

JOURNAL OF *Endodontia*

Volume 1

Published by the
American Association of Endodontia

Number 3



TABLE OF CONTENTS

	Page
EDITORIAL	25
PHAGOCYTES IN THE DENTAL PULP.....	26
H. A. Zander	
PENICILLIN IN ROOT CANAL THERAPY... 28	
Nathan N. Potkin	
PENICILLIN TREATMENT IN PULPLESS TEETH	30
Louis I. Grossman	
PRELIMINARY CASE REPORTS.....	32
John R. Pear	
REVIEW OF LITERATURE.....	35
TREATMENT OF TOOTHACHE IN 1815....	36

SEPTEMBER 1946

Journal of Endodontia

Volume 1

SEPTEMBER, 1946

Number 3

EDITOR

BALINT ORBAN
180 No. Michigan Avenue
Chicago 1, Illinois

PUBLICATION COMMITTEE

Chairman, Louis I. Grossman, Philadelphia, Pa.

Members, Wm. B. Ingersoll, Washington, D. C.

E. A. Jasper, St. Louis, Mo.

Officers of the AMERICAN ASSOCIATION OF ENDODONTISTS

President, E. G. Van Valey, New York, N. Y.

Vice-President, S. M. Weaver, Cleveland, Ohio

President Elect, M. K. Hine, Indianapolis, Ind.

Secretary, T. J. Hill, Cleveland, Ohio

Treasurer, S. D. Green, Chicago, Illinois

Published Quarterly—March, June, September, December—by the
American Association of Endodontists

180 No. Michigan Avenue, Room 2303, Chicago 1, Illinois

Yearly Subscription \$2.00

Single Copy 50 cents

Entry as second class matter May 7, 1946, at the Post Office
at Chicago, Illinois, under the act of March 3, 1879.

Publication of an article or abstract does not imply endorsement by the Journal or the
American Association of Endodontists.

Printed by: McCormick and Henderson, Inc., 411 S. Wells St., Chicago 7, Ill.

Editorial

The editor received a letter which seems to need open discussion as it questions the very principles of the Association of Endodontists. We quote:

"I must confess I am somewhat puzzled by the articles presented in view of the avowed purposes of the organization. It is my understanding that the objective of the Association is to standardize and improve endodontic technics so that periapical infection can be prevented or eliminated in the largest possible percentage of cases.

"Yet the articles by Coolidge and Kesel seem to be devoted largely to showing that the focal infection theory is invalid. If it is, why worry about infection at root apices as long as the teeth are comfortable? Why develop the painstaking technics of modern endodontia?

"On the other hand, your editorial, while brief, struck the right note."

Your editor confesses to be more than somewhat puzzled. Here are a few questions:

Can we condone bad root canal treatment if it is not a danger to the life of the patient?

Is not a granuloma or a cyst always a potential source for severe local symptoms?

Is not good and sound technique necessary if we want to preserve the tooth itself?

Is it not impossible to convince the dentists as well as the physicians of the desirability and the success of root canal treatment if we relapse into the negligence and indolence of the past?

Is not bad root canal treatment to be condemned no matter how far reaching or how localized the consequences?

Are we so shortsighted that we need the specter of focal infection to induce us to improve the endodontic technique?

Did surgery give up asepsis because infection can be fought with sulphadrag and penicillin?

Should we keep the results of research secret in order to preserve fear as a motivation of good work and as a spur for progress?

And finally, does the correspondent not forget that the diehard antagonists of root canal treatment contend that even the best technique is inadequate? Therefore, is it not necessary to show how exaggerated the fears of focal infection are and how unreliable the methods and results of its defenders?

Our present knowledge can be summarized in one sentence: exact, but only exact endodontic technique can save a tooth without in the least endangering the patient.

There is another question which should be discussed by our members. If endodontia develops as a specialty it is clear that endodontists will treat, almost exclusively, patients referred to their care by other dentists or physicians. It is common to thank the referring dentist for sending the patient to the specialist. This is also suggested in a recently published book on Dental Medicine. It does not seem too dignified or professional a procedure. The patient's welfare is the important thing and not the welfare of the specialist. To thank the referring colleague for his confidence—in our ability to help the patient—is one more way to elevate the dentist's professional standing.

