Commentary

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Editorial on Clinical Microbiology Informatics

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The use of information (e.g., data, knowledge, and results) and information tools (e.g., software, databases, and rules) in the "science and service dealing with detection, identification, and antimicrobial susceptibility testing" of clinically relevant microbes and the communication of these results to clinicians" is referred to as "clinical microbiology informatics". A more practical definition includes the use of Information Technology (IT) to improve workflow, efficiency, dependability, and, ultimately, patient care in clinical microbiology

The clinical microbiology laboratory has responsibilities ranging from characterizing the causative agent in a patient's infection to helping detect global disease outbreaks. All of these processes are increasingly becoming partnered more intimately with informatics. Effective application of informatics tools can increase the accuracy, timeliness, and completeness of microbiology testing while decreasing the laboratory workload, which can lead to optimized laboratory workflow and decreased costs. Informatics is poised to be increasingly relevant in clinical microbiology, with the advent of total laboratory automation, complex instrument interfaces, electronic health records, clinical decision support tools, and the clinical implementation of microbial genome sequencing.

The microbiology laboratory information system, decision support tools, expert systems, instrument interfaces, total laboratory automation, telemicrobiology, automated image analysis, nucleic acid sequence databases, electronic reporting of infectious agents to public health agencies, and disease outbreak surveillance are all discussed in this review. The breadth and utility of informatics tools used in clinical microbiology have made them indispensable to contemporary clinical and laboratory practice. Continued advances in technology and development of these informatics tools will further improve patient and public health care in the future.

This work, the position of contemporary microbiology is considered from the perspective of scientific success, and a list of historical points and lessons learned from the fields of medical microbiology, microbial ecology and systems biology is presented. In addition, patterns in the development of top-down research topics that emerged over time as well as overlapping ideas and personnel, which are the first signs of trans-domain research activities in the fields of metagenomics, metaproteomics, metatranscriptomics and metabolomics, are explored through analysis of the publication networks using the computer programme. The current state of affairs is defined, and the need for meta-analyses to leverage publication biases in the field of microbiology is put forward as a very important emerging field of microbiology, especially since microbiology is progressively dealing with multi-scale systems.

Consequently, the need for cross-fertilisation with other fields/disciplines instead of 'more microbiology' is needed to advance the field of microbiology as such. The reader is directed to consider how novel technologies, the introduction of big data approaches and artificial intelligence have transformed microbiology into a multi-scale field and initiated a shift away from its history of mostly manual work and towards a largely technology-, data- and statistics-driven discipline that is often coupled with automation and modelling. A pure bacterial culture remains essential for the study of its virulence, its antibiotic susceptibility, and its genome sequence in order to facilitate the understanding and treatment of caused diseases. The first culture conditions empirically varied incubation time, nutrients, atmosphere, and temperature; culture was then gradually abandoned in favour of molecular methods.

The rebirth of culture in clinical microbiology was prompted by microbiologists specializing in intracellular bacteria. The shell vial procedure allowed the culture of new species of Rickettsia. The design of axenic media for growing fastidious bacteria such as Tropheryma whipplei and Coxiella burnetii and the ability of amoebal coculture to discover new bacteria constituted major advances. Strong efforts associating optimized culture media, detection methods, and a microaerophilic atmosphere allowed a dramatic decrease of the time of Mycobacterium tuberculosis culture. The use of a new versatile medium allowed an extension

of the repertoire of archaea. Finally, to optimize the culture of anaerobes in routine bacteriology laboratories, the addition of antioxidants in culture media under an aerobic atmosphere allowed the growth of strictly anaerobic species. Nevertheless, among usual bacterial pathogens, the development of axenic media for the culture of Treponema pallidum or Mycobacterium leprae remains an important challenge that the patience and innovations of cultivators will enable them to overcome.

It's crucial to note that informatics isn't only about technology, it also encompasses the people who use, build, and manage information systems, as well as the workflow processes that are influenced by it. The various informatics components that are specifically important to the clinical microbiology laboratory are discussed in this review. The microbiology Laboratory Information System (LIS), decision support tools, expert systems, instrument interfaces with the LIS, total laboratory automation, remote and automated image analysis, nucleic acid sequence databases, and reporting of infectious agents to public health authorities are among the topics covered. The focus of this essay is on the numerous links that informatics and clinical microbiology have, as well as the potential benefits that might be gained by increasing the use of informatics tools in clinical microbiology. Some of these informatics solutions have only been implemented in a few hospitals or laboratories, whereas other informatics components are more likely to be familiar to many microbiologists since they are ingrained in clinical microbiology practise. It's critical to keep looking for new informatics tools that have the potential to help.