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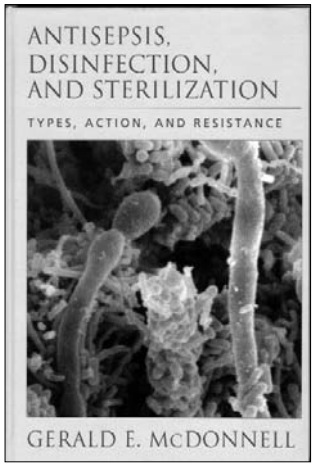

Antiseptics, disinfection, and sterilization. Types, action, and resistance

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Biocides (antiseptics, disinfectants, and preservatives) and other antimicrobial agents have been known and applied for many centuries. The ancient Egyptian art of mummification relied in part on the use of balsams that contained natural preservatives. The preservation of food by salting or mixing with natural spices has also been appreciated since ancient times. Various agents (wine, vinegar, honey, mercuric chloride) even found use as wound dressings. Nonetheless, it is only in the last 160 years that our understanding of microbiology has included recognition of the impact of disinfection and sterilization in the control of microorganisms. Ignatz Semmelweis (1818–1865) and Joseph Lister (1827–1912) developed some of the first microbial control practices for medical procedures. Semmelweis introduced washing of the hands with chlorine, whereas Lister used carbolic acid (phenol) sprays to decontaminate surgical wounds. Indeed, the clinical practice of wearing rubber gloves stems from the fact that direct contact with phenol irritated surgeon's hands. The use of surgical gloves has continued, although it has been many years since carbolic acid was sprayed on open wounds.

The book *Antiseptics, disinfection, and sterilization* offers updated and detailed scientific information on antiseptics, disinfection, and sterilization and thus provides the basis for understanding the prevention of infection and the control of contamination. The continuing timeliness of this information is evidenced by the fact that microorganisms are still a significant cause of morbidity, mortality, and economic losses. For example, in hospitals, the effective use of disinfectants constitutes an important measure in preventing nosocomial infections. These may arise from surface contamination, which contributes to cross-transmission of infectious agents either by facilitating transient hand carriage by healthcare personnel or through patient contact with contaminated surfaces. Similarly, the surfaces of medical equipment may become contaminated with infectious agents and thereby serve as the vehicle in outbreaks involving person-to-person transmission.

The eight chapters of *Antiseptics, disinfection, and sterilization* describe the major disinfection and sterilization applications used in medical, veterinary, and industrial settings. Each method is described with respect to its applications, spectrum of activity, advantages, disadvantages, and mode of action. Importantly, the book introduces essential information about current standards, e.g., the International Standards Organization (ISO) and the European Norm (EN), and guidelines for disinfection, antisepsis, and sterilization applications.

Chapter 1, "Introduction," describes the general principles that must be considered in the choice of a biocide, such as target microorganisms, antimicrobial efficacy, and compatibility (lack of damage to surfaces, inanimate and animate). Also, several techniques with which to evaluate biocidal efficacy are discussed. Chapter 2, "Physical disinfection," reviews the most widely used methods of physical disinfection, such as temperature and non-ionizing radiation (UV, infrared, or microwaves). It should be noted that disinfection is the antimicrobial reduction, to a level previously specified, of the number of viable microorganisms in a product or on a surface. Chapter 3, "Chemical disinfection," focuses on the use of biocides, such as alcohols, aldehydes, antimicrobial metals, and halogens. Biocides have a broad range of antimicrobial activity; however, their toxic effects have limited their use to the treatment of surfaces.

Chapter 4 is entitled "Antiseptics and antisepsis." Antiseptics are disinfectants that are applied to living tissues (e.g., skin) to destroy or inhibit the growth of microorganisms. Requirements for the safe use of antiseptics restrict the choice to those that have limited or no toxicity. Hand hygiene is an important step to reduce potential microbial cross-contamination from surfaces to individuals and between individuals. Accordingly, Chapter 4 discusses both the importance of adequate skin hygiene prior to surgical intervention and the treatment of skin wound, oral, and mucous-membrane infections. Chapter 5, "Physical sterilization," describes the appropriate use of moist heat, dry heat, and ionizing radiation, such X-rays and g-rays, to render a surface or product free from viable organisms, including bacterial spores. Chapter 6, "Chemical sterilization," highlights the problem that, despite the wide variety of chemical biocides, only a limited number have been developed for use in sterilization (epoxides, formaldehyde, oxidizing-agents such as hydrogen peroxide).