B. Orban.

Phagocytes in the Dental Pulp

By H. A. ZANDER*, Boston, Massachusetts

The ability of certain cells to engulf foreign particles such as necrotic tissue, disintegrated cell remnants, bacteria etc., is an established principle. At least two types of such cells can be differentiated: namely, the microphages and macrophages. Microphages are considered to be polymorphonuclear leucocytes and their activities are usually confined to smaller particles. On the other hand, macrophages are characterized by their ability to take up large particles. According to Maximow¹ macrophages originate from lymphocytes or fixed connective tissue cells, which have been defined as histiocytes or resting wandering cells.

Most of our recent knowledge of cellular differentiation is based upon work with tissue cultures. By this method actual changes in cellular morphology have been observed. These phenomena have been defined as "cellular differentiation", "redifferentiation" and "modulation". Some of the shortcomings of tissue culture studies have been pointed out by Bloom² in a review on cellular differentiation and tissue culture. He is of the opinion that the altered environment in tissue cultures seems to stimulate cellular changes. Therefore it would appear that morphological differentiation based upon exact histological technics can still contribute to our knowledge of cytology.

The presence of histiocytes, macrophages and microphages in the human pulp and periodontal membrane has been demonstrated by Orban³. He has described the cellular changes taking place in the periapical granulation tissue following pulp necrosis. The

resting wandering cells are gradually transferred into mobile elements by retraction of the long branching cytoplasmic processes. These are rounded up and assume the characteristic features of macrophages. On the basis of this observation it appears logical to assume that the pulp which contains histiocytes should be capable of the same defense mechanisms as the periapical tissues. Herewith we present a brief consideration of the cellular changes in the pulp.

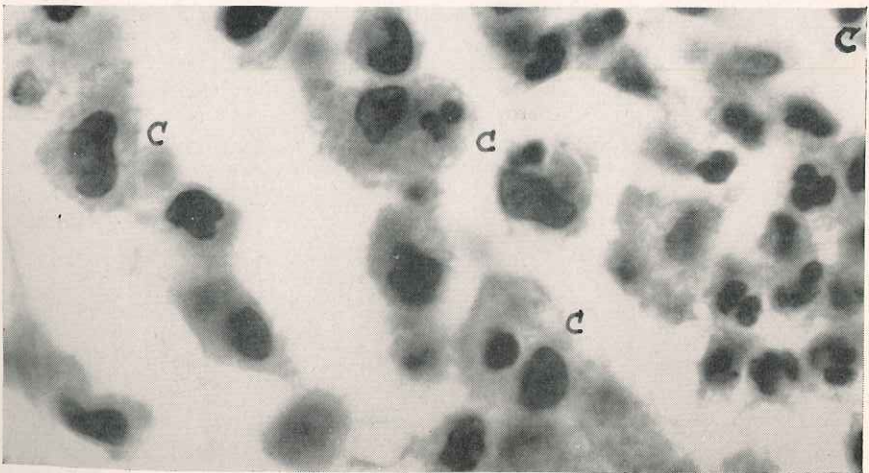
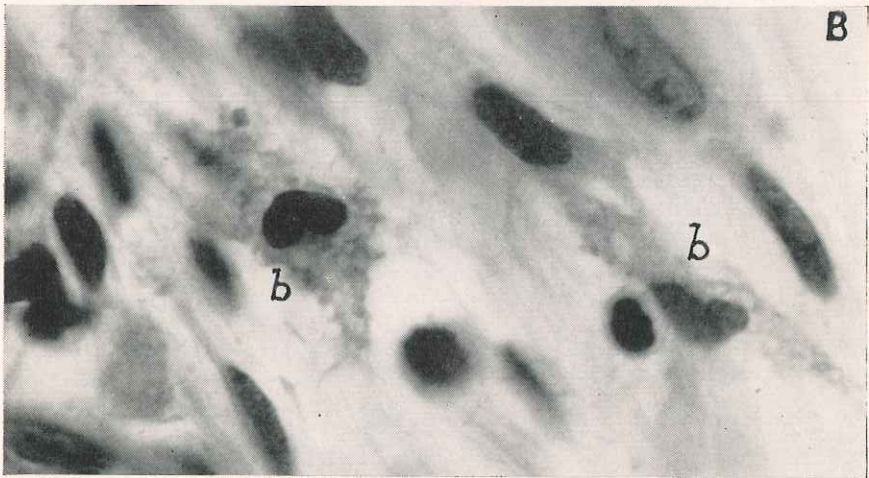
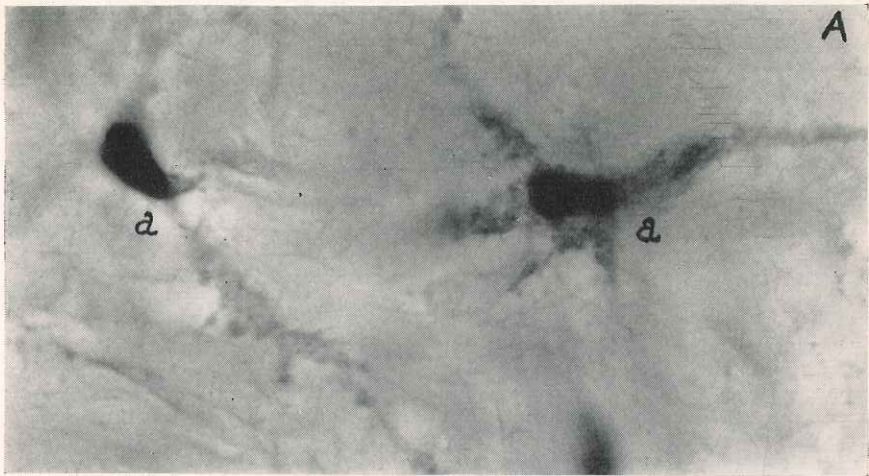
To study the minute cytological features within a pulp, it is necessary that the specimens are properly prepared. In our experience this can best be accomplished by grinding away the excessive enamel and dentin on two opposing sides of an extracted tooth. This gives a thin slab of tooth whose pulp is almost exposed on the two ground surfaces. Thus rapid penetration of the fixative is assured⁴. In order to prevent tissue changes because of frictional heat the grinding must be done with a diamond disc under a constant stream of water. Maximow's Zenker-Formalin mixture is used as fixative. The specimens are embedded in celloidin and, after sectioning, stained with hematoxylin-eosin.

