Use and Abuse of Antibacterials in Urinary Infections

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THE wide choice of antibacterial agents available (Table I) in urinary infections is not an unmixed blessing. With broader choice has often come insufficient understanding of the potentials and weaknesses of each of these agents. The choice of a particular drug must be preceded by valid evidence that an antibacterial is in fact needed, i.e., reasonable proof of the existence of infection. Administration of drugs on the basis of past infections or poorly obtained urine specimens (in the female) are examples of drug abuse. Factors in the choice of antibacterial drugs are listed in Tables II and III. Relatively minor uncomplicated lower urinary tract infections call for the simpler, cheaper agents such as sulfonamides, or urinary acidifiers with mandelamine, whereas upper tract involvement with systemic manifestations require more potent and specific drug management.

Drug effectiveness is obviously the prime factor in choice. Identification of the bacterial invader is worthy of careful determination to simplify the treatment pattern. Most strains of E. coli in the absence of stasis respond to most of the available drugs, hence drug choice may rest on severity and location of the infection by this organism. Proteus variants on the other hand regularly show susceptibility to ampicillin or kanamycin only. Pseudomonas infections, so often associated with stasis or foreign bodies, viz. catheters, or appearing as secondary invaders, may resist therapy by any but the polymyxin group of drugs (colistin). Inevitably, difficult infections will demand culture-sensitivity testing for guidance.

DRUGS AVAILABLE FOR UROLOGIC ANTIBACTERIAL USE

Penicillin-Ampicillin
Streptomycin
Kanamycin
Colistin
Polymyxin
Tetracycline
Oxytetracycline
Chlorotetracycline
Chloramphenicol
Rondomycin
Cycloserine
Cephalothin
Erythromycin
Oleoandomycin
Novabiocin
Mandelamine
Furadantin
Sulfonamides
NegGram (nalidixic acid)

TABLE I

Recurrent Reinfections

The treatment of recurrent reinfections is quite often different from management of chronic infections. The former often envisage relatively short periods of therapy with eradication of source when possible, whereas the latter may demand intensive and extensive medication over many weeks or months. Mode of entry of the offensive organism where known may materially influence drug choice. For example, a young woman subject to recurrent "cystitis" consequent to defloration and continued sexual activity may well need a drug achieving significant antibacterial levels in the urine but not in the renal tissues. Long term low dosage of furadantin (100 to 200 mg/day) will often suffice to control repeated recontamination of urethra and bladder until such time as the subject may gain a measure of intrinsic antibacterial control.

The majority of recurrent infections in female children and women are reinfection rather than chronicity. Hence, careful search for complicating structural abnormalities such as ureteral reflux must precede repetitious drug therapy. Long term, low dosage drug therapy may be justifiable in such situations as ureteral reflux in young female children. Here reinfection is prevalent until chronic infection follows a severe pyelonephritic episode. With a low dosage drug regimen, reinfection can often be prevented by achieving effective urine drug levels. In some children, reflux will cease and drug

URINARY INFECTION FACTORS INFLUENCING CHOICE OF DRUG

1.	Organ involved.
2.	Intensity of infection—acute or chronic.
3.	Smear findings.
4.	Culture—sensitivity.
5.	Past experiences with drug (effectiveness or allergy).
6.	Presence or absence of obstruction or stasis.
7.	Presence of foreign body.
8.	Renal function.
9.	Drug cost and mode of administration.
10.	Length of treatment contemplated.

TABLE II

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FACTORS INFLUENCING EFFECTIVENESS OF AN ANTIBACTERIAL AGENT

1. Bacterial sensitivity.
2. Route of administration.
3. Route of elimination.
4. Blood level.
5. Protein binding.
6. Chemical splitting.
7. pH of urine.
8. Duration of treatment.
9. Dosage.

TABLE III

therapy can be terminated. The second infection in female children warrants uro-radiologic study. The first infection in boys demands prompt investigation rather than total reliance on drug administration due to the high incidence of congenital anomalies producing urinary stasis.

Renal function capability may play a large role in therapy. Renal azotemic patients accumulate drugs normally excreted by the kidneys to toxic levels limiting the dosage if not usefulness of streptomycin, kanamycin and the polymyxins (colistin). Certainly combinations of these drugs should be rarely, if ever, used in such patients due to their renal toxic and neurotoxic tendencies. Other lesser side reactions may limit drug choice. We are all seeing young adults today with unsightly discoloration of teeth due to excessive use of the tetracycline groups of drugs in their childhood.

Adjusting urinary pH to a level favorable to specific drug action may be helpful in infection control. Acid pH levels will enhance, if not fully activate, the antibacterial effectiveness of mandelamine, nitrofurantoin, tetracycline and nalidixic acid. Streptomycin on the other hand is more effective in an alkaline medium.

Errors in drug therapy are categorized in Table IV. Perhaps the most difficult to avoid is that of misuse due to excessive patient or parental demand. While new drugs offer much in future control of infection, we are all aware of the strong tendency to acquaint ourselves with them by their early use, and often "wear them out" prematurely. For example, all of us recall the resurgence in antibacterial effectiveness of chloramphenicol after its withdrawal from heavy usage some years ago.

In summary, the selection of the appropriate antibacterial agent in urinary infections not only hinges on the organism involved, but on the organ involved, severity of infection and other factors mentioned above. Careful consideration of all aspects will improve therapeutic efficiency. ◄

ERRORS IN ANTIBACTERIAL USE

1. Use of the wrong drug.
2. Wrongful usage in viral and other unresponsive diseases.
3. Inadequate dosage.
4. Neglect of drainage — surgical, etc.
5. Failure to discontinue drug in face of toxicity.
6. Excessive attraction to new drugs.
7. Treatment of fever empirically (high incidence of neoplasia, etc.).
8. Use of overly expensive drugs.
9. Drug usage unsupervised.
10. Excessive demand by family or patient.
11. Use of route of administration incompatible to patient.

TABLE IV

VA Reports

The number of veterans hospitalized for emphysema and chronic bronchitis, lung diseases common to the aging, has more than doubled in eight years, the Veterans Administration reports.