Chapter 7, "Mechanisms of action," considers the cellular targets, range of antimicrobial activity, and mechanism of

biocide action in killing microorganisms. Four main modes of biocide action are presented: oxidizing agents, cross-linking or coagulating agents, energy inhibitors, and structure-disrupting agents. In addition, the modes of action of various antibiotics (antibacterial, antifungals, antivirals, and antiparasitic drugs) are briefly analyzed.

While a number of laboratory in vitro studies have demonstrated possible associations between the exposure of bacterial cultures to subinhibitory concentrations of biocidal molecules and changes in antibiotic susceptibility, currently there is little or no direct evidence that this is significant in the development of antibiotic resistance in clinical practice. Chapter 8, "Mechanisms of microbial resistance" considers the mechanisms by which bacteria may become less sensitive to biocide action and then examines potential links between antibiotic and biocide resistance. Resistance is the relative insusceptibility of a microorganism to a particular treatment under a particular set of conditions. The discussion of microbial responses to disinfectants and sterilants is confined to the case of bacteria, because information regarding viruses and other microorganisms is still very limited. Resistance can be a natural property of an organism (intrinsic) or it can be acquired by mutation or horizontal transfer. Several intrinsic mechanisms of resistance have been studied extensively; of particular interest are those involving biofilms, extremophiles, and spores.

Uncontrolled and unwanted microbial growth continues to have dire medical, environmental, and economic consequences. *Antiseptics, disinfection, and sterilization* may contribute significantly to addressing some of the problems arising from contamination by improving our knowledge of modern disinfection and sterilization technologies and of their potential applications.

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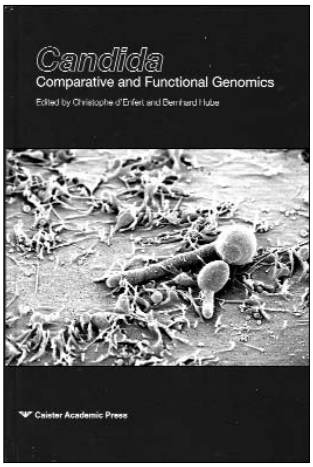

Candida: Comparative and Functional Genomics

CHRISTOPHE D'ENFERT, BERNHARD HUBE (EDS.)

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The last 25 years have seen a serious increase in the number of fungal infections due to a worldwide increase in the number of immunocompromised individuals. AIDS and cancer patients, those receiving immunosuppressive regimens or broad-spectrum antimicrobial therapies are at high-risk of developing disseminated fungal infections. Moreover, the use of indwelling catheters, artificial implants and surgical trauma further increases the risk of patients contracting nosocomial infections. *Candida* species are one of the main fungal pathogens responsible for causing opportunistic infections, and up until now, the high mortality rates associated with these have been partly associated to late diagnosis and the relative inefficiency of currently available antifungal treatments in the aforementioned situations. With the whole genome sequences for several medically relevant *Candida* species now available, our understanding of the biology of these complex organisms has been revolutionized: post-genomic approaches have allowed for more detailed investigations and have changed the way *Candida* species are now studied and understood.

Candida: comparative and functional genomics is one of the most complete reviews on these organisms. This comprehensive book is a collection of 17 concise and straightforward chapters written by international experts, providing a broad coverage on the subject. The complete *Candida albicans* genome was the first in the genus to be sequenced and was made available in 2004. Therefore, the topics in most of the chapters refer to this organism. Nevertheless, there are other medically important *Candida* species such as *C. glabrata, C. parapsilosis, C. tropicalis and C. dublinensis*, all of which represent a therapeutic challenge.

Chapter 1 discusses the genome structure and dynamics in *C. albicans*. This species is both medically important and biologically interesting for a number of reasons. While normally a commensal of the skin and the gastrointestinal and genitourinary tracts, it can, on occasion, become pathogenic, generating opportunistic infections, and is responsible for the majority of the *Candida* bloodstream infections. This chapter concentrates on peculiarities of this organisms' highly-dynamic genome and its mitotic recombination. Chapter 2 discusses the mating systems of *Candida* species. It explains the similarities of C. *albicans* with *Saccharomyces cerevisiae* as well as its own peculiarities, and those of *C. dublinensis* and *C. glabrata* with attention to the possible relationship they may have to pathogenesis. The importance of this chapter lies in the role that *Candida*'s mating processes have on