COMMON PROBLEMS IN INFECTIONS AND STONES

GEORGE W. DRACH

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PREFACE

This text is written for family practitioners, emergency physicians, internists, nephrologists, urologists, and any other physicians who diagnose and treat urinary and genital infections and urinary stones.

This text on urogenital infections and stones was compiled because these diseases are so common in all types of medical practice and because they require special diligence in diagnosis and treatment. In most texts the methods are generalized and not directed toward the problem of a specific patient. In this text we first present the patient's problem, then a consultant discusses the approach to this and related problems.

I would like to suggest a method of chapter review for readers. The chapters in Part I are organized so that urinary tract infections are presented first (Chapters 1 through 12), followed by chapters that deal with infections of the genital systems (Chapters 13 through 20). Part II presents a comprehensive review of diagnosis and treatment of urinary stone disease (Chapters 21 through 50).

If you have a patient with a specific problem, such as an acute stone episode, turn directly to Chapter 21. If after simple metabolic testing you think citrate therapy may be correct for this patient, review Chapter 31. If you wish to review the entire area of infections and stones, then read the text from cover to cover. We have attempted to include all the modern theories of causation and approaches to therapy.

Authors have been selected from experts who have investigated and published in the specific area titled in their chapter(s). I thank them for their chapters, their attention to detail, and for their prompt submission of manuscripts. In addition, I thank the series editor, Alan Wein, M.D., for introducing me to the concepts used in *Common Problems*. The text was organized by Carol Frost, and edited under the direction of David Marshall. They, too, deserve thanks.

Finally, my ongoing thanks to my wife, Paula, who always says, "Not another book!," then spends many hours assisting in its production.

GEORGE W. DRACH, M.D.

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PART ONE

Urinary Tract Infections

1

Office Bacteriology

Jackson E. Fowler, Jr., M.D.

You open your new office in Surprise, Kentucky, but you find that no laboratory facilities exist in the community. The nearest hospital is 25 miles away. As a service to your patients, you consider establishing office microbiology facilities that will allow you to diagnose the majority of genitourinary tract infections.

This practitioner needs facilities to diagnose the two most common infectious disorders encountered by the urologist—urinary tract infection and infections of the male urethra. Although it is unlikely that he received meaningful exposure to basic bacteriology during residency training, the techniques and interpretations of the tests he will perform are well standardized and not difficult to master. In addition, a variety of available kits permit economically feasible office bacteriology even when the volume of work is limited.

All urologists should have a microscope, a countertop centrifuge, and glass slides and coverslips to perform routine urinalysis. Additional equipment and supplies that will be required to establish the laboratory are listed in Table 1–1.

OFFICE BACTERIOLOGY FOR URINARY TRACT INFECTIONS

Urine Culture

The urine culture documents the presence or absence of bacteria in the urine, provides an estimate of bacterial density, and permits presumptive identification of the bacterial isolates.

A supportive and selective agar media are routinely used for the culture. The plates can be purchased from most medical supply houses and may be stored for several weeks in a refrigerator. The most commonly used supportive medium is sheep blood agar. Gram-negative bacilli and gram-positive cocci that infect or contaminate the urine grow on this medium. MacConkey agar, which contains crystal violet and bile salts to inhibit the growth of gram-posi-

TABLE 1–1.
Equipment and Supplies for the Office Microbiology Laboratory

Equipment
Small incubator
Small refrigerator
Flame or electrical sterilizer for inoculation loops
Supplies
Agar plates or dip slides for urine culture
Platinum or sterile plastic inoculating loops
Agar plates for susceptibility testing
Antibiotic disks and disk dispenser
Nutrient broth and control bacteria for susceptibility testing
API 20E biotyping strips
Reagents for Gram stain
Slides or transport media for *Chlamydia trachomatis* assay
Sterile saline solution, plastic test tubes, and swabs

tive cocci, is a commonly used selective medium. Neutral red, which turns red in an acid pH, is also incorporated to differentiate lactose- and nonlactose-fermenting isolates.

The urine is vigorously mixed to ensure a uniform suspension of bacteria, and 0.05 to 0.001 mL is deposited on the middle of the plate using a calibrated platinum loop that can be sterilized or a disposable sterile plastic loop. The drop is spread in a line from one side to the other and then streaked over the entire surface. This promotes isolated bacterial growth, which facilitates both the counting of colonies and assessment of their morphologic characteristics.

The plate is covered and left undisturbed for 15 to 20 minutes while urine diffuses into the medium and is then incubated in an inverted position at 37°C for 18 to 24 hours. In the inverted position moisture collects on the dependent top rather than on the agar surface. If bacterial growth is not identifiable after 24 hours or if only tiny colonies are seen, the plate is incubated for an additional 24 hours. The plate is discarded if growth is not observed after 48 hours.

The density of bacteria in the urine specimen is estimated by counting the number of colonies on the agar surface and dividing by the volume of the inoculum. Precision in this determination is not necessary. From a diagnostic standpoint, meaningful differences in the estimated density of an isolate are measured by a factor of 10. As such, enormous error in the volume of urine plated or in the counting of colonies is necessary for clinically important miscalculations. There is no need to quantitate growth in densities of greater than 10^4 bacteria/mL, which usually appears as confluent bacterial colonies.

Gram-negative bacilli grow on both the supportive and selective agars (Fig 1–1,A). The appearance of the colonies on MacConkey agar (Table 1–2) is a relatively reliable means for speciation. Note that the reddish colonial discoloration of the lactose fermenters is an important identifying feature. The colonies of gram-negative bacilli on blood agar are gray, convex, and somewhat nondescript.

Gram-positive cocci grow on the supportive sheep blood agar only (Fig 1–1,B). These isolates, which usually reflect contamination of voided urine by commensal vaginal or urethral bacteria, are generally found in densities of less than 10^3/mL. Contamination by more than one gram-positive organism is not unusual, and the morphology of the bacterial colonies is often heterogeneous.

Enterococcus and *Staphylococcus saprophyticus* are the principal urinary pathogens that do not grow on MacConkey agar. However, the density of these organisms in infected urine is usually greater than the density of contaminating gram-positive cocci, and the colonial morphology is homogeneous. This simplifies differentiation between infection and contamination.

Dip-slide culture kits are an alternative method for urine culture that may be more appealing to the urologist. Dip-slide kits consist of a sealed chamber and a slide. One surface of the slide is covered with a supportive agar and the