Chapter 9
Fighting Antimicrobial Resistance in the Mediterranean Region

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Introduction

The Mediterranean is a heterogeneous region composed of 20 countries which vary substantially in terms of size, population, and culture. More importantly, the individual nations differ substantially in their socioeconomic development varying by a factor of 7.7 from the country with the highest GDP per capita (France, $29,900) and the one with the lowest (Egypt, $3900) (CIA World Fact Book, 2005). This difference undoubtedly translates itself into varying levels of healthcare provision and should have a direct impact on the individual nations’ capacities in addressing the challenge of antimicrobial resistance. Nevertheless, despite this wide disparity in resources, the epidemiology of antimicrobial resistance throughout the region shows remarkable similarity.

Regional Epidemiology

Reports suggesting a high level of antimicrobial resistance in important pathogenic bacteria within countries of the Mediterranean region have been made for a number of years (Gür and Unal 2001). In addition to epidemiological surveys at individual center and country level, a number of studies have provided useful and comparable intercountry data, particularly from the European zone. Such studies have often pinpointed an increased level of resistance in their Mediterranean participants. The Alexander project highlighted a high prevalence of penicillin resistance among isolates of *Streptococcus pneumoniae* in France and Spain (Schito et al. 2000). Increased quinolone resistance was observed by the SENTRY project in urinary tract isolates from Italy, France, and Spain (Fluit et al. 2000). Extended-spectrum β-lactamases were reported to be common from centers in Italy and Turkey participating in the MYSTIC study (Jones et al. 2003).

Since 1999, the European Antimicrobial Resistance Surveillance System (EARSS) [www.earss.rivm.nl] has been collecting susceptibility test results from invasive strains of *Staphylococcus aureus, S. pneumoniae, Escherichia coli,*
Enterococcus faecium and faecalis which are routinely isolated from clinical samples of blood and cerebrospinal fluid in the participating laboratories. These laboratories are asked to send information only about the first strain isolated from each patient and to follow their routine procedures and breakpoints, which in 78% of participants were based on CLSI (formerly NCCLS) guidelines (EARSS report 2004). The same methodology has been adopted by another study, Antibiotic Resistance in the Mediterranean region (ARMed) [www.slh.gov.mt/armed], which has concentrated on the countries in the southern and eastern Mediterranean (Borg et al. 2006). As a result of the identical methodology used by both networks, it is now possible to depict a comparable epidemiological picture of antimicrobial resistance within the whole Mediterranean region.

The data from these two networks seem to support reports from earlier individual surveys and confirm a high prevalence of resistance within their Mediterranean participants. This is particularly the case with methicillin-resistant Staphylococcus aureus. (MRSA) where, other than Portugal, the United Kingdom, and Ireland, the highest incidence rates were identified from the Mediterranean participants (Figure 9.1). Proportions of MRSA blood culture isolates among the Mediterranean countries in EARSS in 2004 ranged from 11.8% in Slovenia to 56.4% in Malta. In fact, all the countries in the region (except for Slovenia) exhibited proportions in

![Figure 9.1](image.png)

**Figure 9.1.** Invasive isolates of *Staphylococcus aureus* resistant to methicillin (MRSA) reported by laboratories participating in the EARSS and ARMed surveillance networks in 2004.