JOURNAL OF CLINICAL MICROBIOLOGY, Dec. 2001, p. 4593–4594 Vol. 39, No. 12
0095-1137/01/$04.00+0 DOI: 10.1128/JCM.39.12.4593–4594.2001

Letters to the Editor

Detection of Galactomannan for Diagnosis of Fungal Rhinosinusitis

Fungus ball of the paranasal sinus is the growth of a fungal mass (mycetoma) within the sinus cavity, usually caused by molds; endoscopic surgery is the usual treatment (2, 4). Because of the poor viability of the fungi, diagnosis based on fungal cultures of nasal secretion or material removed from the sinus has a low sensitivity (20 to 40%). Histological examination, more sensitive, cannot identify the responsible fungi (2). The aim of this study was to evaluate the direct detection of galactomannan antigen of *Aspergillus fumigatus* in the crushed material removed from the sinus cavity, using the Platelia *Aspergillus* and Pastorex *Aspergillus* kits (both from Bio-Rad, Marnes-La Coquette, France), which are usually designed to detect antigen in the sera (5, 6, 7). We conducted a prospective study during the year 2000 in the following manner. Surgical specimens from the paranasal sinuses were obtained by endoscopic operation from 23 immunocompetent patients presenting with rhinosinusitis at the University Hospital of Poitiers (Poitiers, France): 78.3% were females and 21.7% were males (mean age ± standard deviation, 51 ± 13.6 years). In the laboratory, samples representing 5 to 15 ml of pus or fungus ball were crushed in 10 ml of saline solution (0.09% NaCl) and centrifuged. The pellet was examined microscopically and cultured on Sabouraud agar medium (Bio-Rad), with or without chloramphenicol (Bio-Rad), at 27 or 37°C for 3 weeks. Galactomannan was detected in supernatant with the Platelia *Aspergillus* kit, involving an immunoenzymatic sandwich microplate technique using rat monoclonal antibody EBA2 (sensitivity limit, 1 ng/ml) and with the Pastorex *Aspergillus* kit, involving an agglutination technique using latex particles coated with monoclonal antibodies (sensitivity limit, 15 ng/ml).

Statistics. Comparisons of identification ratios were performed with EpiInfo version 6. The degree of concordance between two observers, represented by the kappa coefficient, was used to evaluate the procedures tested (3). Each technique was compared with the clinical decision of the presence of mycetoma base on positive histology or positive mycology.

Mycological results. Of the patients, 69.5% had fungal rhinosinusitis according to the presence of filaments (histology or mycology) and/or positive mycological cultures. Twenty cases were concordant, but culture and direct microscopic examination were less sensitive than histology and galactomannan antigen detection. Fungus balls were mostly due to *Aspergillus* spp. when the culture result was positive. In all cases in which the latex test and the ELISA assay both produced negative results, fungi were not detected (Tables 1 and 2). Antigen was also detected on one mycetoma identified by culture as *Scedosporium apiospermum* (patient 17) which may represent a cross-reaction with *Aspergillus* galactomannan or a dual infection, where the *Aspergillus* could not be distinguished from or was overgrown by *Scedosporium*. Histology compared favorably with antigen detection, while direct microscopic examination and culture were less sensitive (Tables 1 and 2). The Pastorex Aspergillus kit was more sensitive for antigen detection (K = 0.81) than the Platelia *Aspergillus* kit (K = 0.72). Although the detection level of the enzyme-linked immunosorbent assay (ELISA) was much lower than that of the latex agglutination test (1 ng/ml vs. 15 ng/ml, respectively), there was only a slight difference in detecting fungus in the homogenates. This slight difference may be offset by the fact that the latex

TABLE 1. Diagnosis of fungal rhinosinusitis

Patient	Result for:					Mycetoma
	Galactomannan detection by:		Direct microscopic examination	Determination of histology	Culture[c]	
	Latex agglutination test[a]	ELISA[b]				
1	0	0	−	+	Negative	Yes
2	0	0	−	−	Negative	No
3	32	3	+	+	Negative	Yes
4	64	3	+	+	AFU	Yes
5	8	3	+	+	Negative	Yes
6	8	1	−	−	Negative	No
7	64	3	+	+	ASP	Yes
8	16	0	+	+	AFU	Yes
9	8	1	+	+	Negative	Yes
10	256	3	+	+	AFU	Yes
11	1	1	−	+	Negative	Yes
12	0	0	−	−	Negative	No
13	0	0	−	−	Negative	No
14	0	0	−	−	Negative	No
15	128	3	+	−	AFU	Yes
16	2	3	+	+	Negative	Yes
17	1	3	−	+	SCE	Yes
18	1	3	−	+	Negative	Yes
19	1	3	+	+	AFU	Yes
20	0	0	−	−	Negative	No
21	1	3	−	+	Negative	Yes
22	0	0	−	−	Negative	No
23	16	3	+	+	Negative	Yes

