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WGS challenges and opportunities in bacteriological diagnostics

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Whole-genome sequencing (WGS) has attracted the attention of experts in various fields for decades. Due to the development of new and highly efficient sequencing technologies, sequencing costs per genome have drastically decreased in the last decade, making WGS a powerful and widely used application for diverse scientific questions. In modern bacterial diagnostics there is also a methodological shift from classical detection and typing techniques towards WGS-based approaches, utilizing different Next Generation Sequencing (NGS) technologies. WGS allows for comprehensive analysis and possesses high discriminatory power for bacterial characterization, thus enabling a wide range of applications in routine diagnostics and fundamental research. Whereas some promising approaches using NGS to facilitate bacterial detection and characterization from complex samples are still primarily applied and optimized in research projects, WGS-based bacterial isolate characterization has already replaced traditional standard methods in microbiological laboratories worldwide. Also, at the NRL for Salmonella in Germany, WGS is now used on a routine basis and is the gold standard approach for Salmonella characterization. However, new developments are accompanied by new challenges that affect decision making, risk management strategies and even national or international regulations.

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