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Are PCR and single IgG measurement in convalescent serum complementary for the diagnosis of an acute *B. pertussis* infection?

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OBJECTIVES

The role of *B. pertussis* and the optimal method to detect it is not well known in adult respiratory infections in the community. We therefore evaluated the diagnostic value of real-time PCR on respiratory specimens and a single anti-PT IgG titer in convalescent sera from adults presenting with a lower respiratory tract infection (LRTI) at their general practitioner in the European GRACE primary care network (PCN).

MATERIALS & METHODS

From 10/2007 to 04/2010, 3104 adult patients with LRTI in the community were enrolled in a prospective study in 16 PCNs in 12 European countries; a follow up visit was planned after 4 weeks. Nasopharyngeal flocked swabs (NPFS) and, if available, sputa were collected and stored in the local laboratory until transport to the central lab for nucleic acid (NA) extraction by the NucliSens EasyMAG. Aliquots of NA extracts were analysed for *B. pertussis* by real-time in-house PCR (Reischl 2001). At both visits, a serum sample was collected. A patient was considered positive for a recent *B. pertussis* infection if positive by PCR in a respiratory sample and/or the presence of a single high IgG titer to Pertussis Toxin (PT) (Virion/Serion) in the convalescent phase serum sample with antibody concentrations >125 IU/ml.

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RESULTS

- For 3023/3104 and 1666/3104 patients a NPFS and a sputum could be collected, respectively (Table 1).
- Convalescent serum sample was available for 2433 patients.
- Overall, *B. pertussis* was detected in 92 (3.0%) of patients. Fifty seven patients were *B. pertussis* PCR positive (34 sputa and 39 NPFSs).
- A single high IgG titer >125 IU/ml was found in 52 convalescent phase sera.
- 10/13 patients with a IgG titer >500 IU were also positive by PCR. One patient was PCR negative. For the other 2 patients, no respiratory sample was available (Table 2).
- For 3/10 patients with an IgG titer >=300 and <500, and 4/17 patients with an IgG titer >=150 and <300 a positive PCR result was obtained respectively.
- Twelve patients with an IgG titer between >=125 and 150 were all PCR negative.
- For the other PCR positive patients, the IgG titer was <125, or no convalescent serum was available.
- For 1309 patients all 3 samples were available: 52 of these were *B. pertussis* positive (4.0%). Nine, 24 and 19 patients were positive by both PCR (NPH and sputum) and serology, by PCR only (2 NPH and sputum positive, 5 NPH only, 16 sputum only) and by serology only, respectively. Compared to all positives as gold standard, sensitivity was 63.5%, and 55.8% for PCR and IgG serology, respectively.

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CONCLUSIONS

- For diagnosis of an acute *B. pertussis* infection, PCR and serology are complementary; for early diagnosis PCR is more sensitive.

Table 1. Overview of cases and positive samples available

	Overall (n=3104)	Cases with all 3 samples available (n=1309)
Sputum PCR+	34/1666	27/1309
NPFS PCR+	39/3023	17/1309
IgG convalescent serum +	52/2433	29/1309
B. pertussis positive patients	92/3104	52/1309

Table 2. Overview of IgG titres and corresponding PCR-result (serum and ≥1 respiratory specimen available)

IgG-titre range convalescent serum	Nr of samples	Titre (IU/ml)	PCR result
≥500	10	>500	pos
≥500	1	500	neg
≥300 - <500	3	370; 311; 302	pos
≥300 - <500	7	412; 379; 359; 348; 374; 303; 302	neg
≥150 - <300	4	287; 255; 236; 171	pos
≥150 - <300	13	257; 211; 208; 186; 179; 186; 185; 169; 163; 154; 152; 139; 123	neg
≥125 - <150	12	149; 148; 148; 148; 144; 138; 138; 137; 134; 130; 127; 125	neg
<125	29	<125	pos