

## Studies on the release of histamine from basophils

### 4. Difference between house dust- and *Candida*-induced secretion

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#### Introduction

Basophils from patients with bronchial asthma release histamine by stimulation with antigen (RADERMECKER, M.F., 1980, TANIZAKI, Y. et al., 1983c). Recent reports (HIRATA, et al., 1979, ISHIZAKA, T., et al., 1980) have clarified the mechanism of IgE-mediated release of histamine; allergen stimulates phospholipid methylation of cell membrane, followed by calcium ions influx into the cells. Histamine is released following increase in calcium ions uptake by the cells (TANIZAKI, Y., et al., 1983a, TANIZAKI, Y., et al., 1983b). It has been thought that histamine release induced by agents acting through IgE receptors has several similarities. MARONE, et al. (1981), however, showed some differences between allergen- and anti-IgE-induced release of histamine. Our previous report (TANIZAKI, Y., et al., 1984) also revealed that there are several differences between allergen- and anti-IgE-induced histamine release.

In the present study, histamine release induced by house dust and *Candida albicans* was compared in relation to the release induced by anti-IgE.

#### Subjects and Methods

##### Subjects

Thirty patients with bronchial asthma (19

females and 11 males, their ages varied from 16 to 66 years) were selected to examine histamine release. All cases showed a positive RAST score (2+ <) either to house dust or to *C. albicans*: 19 cases were positive to house dust and 12 cases to *C. albicans*.

##### Histamine Release

Histamine release was carried out using a whole blood method, as previously described (TANIZAKI, Y., et al., 1983c, 1984). Basophils from asthmatics sensitive to house dust were challenged with house dust and anti-IgE, and the cells sensitive to *C. albicans* were incubated with *C. albicans* and anti-IgE. To 4 ml of heparinized whole blood was added 0.2 ml of various concentrations of allergens or anti-IgE, and the mixed solution was then incubated for 15 min at 37°C. After the incubation, the histamine content of the cells and supernatant fluid was measured by an automated histamine analysis system (Technicon) (STRAGANIAN, R.P., 1974). The results were expressed as a percent release of the total histamine content.

##### Release Ratio

Basophil reactivity to house dust or *C. albicans* was compared with the reactivity to anti-IgE. The results were expressed as a release ratio calculated by the following formula:

$$\text{Release Ratio} = \frac{\text{HR induced by HD or by } C. \text{ albicans}}{\text{HR induced by anti-IgE}}$$

HR; histamine release, HD; house dust

#### Evaluation of Specific Allergen

Serum specific IgE antibodies for house dust or *C. albicans* were estimated by the radioallergosorbent test (RAST). When the RAST score to house dust or *C. albicans* was 2+ or higher, the allergen was evaluated as a specific.

### Results

#### Histamine Release by House Dust

Basophils from all subjects sensitive to house dust released a significant amount of histamine (more than 15%) by stimulation with house dust. The mean maximum percent histamine release was  $41.8 \pm 2.7\%$  (range; 16.5–55.8%). Anti-IgE also caused histamine release from basophils of these subjects (mean; 40.8%, range; 16.3–63%). The mean percent release by house dust was almost same as that by anti-IgE.

#### Histamine Release by *C. albicans*

Nine out of 12 patients (75%) showed a significant histamine release following the incubation with *C. albicans*. However, a significant amount of histamine release was not observed in 3 cases with a RAST score 2+ or higher. The mean maximum percent histamine release by *C. albicans* was  $27.1 \pm 5.3\%$  (range; 4.6–66%). Anti-IgE-induced histamine release was observed in 10 out of these subjects (83.3%). The mean maximum percent release by anti-IgE was  $32.2 \pm 5.3\%$  (range; 9.–63%)

#### Comparison between House Dust and *C. albicans*-Induced Histamine Release

According to a release ratio described above, histamine release induced by house dust and *C. albicans* was compared with the release induced by anti-IgE. In the histamine release induced by house dust, the release ratio showed a considerably definite value, and 14 out of 19 subjects (73.9%) show a release ratio between 0.8 and 1.2. The mean release ratio was  $1.05 \pm 0.06$  (range 0.65 – 1.86). The results suggest that the release of histamine induced by house dust almost similar to that induced by anti-IgE.

The release ratio in *C. albicans*-induced histamine release varied widely from 0.07 to 2.7 with a mean of  $1.39 \pm 0.55$ , suggesting that histamine release induced by *C. albicans* does not correlate with the release induced by anti-IgE (figure).

