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Adhesins and Ligands Involved in the Interaction of *Candida* spp. with Epithelial and Endothelial Surfaces

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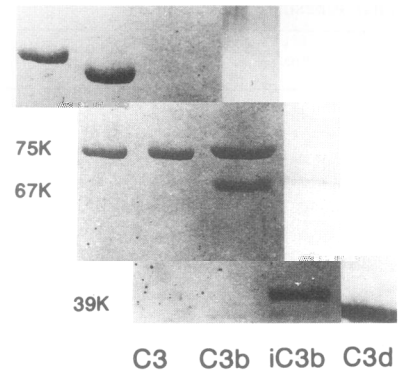
appear to vary among different types of epithelial cells and

TABLE 1. Epithelial and endothelial adhesins

Adhesin	M_r (10^3)	Epithelial ligand	Inhibitor(s)	Gene	Reference(s)
Epithelial					
Protein-protein					
Integrin analog (iC3b receptor)	130–165	iC3b	MAb, iC3b, RGD peptides	No	5, 27, 29, 37, 39, 45, 49, 82
Fibronectin	60–68	Fibronectin	Fibronectin, proteases	No	100
Lectin-like					
Fucose-binding protein	ND[a]	Fucose	ND	No	22, 23, 25, 70, 72, 105
GlcNAc-binding protein	ND	*N*-Acetylglucosamine	ND	No	22, 23, 25
Partially determined					
Aspartyl proteinase	45	ND	Pepstatin	Yes	36, 50, 90–92, 103, 110
Factor 6	ND	ND	MAbs, polyclonal antibodies	No	75, 76
Endothelial (protein-protein)					
Fibronectin	60–68	Fibronectin	Fibronectin, RGD peptides	No	60, 64, 97, 98, 100



COMPLEMENT RECEPTORS

...n Cells	Receptor	C3 Ligand	Mammali...
...s, macrophages, ...cytes, lymphocytes, ..., renal podocytes	CR1	C3b	PMN's, mono, RBC's
...phocytes	CR2	C3d	B lym...
...'s, macrophages, ...cytes, NK cells	CR3	iC3b	PMN, mono
...'s, macrophages, ...cytes, NK cells	CR4	iC3b	PMN, mono

β_2 INTEGRINS

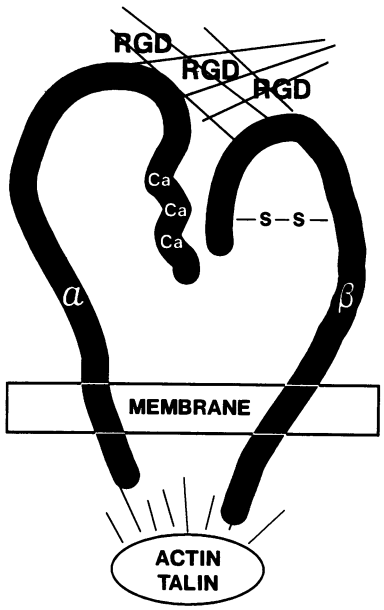


FIG. 3. Diagrammatic representation of α- and β-chains of the mammalian integrins. The amino termini are extracellular, the

TABLE 2. Binding of MAbs to *C. albicans*[a]

Specificity	MAb	Isotype	Reactivity with *C. albicans*	Protein(s) recognized (kDa)	Blocks:	
					EA rosette	Adhesion
α_M	OKM1	IgG2a	++++	42, 130, 165	Yes	No
	Anti-Mo1	IgM	++++	165	No	No
	MAb 17	IgM	+++	ND	ND	Yes
	MAb 44	IgG2a	+++	ND	ND	Yes
	Mn41	IgG1	+++	ND	ND	ND
	OKM10	IgG2a	++	ND	ND	ND
	M1/70	IgG2a	++	ND	ND	ND
	Mac-1	IgG2b	ND	ND	Yes	ND
α_X	BU-15	IgG1	++++	165 ± 15	ND	ND
β2	TS1/18	IgG	0	ND	ND	ND
	MHM23		0	ND	ND	ND
CR2	HB5	IgG2a	0	ND	Yes	ND
	Anti-gp140	Polyclonal	0	ND	Yes	ND
	Anti-B2	IgM	0	ND	No	ND

assays, the 42-kDa protein bound C3(H2O), C3b, and iC3b. immunofluorescence on yeast cells, germ tubes, and pseudo-

