Obviously, any rapid test for antibiotic resistance that is not started as soon as possible, and whose results are not implemented quickly, is no better for the patient than a standard method (Diekema and Pfaller 2013). Current official recommendations by the Food and Drug Administration (FDA) and other regulatory agencies on any methods mentioned here must be obtained from the agency websites and publications.

21.2 Standard Methods for Antibiotic Sensitivity Testing

Among the clinically important bacteria that require not only immediate identification but also *antibiotic sensitivity testing* are species of *Staphylococcus*, *Enterococcus*, *Escherichia*, *Pseudomonas*, *Klebsiella*, *Enterobacter*, *Acinetobacter*, and others (Weiner et al. 2016). After purification, a bacterium can be identified by cultural, serological, or genetic methods (Sutherland and Rafii 2006), and the antibiotic sensitivity can be determined (Pulido et al. 2013). The standard methods for characterization of antimicrobial susceptibility in clinical isolates of bacteria show phenotypic resistance by determining cell growth in the presence of different concentrations of antibiotics. Agar dilution, broth microdilution, disk diffusion, and gradient diffusion (Etest) are some of the methods currently used to determine antibiotic sensitivity of pure cultures (Levy Hara et al. 2013; van Belkum and Dunne 2013). These methods follow standardized techniques accepted by regulatory agencies and standards institutes (Leclercq et al. 2013; Levy Hara et al. 2013; CLSI 2017). The minimum concentration of an antibiotic needed to prevent the growth of a target bacterium, referred to as the *minimum inhibitory concentration (MIC)*, indicates the level of resistance. The determination of the MIC is important for the treatment of an infectious disease because it predicts the effectiveness of various doses of an antibiotic against a particular strain. Although the standard cultural methods correctly identify antibiotic-resistant strains of bacteria, they still require time for the isolation of pure cultures before testing for resistance (Osei Sekyere et al. 2015) and then additional time for detecting bacterial growth with different concentrations of antibiotics. These time requirements often delay the use of the most effective drug for critically ill patients.

Most *biochemical methods* for detecting resistant bacteria rely on phenotypes that are only seen with pure cultures. Several commercial biochemical tests are available to detect specific kinds of resistance. Chromogenic agars for the detection of methicillin-resistant *Staphylococcus aureus* (MRSA), containing inhibitors against other bacteria, indicate the growth of MRSA by a pink or mauve color and can be used directly to screen clinical samples (Wolk et al. 2009; Hernandez et al. 2016). Gram-negative bacteria suspected of possible