By using this careful technic we were able to make a study of pulp inflammation following silicate cement restorations of cavities cut in intact teeth. It was possible to demonstrate in the same section of a human tooth all of the principle stages of cell transformation, i. e. the resting wandering cell (Fig. 1A) in an area far removed from the actual scene of inflammation.

*Tufts College Dental School, Boston, Mass.

Fig. 1. Three different areas within the same inflamed human pulp.

- A. Resting wandering cells (histiocytes)(a) in some distance apically from the actual inflammatory area.
- B. Transformation of the resting wandering cells into active mobile elements(b). Rounding off of cytoplasmic processes.
- C. Phagocytosis by macrophages(c).



The withdrawing of the processes of histiocytes as shown in Fig. 1B, represents one phase of the transformation to an active macrophage. Fig. 1C demonstrates a final phase in this cycle namely phagocytosis by macrophages and is a photomicrograph of that part of the pulp which is near the injured dentin tubules.

It is our belief that these observations of cytological differences in various areas of the pulp can be inter-

preted as indicating that during inflammatory reactions in the human pulp macrophages develop from resting wandering cells in a manner similar to other parts of the human body.

REFERENCES

- 1Maximow, A.—Handbuch d. mikrosk. Anatomie d. Menschen (v. Mollendorff). Vol. 2, pt. 1, 1927.
- 2Bloom, W.—Physiological Reviews—Vol. 17 p. 589, 1937.
- 3Orban, B.—J.A.D.A. 16:965: 1929.
- 4Oral Histology and Embryology edited by B. Orban—Mosby Company, 1944, p. 326.

Penicillin in Root Canal Therapy

NATHAN N. POTKIN*, B.S. R.ph. B.S. D.D.S.

Recent discoveries in the field of chemotherapy have brought to the attention of the dental profession new and powerful agents. It is possible that some of these may have a beneficial action in the field of root canal therapy. A review of the literature shows evidence that penicillin combines two desirable qualities, low toxicity to tissue cells and powerful bacteriostatic action.

The author felt that investigation into the action of this drug in root canal therapy would reveal a method of treatment. Penicillin has been used for only a comparatively short time in dentistry, and only casually in root canal therapy. In order to control and to measure the effects of the drug, a method of bactericidal determination was developed.