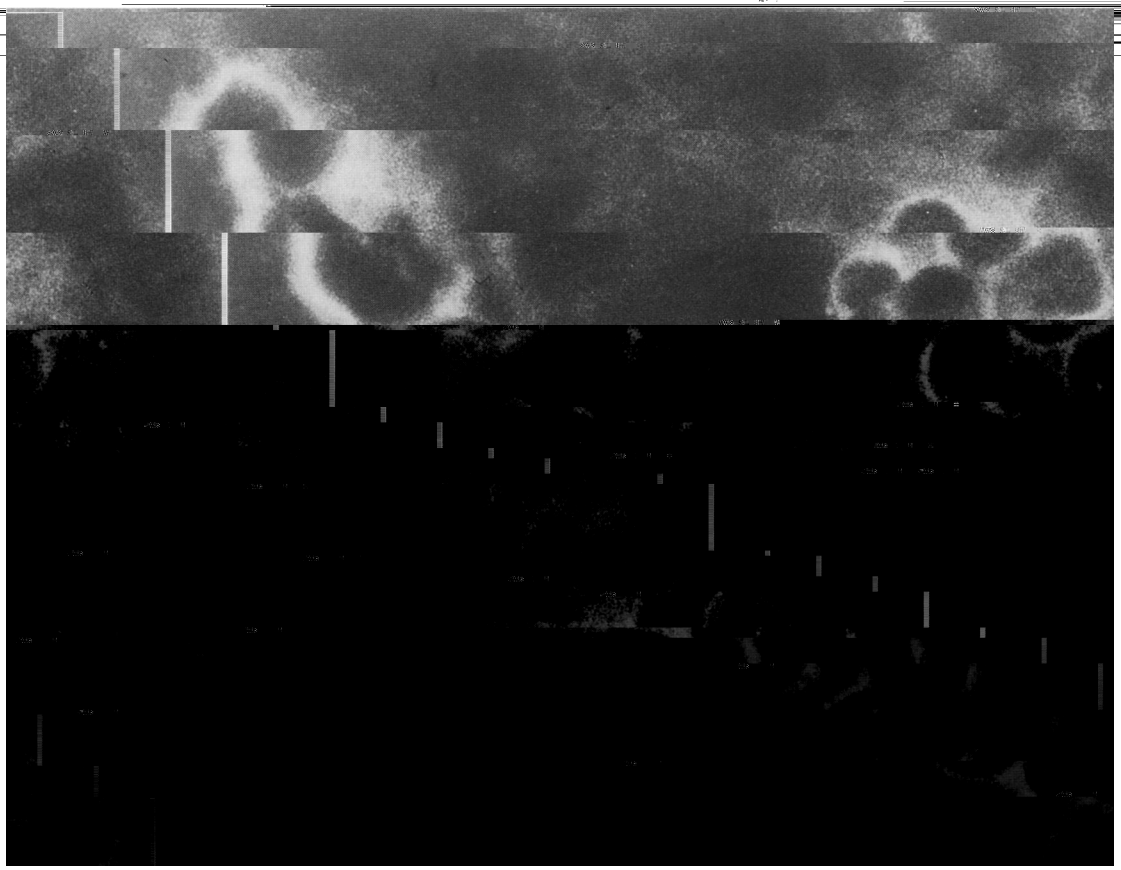


FIG. 4. Photomicrograph of *C. albicans* removed from the peritoneum of fungemic mice and incubated with MAb OKM1. There is visible immunofluorescence surrounding both blastospores and germ tubes (52).

O express the H antigen, a glycoside containing D-galactose, *N*-acetyl-D-glucosamine, *N*-acetyl-D-galactosamine, and an

proteinase activity and from the employment of assays that distinguish adhesion from invasion.

Parameter	Epithelial adhesion	Endothelial adhesion

Moreover, *C. albicans* adhered to immobilized components of the extracellular matrix, including type I and IV collagen, fibronectin, and laminin. Interestingly, although fibronectin easily inhibited candidal binding to all four substrates, RGD peptides did not reproducibly inhibit binding to collagen or laminin. The latter result, together with data collected on the efficacy of inhibition by GRGESP, suggests that determinants other than the RGD sequence may be important in *albicans* adhesion to immobilized extracellular matrix proteins (62) but had no effect on hepatic uptake (96) emphasizes again the tissue specificity of adhesion and the possibility that sequences surrounding the RGD site could regulate binding specificity.

Laminin receptor. Laminin-binding proteins, which in mammals are members of the β1 integrin subset, may also play a role in *C. albicans* adhesion to endothelium. For

antiserum against this protein has been used to stain kidneys, cutis, or urethral epithelium and demonstrates the presence of the protein in both blastospores and pseudohyphal forms in vivo. However, the antibody did not signifi-

genesis, has just begun. Diligent investigation will provide new insights into these mechanisms and ultimately improve treatment of candidal infections.

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albicans adherence to human vaginal epithelial cells in vitro. ties analogous to bovine conglutinin and functions as a recep-

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