Aim
The diagnosis of prosthetic joint infections (PJI) represents a critical challenge for orthopedic surgeons and infectious disease specialists. The diagnosis of PJI is often delayed because non-invasive assays lack sensitivity and specificity. A novel multiplex immunoassay detecting antibodies against Staphylococci, Propionibacteria and Streptococcus agalactiae was developed and its performance evaluated in a prospective, multicenter, non-interventional study.

Methods
The Luminex-based assay measures serum IgG against a proprietary panel of recombinant purified antigens from Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus lugdunensis, Streptococcus agalactiae and Propionibacterium acnes. Patients undergoing revision arthroplasty were included over a 2-year period (from 2012 up to 2014) in two French reference centers in compliance with IRB and French regulations. PJI cases were defined microbiologically (=2 intraoperative samples yielding the same microorganism) for confrontation of microbiological and immunoassay data.

Results
455 patients were eligible for study analyses. 149 patients (32.7%) were found to be infected. Among the most frequent infecting species recovered were S. aureus (30%), S. epidermidis (26%), P. acnes (9%), S. lugdunensis (6%), and S. agalactiae (4%). The sensitivity and specificity values of the test were, respectively, 75.9% (63/83) and 82.2% (180/219) for staphylococci (S. aureus, S. epidermidis, S. lugdunensis), 38.5% (5/13) and 81.9% (190/232) for P. acnes, and 66.7% (4/6) and 92.4% (208/225) for S. agalactiae. Interestingly, all cases (9/9) involving S. lugdunensis were detected by the test and the sensitivity for S. epidermidis reached 79.4% in patients more than three months after joint replacement. In a similar fashion, 89.5% (17/19) in the subpopulation with elevated inflammatory markers (ESR>30 and CRP>10). The assay correctly identified 67% of the microbiologically positive patients that were negative by ESR or CRP screening.

Conclusions
This novel multiplex serological test allows the rapid and non-invasive diagnosis of the most frequent PJI pathogens, showing a good correlation with microbiological culture. and appears to be a new promising tool in the management of PJI, adding sensitivity to the current serological assays and enhancing the management of patients with pauci-inflammatory PJI.