A solution of sodium penicillin was made, using only that amount of distilled water which would be completely absorbed by (200) two hundred absorbent paper points of uniform size. The original solution of sodium penicillin contained 100,000 units, and was absorbed by (200) points. Thus, each point contained (500) five hundred units of penicillin. The points were separated in groups of 10, placed in sterile glass vials, and kept refrigerated.

A method was devised for testing the potency of penicillin paper points

and at the same time having a visual means of comparison. An agar plate was streaked in quadrants with a standard laboratory strain No. 209 of *Staphylococcus aureus*, and on two quadrants a penicillin paper moistened with sterile saline was placed and the plate incubated. This inoculated plate, after 48 hours incubation, showed no growth in the quadrants exposed to the penicillin. The results using a hemolytic streptococcus similarly showed no growth or hemolysis after incubation for 48 hours. To check these results, controls were made. Sterile absorbent paper points with and without saline or distilled water produced no inhibition.

To compare the zones of inhibition produced by other drugs used in root canal therapy, spread plates were inoculated with the staphylococcus aureus. Paper absorbent points containing beechwood creosote, eugenol, chloramine T., cresol, phenol compound, and equal parts of beechwood creosote and iodine, and beechwood and eugenol, as well as penicillin were placed on the inoculated plates. These plates were incubated and the zones of inhibition observed and photographed. The results were as follows: The greatest zone of inhibition was obtained with a penicillin paper point. The next in order was with that produced by phenol compound, cresol,

*Department Materia Medica and Dental Therapeutics. University of Ill.

eugenol, beechwood creosote with iodine, and finally the least zone was obtained with chloramine T. This experiment also showed the interesting result that the combination of two of the drugs had a smaller zone of inhibition than either of the drugs used singularly. Beechwood creosote in combination with iodine or eugenol exhibited a smaller zone of inhibition than either beechwood creosote or eugenol used alone.

To study the possible counter effects of other drugs commonly used in root canal therapy, penicillin paper points were used in combination with eugenol, beechwood creosote, chloramine T., cresol, phenol compound, beechwood creosote and iodine, beechwood creosote and eugenol. These points were placed on agar spread plates containing staphylococcus aureus and incubated for 48 hours. The results obtained were as follows: Beechwood creosote and penicillin, cresol and penicillin produced larger zones of inhibition than when either drug was used alone.

Testing the activity of Penicillin Paper Points: Penicillin paper points were placed in root canals for definite lengths of time, and then the points were placed on spread agar plates. The results obtained are indicated in table No. 1. The same tooth was used for the activity test. The pulp was vital and the canals were dry. It was recognized that these conditions were favorable for the prolonged action of penicillin; if the penicillin had lost its effectiveness in seventy-two hours under these conditions, it could not be expected to last longer in moist putrescent root canals.

However, a point which had been sealed in a moist necrotic canal for 48 hours, and tested similarly, still had the ability to inhibit the test organism.

The following are two examples of the 32 infirm cases treated.

Case 1.—A 14 year old colored male with a previous root canal filling and a granuloma in the lower right first

molar: Cresol and Phenol were employed and positive cultures were obtained. Penicillin paper points were placed in the root canals for 48 hours, and a negative culture resulted. The same treatment was repeated and again a negative culture was obtained. The root canals were then filled with gutta-percha cones.

Case 2.—A 15 year old colored female with a necrotic pulp of the upper left first bicuspid: For four sittings chloramine T., beechwood creosote and iodine were used; positive cultures resulted. The tooth remained tender to percussion. Penicillin paper points were used for the fifth and sixth sittings for 24-48 hours and negative cultures were obtained. The tooth was then filled with gutta percha cones.

A rubber dam was utilized in every case and for every sitting to maintain a surgical clean field.

Discussion: It is evident that teeth tender to percussion and difficult to seal by other means or drugs respond very well to penicillin treatment. Teeth with necrotic pulps and those persistently positive to other medication give negative cultures after 24 hour contact. Penicillin paper points are not active within the root canal after 72 hours. Penicillin paper points prepared by the above technic and refrigerated remained active for at least 23 weeks. These points were as active 23 weeks after preparation as when tested immediately after production.