[a] Pastorex *Aspergillus* kit. Values are in nanograms per milliliter.
[b] Platelia *Aspergillus* kit. The values given as results signify the following: 0, negative; 1, positive; 2, highly positive; 3, overflow.
[c] If not negative, the culture was positive for the species listed, as follows: AFU, *Aspergillus fumigatus*; ASP, *Aspergillus* sp.; SCE, *Scedosporium apiospermum*.

TABLE 2. Diagnosis of fungal rhinosinusitis: kappa coefficient to measure concordance of methods[a]

Method	K	Sensitivity	Specificity	PPV	NPV
Galactomannan detection by:					
Latex agglutination test[b]	0.81	0.93	0.88	0.93	0.88
ELISA[c]	0.72	0.87	0.88	0.93	0.78
Direct microscopic examination	0.66	0.73	1	1	0.67
Histology	0.90	1	0.88	0.94	1

[a] PPV, positive predictive value; NPV, negative predictive value.
[b] Pastorex *Aspergillus* kit.
[c] Platelia *Aspergillus* kit.

agglutination test is much less expensive and more rapid than the ELISA, taking approximately 15 to 30 min. Since cultures often take several days to weeks for definitive identification, both antigen detection tests are appropriate for rapid diagnosis in cases of patients with high risk of invasive infection or those with evidence of invasive infection. It is still recommended that confirmatory culture be done in addition to antigen detection, in case (i) the ethiologic agent does not have detectable galactomannan or (ii) the cross-reacting organism is not susceptible to empiric therapy, as in the case of *S. apiospermum* infection treated with amphotericin B (1).

We acknowledge D. Mayet and G. Toullat for their assistance.

REFERENCES

1. **Dupont, B., L. Improvisi, and O. Ronin.** 1991. Aspects épidémiologiques et cliniques des infections à *Scedosporium* et à *Pseudallescheria*. J. Mycol. Med. **1:**33–42.
2. **Ferguson, B. J.** 2000. Definitions of fungal rhinosinusitis. Otolaryngol. Clin. N. Am. **33:**227–235.
3. **Fermanian, J.** 1984. Measure of concordance between two observers. The qualititative case. Rev. Epidemiol. Santé Publique **32:**140–147.
4. **Klossek, J. M., E. Serrano, L. Pelequin, J. Percodani, J. P. Fontanel, and J. J. Pessey.** 1997. Functional endoscopic sinus surgery and 109 Mycetomas of paranasal sinuses. Laryngoscope **107:**112–7.
5. **Latgé, J. P., H. Kobayashi, J. P. Debeaupuis, M. Diaquin, J. Sarfati, J. M. Wieruszeski, E. Parra, J. P. Bouchara, and B. Fournet.** 1994. Chemical and characterization immunological of the extracellular galactomannan secreted by *Aspergillus fumigatus*. Infect. Immun. **62:**5424–5436.
6. **Stynen, D., A. Goris, J. Sarfati, and J. P. Latgé.** 1995. A new sensitive sandwich ELISA to detect galactofuran in patients with invasive aspergillosis. J. Clin. Microbiol. **33:**497–500.
7. **Verweij, P. E., D. Stynen, A. J. M. M. Rijs, B. E. de Pauw, J. A. A. Hoogkamp-Korstanje, and J. F. G. M. Meis.** 1995. A sandwich ELISA compared with Pastorex latex agglutination test for diagnosing invasive aspergillosis in immunocompromised patients. J. Clin. Microbiol. **33:**1912–1914.

Catherine Kauffmann-Lacroix*
Marie-Helène Rodier
Jean-Louis Jacquemin
Laboratoire de Parasitologie et Mycologie
CHU de Poitiers, BP 577
86021 Poitiers Cedex, France

*Phone: (33) 05-49-44-39-59
Fax: (33) 05-49-44-39-08
E-mail: c.lacroix@chu-poitiers.fr

Jean Michel Goujon
Service d'Anatomie et Cytologie Pathologiques
CHU de Poitiers, BP 577
86021 Poitiers Cedex, France

Jean-Michel Klossek
Service ORL et Chirurgie Cervico-Faciale
CHU de Poitiers, BP 577
86021 Poitiers Cedex, France