The liberal, though not indiscriminate, use of antibiotics in pediatrics has resulted in far more assets than liabilities, although the statement has been made that 90% of antibiotics used in this country today are wasted. Often the pediatrician is able to select the correct and most effective antibiotic on the basis of clinical examination alone. At other times, laboratory examinations are necessary to establish an etiologic diagnosis. This information frequently allows the selection of the most favorable antibiotic when the bacterial species is of predictable sensitivity. Cases in which the bacterial species isolated are of unpredictable sensitivity require determination of the in-vitro efficacy of antibiotics. It must be stressed that many bacterial pathogens are as sensitive to penicillin and other antibiotics today as they were years ago, and that the emergence of antibiotic-resistant bacteria is not a general phenomenon. For example, the vast majority of strains of group A hemolytic streptococcus, gonococcus, pneumococcus, influenza bacillus, and the spirochete of syphilis have not become antibiotic resistant. In contrast, the staphylococcus has become a serious problem, particularly in hospitals and hospital-acquired infections. With the widespread use of penicillin and other antibiotics the percentage of antibiotic-resistant bacteria isolated from lesions in man has increased substantially. In addition, workers in hospitals rather frequently have become carriers of these strains and thus may in turn spread the infection to patients.

Status of Current Antibiotics

During the last few years several antibiotics have been added to the armamentarium of the physician. The present status of these antibiotics or special preparations may be summed up as follows.

1. So far as penicillin is concerned penicillin V gives somewhat higher blood levels than the hitherto available oral preparations. Expense and the fact that an occasional patient may not absorb the drug optimally have to be taken into consideration. Severe allergic reactions are less common after oral than intramuscular administration. Oral penicillin V in large doses has been used even in serious infections.
2. The various tetracyclines, including chlortetracycline, oxytetracycline, and tetracycline itself, are of similar, although not always identical, activity against most pathogenic bacteria. Side effects are somewhat less common with the latter preparation.

3. Chloramphenicol has had its ups and downs in popularity, and the evidence available to date indicates that blood dyscrasia following its use is occurring in perhaps 1 out of 40,000 individuals. Chloramphenicol is still the drug of choice in typhoid fever and has proved to be excellent in Hemophilus influenzae infections, notably meningitis, and other bacterial diseases.

4. Several antibiotics particularly effective against staphylococci are now available, namely, erythromycin, novobiocin, and oleandomycin. Whether staphylococci resistant to these antibiotics will emerge depends to some extent on the general usage of these drugs.

5. Neomycin, bacitracin, and polymyxin B are highly effective antibacterial agents with characteristic spectra of activity; the drugs are well tolerated locally. Local administration includes oral use, since the antibiotics are poorly absorbed from the intestinal tract. Neomycin has become the drug of choice for the treatment of diarrheal disease due to enteropathogenic Escherichia coli. Systemic use should be restricted to seriously ill and hospitalized patients. Under these conditions these agents have proved beneficial, when other antibiotics failed.

6. Nystatin is an antifungal antibiotic, particularly useful in moniliasis.

7. Indubitably, new antibiotics will be introduced in the future and the potential usefulness of several agents, such as ristocetin and vancomycin, presently are under study.

8. It should be emphasized that sulfonamides still are useful chemotherapeutic agents, notably in urinary tract infections, bacillary dysentery, and upper respiratory infections. It must be stressed, however, that penicillin is superior to the sulfonamides in group A hemolytic streptococcal infection.

**Use of Combinations of Antibiotics**

1. In mixed infections two or more antibiotics may have to be used to affect all pathogens involved.

2. So long as an etiologic diagnosis of the infection, for example, purulent meningitis, cannot be made, it may be necessary to use combined therapy (such as penicillin, chloramphenicol, and a sulfonamide). As soon as the diagnosis has been made, drugs no longer needed should be discontinued.

3. Antibiotics may produce synergistic effects. This synergism may consist of either suppression of resistant bacterial cells of the pathogen or other bacterial species that otherwise may emerge or the combined drugs may produce greater killing. Antagonism, which can be clearly demonstrated in vitro and in experimental animals, does not play a significant role in practice.

**Questions and Answers**

**Q.** How long should a streptococcal infection be treated for the prevention of rheumatic fever?

**A.** Ten days of adequate therapy are desirable, the goal being 10 days of adequate penicillin levels. The number of penicillin administrations depends upon the particular penicillin preparation used whether it be procaine penicillin, benzathine penicillin, or combinations thereof.

**Q.** How long should prophylaxis against streptococcal infection be carried out in rheumatic fever subjects?

**A.** At least until puberty when the problem becomes the responsibility of a physician other than a pediatrician! Year-round penicillin prophylaxis rather than administration during winter months only is highly desirable.

**Q.** Has the treatment of otitis with antibiotics alone, without myringotomy, resulted in a greater incidence of deafness?

**A.** Before antibiotics were used, there was no convincing evidence that myringotomy as opposed to spontaneous rupture
gave any different end results in regard to deafness. There is no reason to believe that antibiotic treatment without myringotomy has increased the incidence of deafness.

