## DISCUSSION

Our field study of the *Der p* I antigen in house dust indicates that a large amount of mite allergen is present in the houses in the Taipei area. Remarkable seasonal variation of *Der p* I levels is demonstrated, with peaks occurring in November and December. The pattern of seasonal variation of the *Der p* I allergen observed in Taipei was different from that reported in the United States, with the highest levels in July.[3] Furthermore, the house dust samples from mattresses, bedroom floors, and living room floors contained higher concentrations of *Der p* I in June, November, and December than in August, February, and April. In addition, it is important to point out that the occurrence of peaked *Der p* I concentration in November corresponded to the highest hospital admission rate for bronchial asthma in November found in our previous study.[1]

Absolute humidity was shown as the best single guide for excess mite growth; however, no correlation between absolute humidity and mite allergen content was found in our study. Because the indoor absolute humidity in Taipei is always higher than 9 gm/kg, which has been suggested to be critical for mite growth,[4] the humidity cannot be used as a determining factor for mite growth in subtropical climates.

In summary, the mite allergen *Der p* I content varied with seasons but was not influenced by the change of indoor absolute humidity in the Taipei area. On average, the highest *Der p* I concentration was found in the mattresses, and the pattern of the seasonal variation was similar among mattresses, bedroom floors, and living room floors. Furthermore, more than 90% of the dust samples collected in November and December were found to contain *Der p* I with a concentration higher than 2 μg/gm dust, the proposed critical level for an asthma attack.[5] Therefore procedures to reduce the mite allergen as much as possible might be a feasible way to prevent the continuing rise in the prevalence of asthma in this area. In addition, the marked seasonal variation of mite allergen content observed in this investigation indicates that monitoring mite allergen levels in individual houses will be of great benefit in studying the relationship between HDM exposure and the occurrence of asthmatic symptoms.

We thank the occupants of the 12 houses who let us use their homes to conduct an extensive sampling throughout the year.

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# Conjunctivitis medicamentosa

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Rhinitis medicamentosa is a well recognized condition of chronic nasal congestion associated with the overuse of vasoconstricting nose drops. It is thought to be due to rebound nasal mucosal edema, which may occur after use of topical nasal vasoconstrictors even for a short period of time.[1]

An analogous clinical condition in the eye is associated with the overuse of vasoconstricting drops. This results in increased conjunctival injection and often a rebound hyperemia that persists despite discontinuation of eye drops. The Physician's Desk Reference product information cautions about persistent redness or irritation and

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FIG. 1. Hyperemia immediately after cessation of Albalon- A administration.

can be interpreted as a persistence or worsening of the underlying condition. We describe five patients with a distinct clinical pattern, suggesting "conjunctivitis medicamentosa."

## CASE REPORTS

### Patient 1

Patient 1, the prototype patient, is a 19-year-old student who sustained an injury to one eye initially but had underlying allergic rhinitis and conjunctivitis. He was very self-conscious about his red eyes and had sought help from many ophthalmologists. His program, when he was first seen, included naphazoline and antazoline (Albalon-A), which he used repeatedly throughout the day. The drops appeared to be required at shorter and shorter intervals to obtain relief. Ophthalmologists had prescribed steroid eye drops, which successfully improved the condition; but because he was told to use them sparingly, when they were stopped, the condition reappeared. A thorough allergic evaluation revealed strongly positive skin test results. Skin test responses to the drops themselves were negative. An eye smear was positive for eosinophils. Immunotherapy and administration of cromolyn eye drops were started.

After a few weeks, all vasoconstricting drops could be discontinued, and with long-term follow-up the patient continued to be free of symptoms. Fig. 1 shows the hyperemia seen immediately after cessation of Albalon-A administration.

### Patient 2

Patient 2 is a 37-year-old man who went sailing each week without proper protection for his eyes. He had marked redness of his eyes caused by sun exposure and used tetrahydrozoline hydrochloride (Visine) three times a day for 5 days. When he stopped using the eye drops, his eyes became "redder than they had ever been