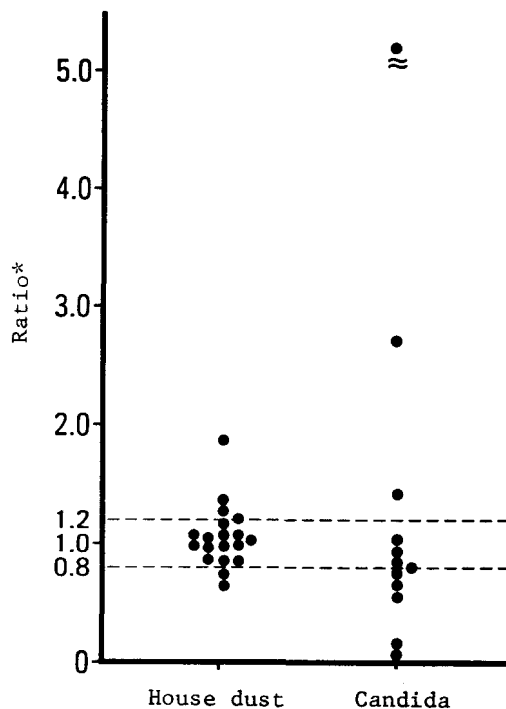


Figure. Histamine release from basophils induced by house dust and *C. albicans* and its relation to anti-IgE-induced release.

\*Ratio =

$$\frac{\text{Histamine release induced by allergen}}{\text{Histamine release induced by anti-IgE}}$$

### Discussion

Histamine is released from basophils and mast cells by various stimulating agents. Histamine release induced by non-IgE-mediated stimuli such as comp. 48/80 and Ca ionophore A23187 is different from the release elicited by allergen (LICHTENSTEIN, L.M., et al., 1975, SIRAGANIAN, R.P., et al., 1976, GRANT, J.A., et al., 1977). However, it has been shown that the mechanism of IgE-mediated histamine release is essentially identical.

RECENTLY, MARONE, G. et al. (1981) reported several differences between allergen- and anti-IgE-induced histamine release from basophils:

antigen induces histamine release over a wide range of concentrations, while anti-IgE causes histamine release over a limited concentration range; release by antigen occurs with a shorter lag period and a more rapid rate than the release by anti-IgE. Our previous studies (TANIZAKI, Y., et al., 1984) have also shown that dose-response curves of histamine release induced by house dust is different from those induced by anti-IgE. However, the maximum percent histamine release is almost similar to that induced by anti-IgE.

In the present study, maximum percent histamine release induced by house dust and *C. albicans* was compared with that caused by anti-IgE. It was found from the results that basophil reactivity to *C. albicans* is considerably different from the reactivity to anti-IgE, although basophil reactivity to house dust and anti-IgE is similar, as previously described (TANIZAKI, Y., et al., in press). The release of histamine caused by *C. albicans* and house dust is one of the IgE-mediated reactions. Basophils from subjects sensitive to house dust and the cells from subjects sensitive to *C. albicans* similarly reacted to anti-IgE. These findings suggest that difference between house dust- and *C. albicans*-induced histamine release might be due to antigenicity of the two allergens.

### Summary

Histamine release from basophils induced by house dust and *C. albicans* was examined in 30 patients with bronchial asthma. House dust and *C. albicans* caused a significant amount of histamine release in subjects with a RAST score to corresponding allergen. A close correlation was found between house dust- and anti-IgE-induced histamine release. However, histamine release induced by *C. albicans* was considerably different from the release induced by anti-IgE.

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## 好塩基球からのヒスタミン遊離に関する研究

## 4. ハウスダストおよびカンジダによるヒスタミン遊離の相違

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ハウスダストあるいはカンジダが特異抗原である気管支喘息30例を対象に, それぞれの抗原刺激時の好塩基球からのヒスタミン遊離を, 抗ヒト IgE による遊離と比較検討した。

1. ハウスダストが原因抗原である症例の好塩基球からのヒスタミン遊離は, 抗原刺激時 41.8%, 抗ヒト IgE 刺激時 40.8% であった。
2. カンジダが原因抗原である症例の好塩基球からのヒスタミン遊離は, 抗原刺激時 27.1%, 抗ヒト IgE 刺激時 32.2% であった。
3. ハウスダストと抗ヒト IgE による好塩基球からのヒスタミン遊離は, ほぼ同様の値を示した。一方カンジダと抗ヒト IgE によるヒスタミン遊離の間には有意の相関関係はみられなかった。