

# Low Rate of Macrolide Resistance in *Mycoplasma pneumoniae* Strains in Germany between 2009 and 2012

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*Mycoplasma pneumoniae* is a common cause of a broad spectrum of human respiratory tract infections which can be followed by extrapulmonary complications. Especially in epidemics, up to 20% to 40% of all cases of community-acquired pneumonia have been attributed to these cell wall-less bacteria (1, 2). Tetracyclines, fluoroquinolones, and macrolides are the only effective antibiotics for the treatment of infections due to *M. pneumoniae*. With respect to side effects, macrolides are the first-line antibiotics and the only ones recommended for treatment of pediatric patients. In Asia, a dramatic increase of macrolide resistance, in some regions approaching more than 90% of *M. pneumoniae* strains investigated, was observed in recent years (3). In other parts of the world, the rates of macrolide-resistant strains are currently lower; i.e., rates of 0% (the Netherlands), 2% (Denmark), 8% (France and the United States), and 22% (Israel) were previously reported (4–8). In a previous study, we demonstrated macrolide resistance in 1.2% of *M. pneumoniae*-positive respiratory tract specimens sampled between 2003 and 2008 in Germany (9). It is important that between 2010 and 2012, high incidences of infections due to *M. pneumoniae* in different European countries, resulting in increased prescription of macrolides, were reported (2; data from Germany are not available). Results from different reports showed that the possibility of development of macrolide resistance during appropriate therapy for *M. pneumoniae* pneumonia cannot be excluded (10).

To monitor a possible increase in the macrolide resistance rate, we investigated 84 *M. pneumoniae*-positive respiratory tract samples (all from different patients) submitted between 2009 and 2012 to the German Reference Laboratory for Mycoplasma. The specimens (bronchoalveolar lavage fluids, sputa, tracheal swabs, and throat-washing fluids) were sampled in outpatients and inpatients with a median of age of 38 years (range, 1 to 92 years; 61% males) from different parts of Germany. DNA was extracted as previously described, and *M. pneumoniae* was detected by real-time PCR (11). Macrolide resistance in mycoplasmas was tested by a culture-independent approach using PCR and melting curve analysis (9). Mutations at positions 2063 and 2064 and at position 2617 of the 23S rRNA of *M. pneumoniae* were confirmed by sequencing.

In three samples, a mutation (A to G at position 2063) could be demonstrated which is the most common one associated with complete macrolide resistance. The resulting rate of resistant strains of 3.6% is higher than that found in specimens sampled between 2003 and 2008 but still remained at a low level in Germany. Nevertheless, the data showed a resistant strain circulation that requires further monitoring of *M. pneumoniae*-positive clin-

ical samples to allow early identification of changes in the resistance pattern of this important agent of human respiratory tract infections.

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