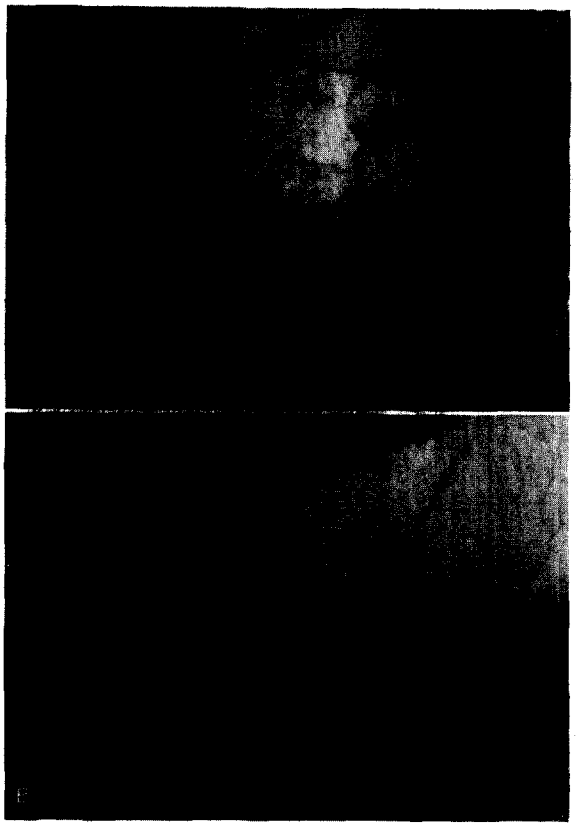

FIG. 2. A, Appearance of eye within hours after use of eye drops. B, Appearance after cessation of drops for several days.

artificial tears without preservatives, and after a few days his problem resolved. Fig. 2, *A* shows the appearance of his eye within hours after the use of the eye drops, and Fig. 2, *B* shows appearance after cessation of the drops for several days.

### Patient 3

Patient 3 is a 44-year-old man with chlamydial conjunctivitis, which caused 5 months of bilateral ocular redness. Naphazoline and pheniramine maleate solution (Naphcon-A) was prescribed 3 to 4 times per day for 1 month. On the advice of his physician, Naphcon-A was stopped, and doxycycline, 100 μg 2 times per day, was started. An office visit 3 days later revealed eyes that were redder than before. After the drops had been discontinued for a longer time, the hyperemia was minimal. He restarted the drops, and the process recurred.

### Patient 4

Patient 4 is a 32-year-old woman with seasonal allergic rhinitis and conjunctivitis. An eye smear was examined for eosinophilia, but the result was negative.

Lomb, was her treatment. When the drops were stopped, increasing tearing and redness occurred. After the patient was warned of a possible association between the eye drops and redness, she was able to stop using them on her own.

### Patient 5

Patient 5 is a 32-year-old woman who had excision of bilateral pterygia resulting in revasculization of the larger vessels at the site of surgery. Naphazoline helped redness to clear completely in 20 to 30 minutes; however, 12 to 24 hours after the eye drops were discontinued, the redness returned and became more intense. Immediate and delayed skin test responses to the drops were negative. She required no other medications after she stopped using the eye drops.

## RESULTS

Skin test responses to the drops themselves, for both immediate and delayed hypersensitivity reactivity, were negative in the three patients tested. Skin tests for possible pollen, dust, or mold allergies were done in those patients with allergic rhinitis and helped to confirm the diagnosis. An eye smear for eosinophils was done in patient 1, and the result was positive.

## DISCUSSION

Certain characteristics of the patients described should be noted. All patients had an underlying ocular problem that prompted the use of vasoconstrictor eye drops. The vasoconstrictor drops helped the redness, prompting continuation of their use. In some patients the vasoconstrictor ocular drops appeared to be required at shorter and shorter intervals to obtain relief. Attempts to discontinue the drops after days, weeks, or months without additional treatment caused hyperemia, thought to be due to a rebound phenomenon. Artificial tears, corticosteroid drops, or long-term therapy with ocular cromolyn and/or immunotherapy may help terminate dependence on the vasoconstrictor drops, depending on the underlying condition. The most common agent used by the patients described was naphazoline, but other agents such as tetrahydrozoline hydrochloride can be responsible for the phenomenon described.

The cause of these problems is unclear. Preexisting conjunctival disease may be a prerequisite condition for the development of medicamentosa. Abelson et al.,[3] using a histamine model to produce ocular redness, did not observe rebound vasodilation after administration of naphazoline or tetrahydrozoline in 11 normal volunteers after single use or 10 days of exaggerated use. Perhaps an underlying medical problem is necessary, as was the case in our patients, for its development. Skin testing done with the components of the drops in three of the patients did not indicate immediate hypersensitivity or delayed hypersensitivity reactivity. Additionally, patient 1 did not show reactivity by skin testing to the preservative benzalkonium, tested by itself.

The use of vasoconstrictor eye drops has recently increased in the United States because of the nonavailability of cromolyn sodium. This could help explain why more patients have been using the ocular formulation of vasoconstrictor drops. The analogy between rhinitis medicamentosa and conjunctivitis medicamentosa is obvious. We think that physicians should be made more aware of the two entities. In a British study 26% of practitioners prescribed topical nasal decongestants as a first-line therapy in allergic rhinitis.[4] We suspect that the ocular equivalent is more common than physicians realize and that most patients just stop using the drops because they think that they are not helping or because the situation is getting slightly worse. Often, patients do not bring their ocular problem to the attention of the physician because many over-the-counter preparations are available. They might conclude that the eye drops are not working rather than that there is an actual worsening of the condition. If the diagnosis of conjunctivitis medicamentosa is considered, the vasoconstrictor eye drops should be discontinued in favor of more appropriate treatment of the underlying condition.

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