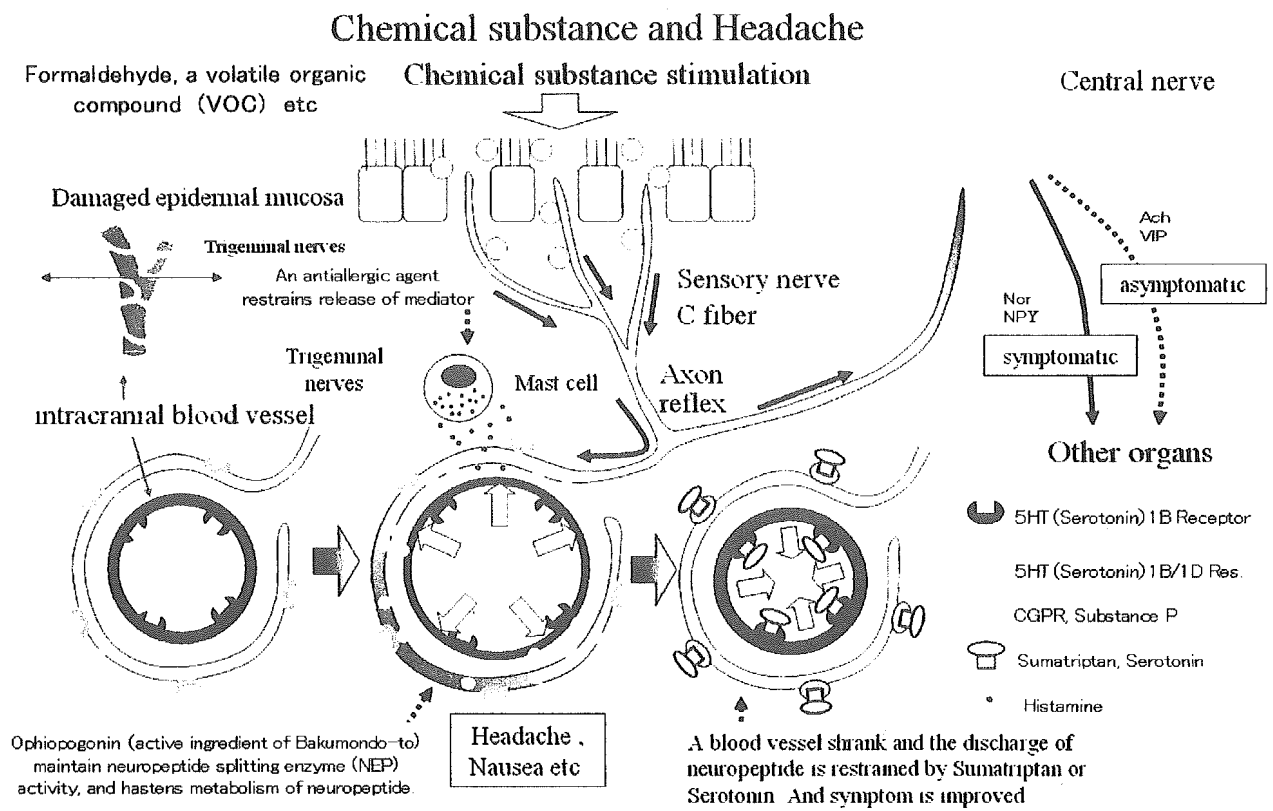


Fig. 33 Chemical substance and Headache

Neuropeptide is discharged from the nervous system by chemical stimulation and a blood vessel expand. The mediator release from mast cell causes. Vascular permeability accentuation, and the edema and inflammation occur in blood vessel circumference of trigeminal nerve. When serotonin is exhausted, it is impossible to inhibit vasodilatation. And a headache occurs.



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宮城県内の一般人を対象とした QEESI を用いたアンケート調査

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### 研究要旨

米国の Miller<sup>1,2)</sup> は世界共通の化学物質過敏症 (MCS) 患者の研究、診断、スクリーニングに役立つ問診票として、QEESI (Quick Environment Exposure Sensitivity Inventory) を開発し、これを日本でも使用して欲しい旨要請があった。そこで、本研究では、宮城県内の一般人 420 名を対象にして、QEESI (日本語訳版)<sup>3)</sup> を用いたアンケート調査を行った。

その結果、有効回答者 388 名中 16 名 (4%) が Miller と Prihoda<sup>1,2)</sup> の診断基準で MCS の疑いが非常に強い “Very suggestive” に分類された。この “Very suggestive” に分類された 16 名中 15 名に電話での詳細な聞き取り調査を行ったところ、15 名中 14 名が MCS 以外の病名で通院していることがわかった。そこで、北里研究所病院臨床環境医学センターの MCS 専門医の集団検診および東北大学大学院工学研究科の吉野研究室の室内空気質測定を紹介した。7 名が集団検診と実測の両方に参加、5 名は実測のみに参加、残り 2 名はどちらも希望しなかった。集団検診を受診した 7 名全員が専門医により MCS 患者と診断された。また、室内環境調査の結果から、7 名中 6 名は自宅内外に発症または症状悪化の要因が推定できたので、それらの要因の除去法および換気指導と生活指導を行ったところ、6 名は症状が軽減した。残り 1 名は発症要因が学校での化学物質曝露と推定された。

以上の結果から、日本においても MCS のスクリーニング用問診票として役立つ可能性が示唆された。また、室内環境に関するアンケートと併用すれば、シックハウス症候群のスクリーニングにも役立つこと、さらにシックハウス症候群患者は早期に発症要因を推定して対策を講ずれば症状が軽減する可能性が示唆された。ただし、QEESI は米国で開発された問診票であり、日本独自のカットオフ値の設定と日本人の生活スタイルに合っていない部分は若干の改良が必要と思われる。

#### A. 研究目的

わが国の MCS に関する社会的認知度は欧米と比べるとまだまだ低いと思われる。また、MCS に対する世界共通の定義や診

断法はまだ確立していないため、国際間での患者の比較はほとんどなされておらず、わが国の MCS 患者と諸外国の患者の発症要因や症状の相違点については全くわかっ