β-1-3-D-glucan

β-1-3-D-glucan (BDG) is a polysaccharide found in the cell wall of many pathogenic fungi. It is therefore not specific to any kind of fungal infection and often referred to as a "pan-fungal" biomarker. It is released by Candida, Aspergillus and Pneumocystis but, importantly, not by Cryptococcus or the mucoracious moulds. In visceral candidiasis (e.g. liver abscess) Candida often doesn't cause candidaemia whereas the BDG is often detectable in the serum helping to make the diagnosis in conjunction with relevant imaging.

In confirmed fungal infections such as candidaemia the BDG can take a long time to clear from the blood stream which means BDG is not a marker to assess clinical response to treatment, and a positive result can thus also be a sign of past (recent) invasive fungal infection. Interestingly BDG levels are also not effected by antifungal treatment which means in can still be applied as a test when patients are already on antifungal agents. The BDG test can be affected by a number of factors causing false positive results (Figure 4).

B-D glucan	**Pan-fungal biomarker**	
BDG Positive	Candida, Aspergillus, PCP	False pos.: b-lactam anibiotics haemodialysis, blood transfusion, surgical gauze, albumin or immunoglobulin infusion. Nutritional feeds, environmental contamination during processing
BDG Negative	**Cryptococcus, Mucor**	

Figure 4. BD glucan, a pan fungal biomarker

Due to the complexity of the patients at risk for invasive fungal infections and the potential alternative sources of fungal glucan, the interpretation of the results usually requires specialist input.

In the critical care setting BDG may be used as a screening tool in patients with a high risk of fungal infection (e.g. following abdominal surgery, liver transplantation etc) to detect early infection. As a diagnostic assay the sensitivity is not very high (Table 1.) Equally due to the high negative predictive value BDG monitoring may be used to prevent unnecessary use of antifungal agents.

Serology-B D Glucan	
Adult ICU, hematological diseases, SOT	**Diagnostic assay**: 5 different assays, Fungitell (FDA and CE); Dynamiker Fungus assay (CE) Overall sensitivity 77%, specificity 85%[1,2] Negative likelihood ratio 0.28[2]
	Screening assay: 1–2 weekly Sensitivity 65%, specificity 93%[1,2]
Adult haematological malignancy and HSCT	**Diagnostic assay:** Sensitivity 49.6%[3], 69.9%[4] , specificity 87.1[4], 98.9%[3] NPV 75.1%[4], 94.6%[3]
Paediatrics	Limited data on interpretation

HSCT, hematopoietic stem cell transplantation; ICU, intensive care unit; NPV, negative predictive value; PPV, positive predictive value; SOT, solid organ transplant.
1. Karageorgopoulos DE, et al. Clin Infect Dis;2011:52;750-770; 2, Lu Y, et al. Intern Med 2011:50;2783-2791; 3. Lamoth F, et al. Clin Inf Dis 2012;54:633-643; 4. Ostrosky-Zeichner L, et al. Clin Inf Dis 2005;41:654-659.

Table 1. Sensitivity and specificity of BDG