Q. How long should penicillin be given to children with nephritis?

A. It is recommended that penicillin be given in a dosage similar to that used in streptococcal sore throat and treatment continued for 10 days; also, the antibiotic may be used prophylactically for the family. No continued prophylaxis is required for the patient, however.

Q. What kind of antibiotic therapy is recommended for nephrosis?

A. Dr. Hodes uses a broad-spectrum antibiotic, starting in the hospital, and continues it for 1 month. After this, the procedure varies with each case, depending on the circumstances.

Q. In the treatment of pneumococcal meningitis, is there a place for intrathecal antibiotic therapy?

A. The results in pneumococcal meningitis are not quite as favorable as those in meningococcal and meningitis due to H. influenzae. The best treatment of pneumococcal meningitis consists of the administration of penicillin in very large doses systemically. We have used even in young infants as much as 10,000,000 units per day. Intrathecal administration of penicillin may have a place in the occasional infant with overwhelming infection, particularly if the spinal fluid is loaded with pneumococci and contains only few leukocytes. It must be emphasized that only small amounts of penicillin should be given intrathecally and that the volume should be less than that of spinal fluid removed.

Q. What is the specific treatment of infectious diarrhea? Do you give these agents without cultural evidence?

A. Sulfonamides are excellent in shigellosis, unless the incitant is sulfonamide resistant. We prefer absorbable sulfonamides during the acute phase and insoluble preparations, if necessary, during the convalescent or carrier phases. Fairly good results are obtained with chloramphenicol, and the tetracyclines as well, and, on occasion, with neomycin in salmonella enteritis; in typhoid fever chloramphenicol is the drug of choice. The drugs, however, not rarely fail to prevent or eliminate the carrier state. Dr. Szanton commented on his experience with Salmonella oranienburg infections involving 46 newborn infants. Sulfadiazine, sulfathalidine, bacitracin, neomycin, chloramphenicol, and yogurt were all tried. These drugs were not effective in carriers as compared to controls. In diarrheal disease of infants due to enteropathogenic Escherichia coli, neomycin by mouth has yielded excellent results. Specific therapy may be given without cultural evidence, but it is recommended that in the face of an epidemic in a community, hospital, or institution microbiologic diagnosis be attempted in representative cases. Furthermore, not enough use is made of interhospital intelligence which can make available information on prevalence of contagious diseases.

Q. Are disc sensitivity tests of any value?

A. The results of these tests must not be interpreted quantitatively, because of the inherent variations encountered, such as the diffusion rate of the antibiotic through the culture medium, the stability of the antibiotic, the composition of the culture medium, the length of incubation, the concentration of the antibiotic in the disc, and others. As a rough guide the test is of value if the report states merely that the microbe is either sensitive or resistant or that the result is equivocal. In the interpretation of the results consideration should be given to the concentration of the antibiotic in the disc to that of the infected site. The test-tube method is more accurate, though more cumbersome.

Q. How can the results of sensitivity determinations be expedited?

A. Duplicate plates may be seeded with the specimen, one for bacteriologic identification, the other for sensitivity determination. Obviously, results will not be available within 18 hours, if the inoculum is too small to produce confluent growth. Even when two or more different microorganisms are
present in the specimen, one may observe inhibition of growth by a given antibiotic. Sensitivity determination of the isolated strains should be carried out subsequently.

Q. Is it possible that with the use of antibiotics we are raising a generation without immunity?

A. Treatment of active disease does not prevent immunity resulting from subclinical infection occurring at other times. On the other hand, it is clear that early and adequate therapy of certain bacterial infections may reduce or eliminate the antibody response, but it must be added that all antibodies are not protective.

Q. Does allergy to penicillin ever disappear?

A. Yes, but it is not predictable.

Q. Is moniliasis a common complication of antibiotic therapy?

A. No, in our experience. However, every effort must be made to recognize the disease, should it occur, and treat it with nystatin. Systemic moniliasis has occurred, for example, in leukemic patients during antibiotic therapy.

Q. Is there a danger of masking serious infections with antibiotics?

A. If masking results in prevention or cure of mastoiditis, empyema, meningitis, etc., it is a desirable effect. On the other hand, the recognition of complications may be more difficult, if therapy is inadequate. The physician must be aware of this fact.

DENTAL EXTRACTION IN HAEMOPHILIA AND CHRISTMAS DISEASE, John A. Orr et al. (Brit. M. J., 1:1035, May 4, 1957.)

This paper reports experience derived from the management of 32 dental operations for tooth extraction in patients with hemophilia or Christmas disease. The greatest incidence of complicating hemorrhage was on the third postoperative day. A feature of the management was preparation of an acrylic resin protective splint before operation for insertion immediately afterward to protect the soft friable clot in the tooth socket from trauma by food or from disturbance by the tongue. Details for the preparation of this splint are given. The measures found by the authors to promote most successful management include (a) extraction of not more than two teeth at one time, (b) use of the acrylic resin protective splint, (c) administration of fresh frozen plasma just before the extractions, and (d) oral antibiotic therapy.
# ANTIBIOTIC THERAPY: Report of a Round Table Discussion

**Erwin Neter and Horace L. Hodes**

*Pediatrics* 1957;20;362

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