

Fiber-Optic Fluoroimmunoassay for Determination of *Dermatophagoides farinae* Allergen by Flow Analysis Technique

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(Received June 10, 2013; accepted August 21, 2013)

Key words: *Dermatophagoides farinae*, *Der f1*, allergen, optical fiber, flow cell

A fiber-optic fluoroimmunoassay system for *Dermatophagoides farinae* allergen (*Der f1*) is developed and applied to a flow analysis system. The immunoassay system consists of an optical fiber probe with a collective lens, a reaction cell with inlet/outlet ports for reagents, a laser diode for excitation light source, and a photodiode for detecting fluorescence. The measurement principle is based on sandwich immunoassay. By flowing reagents into the reaction cell, the optical fiber probe becomes coated with immunological complexes formed by capture antibodies, *Der f1* derived from house dust mite *D. farinae* as target analytes, and fluorescent dye (cyanine 5)-labeled antibodies. An excitation light is transmitted into the optical fiber probe, and then the fluorescent molecules of fluorophore-labeled antibodies are excited by the evanescent light of the laser diode. The fluorescence recoupled into the probe is quantified by the photodiode as current values. The calibration range for *Der f1* is from 0.98 to 250 ng/ml, and the assays are completed within 16 min. To achieve faster immunoassay, changes in fluorescence signal are monitored using the probe exposed to the fluorescent-labeled antibodies for the detection of *Der f1*, and calculated to obtain the rate of fluorescence increase for each *Der f1* concentration. The calibration range is equal to that of the above-mentioned assay, and the assay time is shortened to 6 min. In the future, the flow immunoassay system allows determining allergens with high precision in a residential environment on site.

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