TABLE No. 1

<i>Time</i>	<i>Activity</i>
10 minutes	Maximum inhibition
20 minutes	Maximum inhibition
30 minutes	Maximum inhibition
1 hour	Maximum inhibition
2 hours	Maximum inhibition
24 hours	Maximum inhibition
48 hours	Maximum inhibition
72 hours	Moderate inhibition
96 hours	No inhibition
1 week	No inhibition

Penicillin Treatment of Pulpless Teeth

By LOUIS I. GROSSMAN, D.D.S., Dr.-med.dent.*

The last several years have witnessed remarkable advances in the field of chemotherapy. The words "sulfonamide" and "penicillin" are now as familiar to the layman as to the scientist. And yet, Fleming, who first observed the lytic effect of a mold upon bacteria, which observation led to the development of penicillin, has stated: "During the last few years there has been no striking advance in 'antiseptic therapy', by which is meant the *local* application of an antibacterial chemical with a view to the direct destruction of the infecting bacteria." This statement may be both startling and disillusioning since we have become accustomed to expect so much from the sulfonamides and penicillin.

The conditions of sterilization of a pulpless tooth are somewhat unique in that the antiseptic comes in contact with a hard calcareous tissue on the one hand, namely dentin, and soft vital tissue on the other, namely periapical tissue. The former can tolerate highly germicidal agents even though they be destructive while the latter is easily irritated even by relatively mild antiseptics.

For a great many years dentists have used strong chemical agents in the root canals of infected pulpless teeth — much stronger perhaps than could be tolerated elsewhere in the body — but the quest has always been for non-irritating, effective sterilizing agents. The search for the ideal root canal antiseptic still goes on and more recently has been focused on the antibiotic agents, particularly penicillin.

Penicillin

From the standpoint of root canal antisepsis, we are primarily concerned with those antibiotic agents which are effective against gram positive organisms, since streptococci, staphylococci, pneumococci and other microorgan-

isms isolated from pulpless teeth fall into this group. Penicillin is highly effective against the following bacteria in the order given: gonococcus, meningococcus, hemolytic streptococcus, staphylococcus aureus, streptococcus viridans, staphylococcus albus, and gram-positive rods. While penicillin is effective against certain species of microorganisms, it may nevertheless be resistant to certain strains within the species.

The causes of failure of penicillin when used locally have been listed by Florey and Jennings, as follows: (1) "The presence of dead tissue or sequestrums, (2) inaccessibility of the infected area by the drug, (3) dosage too small, (4) penicillin not renewed often enough, (5) and presence of penicillin-resistant strains of microorganisms."

The use of penicillin for the treatment of pulpless teeth either as a root canal dressing, for irrigating the canal, and/or for injecting directly into the periapical tissue has been reported by Adams, Buchbinder, Dunn, Grossman, Shaw *et al*, Stern, and Weiner. Realizing the need for a stable solution if penicillin was to be used by the average dentist, the author tried peanut oil or propylene glycol as a solvent for penicillin, each cc. containing 5,000 units. In a controlled series of 43 cases treated with these solutions, it was found that they were as good as, but not better than, other root canal antiseptics.

In order to provide a higher concentration of penicillin and a stable and convenient manner of using penicillin for root canal therapy, J & J absorbent points were later saturated with a concentrated solution of penicillin and the moisture was evaporated in vacuum. It was reasoned that in the dry state such penicillin-impreg-

* (From the Oral Medicine Department, School of Dentistry, University of Pennsylvania)

nated absorbent points would be stable for several months. A number of penicillin points were prepared by the E. R. Squibb Research Laboratories for clinical trial, each point containing 650 units of penicillin. This represented about 13 times the highest concentration of penicillin previously used for the treatment of pulpless teeth.

Method of Treatment

Penicillin points were used at the first treatment immediately after cleansing and irrigation of the root canal if the canal contained only dry pulp tissue or debris. Where moist remnants of pulp tissue were present, no instrumentation was done in the apical-third of the canal at the first visit and treatment with penicillin points was not begun until the second visit. Only pulpless teeth with infected root canals, i.e. necrotic or gangrenous pulp, acute or chronic alveolar abscess, or granuloma were accepted for treatment with penicillin points. It was felt that a number of effective root canal antiseptics are already available and that if penicillin is to be used for the treatment of pulpless teeth, it must prove its effectiveness in moderately or severely infected pulpless teeth and that the results must be spectacular rather than just good, to warrant its use.

Control cultures were taken in each case before beginning treatment except where a foul odor was present in the root canal, which was taken as evidence that the canal was infected. In one case the control culture was negative and this case is not included here. In all cases of treatment with penicillin, two successive negative cultures were required as evidence that the canal was sterile. A penicillin inactivator such as cysteine hydrochloride was not added to the culture medium since there was little likelihood of carrying any penicillin over into the medium after 3 or 4 days, and since no inactivator was added to the medium in the control series.

At first, a drop of sterile water from a carpule syringe was ejected into the

pulp chamber in order to moisten the penicillin point but it was soon realized that this was unnecessary since the periapical exudate seeping into the root canal would act as a natural solvent for the penicillin. The butt end of the penicillin point was not cut off but was folded over into the pulp chamber so as not to lose any appreciable number of penicillin units. Each point was sealed in the root canal with gutta percha, over which was placed a layer of cement. Treatments were given twice a week, with few exceptions.

Results of Study

Of the 24 pulpless teeth treated in this manner, there were 3 failures. One of these was a case of necrosis of the pulp of an upper premolar which failed to yield a negative culture after 4 treatments with penicillin and later responded to electrolytic medication while the other two cases showed fairly large areas of rarefaction in the radiogram and root resection was recommended.

The results of the 21 successfully treated cases with penicillin points are shown in Table 1. It will be seen that an average of from 3 to 4 treatments were necessary in every case before 2 successive negative cultures were obtained. No staining of tooth structure was observed in any of the teeth treated.

It is evident that treatment with penicillin points was not spectacular. Elimination of infection of the root canal by 1 or 2 treatments did not follow. Some failures occurred.

In this small number of cases, however, some slight advantage over older root canal antiseptics was shown by the penicillin points. Whether this advantage is apparent or real can only be determined after a larger number of pulpless teeth will have been treated with penicillin points and the results are checked against treatment with older root canal antiseptics.

BIBLIOGRAPHY

1. Adams, F. R., D. Items of Int., 66:1147, 1944
2. Buchbinder, M., J. Dent. Res., 25:13, 1946
3. Dunn, L. J., J. Second Distr. Dent. Soc., 31:255, 1945
4. Fleming, A., Proc. Royal Soc. Med. 33:127; 1940
5. Florey, H. W. and Jennings, M. A., Brit. J. Surg. 32:112; 1944
6. Grossman, L. I., N. Y. J. Dent. 15:233; 1945
Grossman, L. I., Pa. State D. J. 13:252; 1946
7. Shaw, F. E., Sprawson, E., and May, H. B., Brit. Med. J., 551, 1945
8. Stern, L., J. Second Distr. Dent. Soc., 31:249, 1945
9. Weiner, L., J.A.D.A., 32:538, 1945

TABLE 1.

<i>Diagnosis</i>	<i>Number of Cases</i>	<i>Penicillin Points</i>	<i>Control Group</i>
Necrosis or gangrene of pulp.....	9	3.3	4.5
Acute alveolar abscess	2	3.5	5.4
Subacute alveolar abscess	2	3.5	5.6
Chronic alveolar abscess	7	4.0	5.4
Granuloma	1	4.0	5.3

Preliminary Case Reports and Technic on the Treatment of Apical Infections With Penicillin and Streptomycin

By JOHN R. PEAR, Detroit, Michigan*

The use of penicillin and streptomycin for the treatment of infected pulp canals seems to have merit. We have been using both of these drugs with considerable success.

The same precautionary technic is used as in any method of pulp canal procedure. The rubber dam is always applied, and the teeth and surrounding area of the dam are swabbed with a germicide, followed with alcohol. At the first sitting the contents of the canal are cultured, and a smear made and stained, and viewed microscopically. The canal contents are removed, and the canal enlarged through, at least, a size six Kerr file or reamer. The apical foramen is also enlarged to the same size. This is done with the guidance of proper diagnostic and measurement radiographs, thus eliminating undue apical trauma from over instrumentation. One half a c.c. of a sterile distilled water solution of penicillin calcium containing 5000 units is injected at, or through the foramen. This is done with a regular hypodermic syringe using a 27 gauge needle. Of course a considerable amount of the solution runs back out of the canal thus irrigating at the same time. A sterile paper point is placed in the

canal to the apical foramen and left for ten to fifteen minutes. This is followed by drying the canal with additional sterile paper points. Again a one half c.c. of the penicillin solution is deposited as described above. A paper point is placed in the canal making certain it does not protrude through the foramen thus causing irritation to the apical tissues. The excess solution is dried from the pulp chamber only and the paper point and remaining penicillin in the canal are sealed in the tooth with temporary stopping and cement. The patient is dismissed for 24 to 72 hours.

At first we saw the patients the following day to care for any possible untoward effects and also to repeat the treatment before the effect of the penicillin was lost. Later we extended the treatments to 48 hour and 72 hour intervals with equal success. The teeth were cultured when the patients returned in 48 or 72 hours and at each subsequent sitting.

The procedure in the use of streptomycin is exactly the same as with penicillin. Streptomycin is more stable in solution than penicillin. After two weeks a solution of penicillin kept at a temperature of 15°C., loses its anti-

*School of Dentistry, University of Detroit, Michigan

biotic properties, and probably would be safer not to use it after one week. A solution of Streptomycin kept under similar conditions retains its antibiotic properties for three weeks. It is twelve times less antibiotic against the Staphylococci Aureas than penicillin, but does have antibiotic properties against both the Staph and Strep and is effective against some gram negative organisms not effected by penicillin.

No serious skin eruptions have been observed from the parenteral use of streptomycin, and repeated examinations of the blood have failed to reveal any damage to the blood forming system. Daily urinalysis, and daily urine volume have indicated no deleterious effects to the kidneys. The average daily dosage was 2,000,000 S. units. Experimental animal biology corroborates these findings. I merely mention this to bring out its toxic, or non-toxic properties when used in terrific amounts compared to the units used in pulp canal therapy. (1)

Streptomycin is not decomposed by any bacteria so far tested and is not toxic to the host in the concentrations necessary for therapeutic uses. Some organisms inactivate penicillin, but to date no specific streptomycin inhibitor has been demonstrated in the human or animal body. It is usually dispensed as streptomycin hydrochloride or sulfate in a dry state in 1,000,000 S. units or 250 mgm. We have been using streptomycin hydrochloride.

In the thirty-four cases in which we have used penicillin for the treatment of infected pulp canals, they have all cultured negative after one to four treatments, except four cases which remained positive. These four showed a gram negative rod that was resistant to penicillin. These four cases that remained positive to the penicillin treatment, cultured negative after one or two treatments with streptomycin.

In the twenty-four cases treated with streptomycin all cultured negative after a maximum of three treatments.

A sterile distilled H₂O solution of 20,000 units per c.c. was used. These results were rather surprising due to the fact that streptomycin is not considered too effective against some of the gram positive organisms. However this is not conclusive as we treated fifteen cases with penicillin without failure and then failed with three in succession. These results would seem to indicate that the concentration of the antibiotic at the site of infection, *i.e. the apical foramen, is an important factor.*

I have personally treated two cases by flooding the canals with a 10,000 unit per c.c. solution of penicillin without success. After enlarging the canals they were flooded as well as possible with a condit applicator. A paper point was inserted in the canal and left for ten minutes. The canal was dried and again flooded with the solution of penicillin; a paper point cut so as not to extend through the foramen was sealed in the tooth. In both cases after 24 hours there was soreness about the apical area and some tenderness from pressure on the tooth. In the treatments where a hypodermic needle was used, and the solution deposited at or through the apical foramen, no soreness or edema was recorded in any of the cases. Again, as mentioned with streptomycin, the deposition of the antibiotic at or through the apical foramen seems to be the important factor.

In the brief time allotted to me I would like to include the histories of a few of the non-routine cases.

Female, white, age 20, Student, Date 4-13-45. She came in the clinic with severe pain in lower central incisors region, unable, due to pain, to close anteriors in end to end bite. Both centrals were sore to percussion, and labial area about apices was swollen and sore. The radiographic examination showed a large area involving both centrals. The right central had been

(1) Feinman, Archives of Internal Medicine, August 1945.

previously treated and the canal was only partly filled. The left central had a large silicate restoration under which the pulp had died. The canal of the left central was opened for drainage with instructions to patient to return the following day. However, she was comfortable and did not return until May 3rd. At this sitting the rubber dam was applied, and the contents of the lower left incisor removed and the canal enlarged. Bear in mind that this tooth had been open for over three weeks. The old gutta percha point was removed from the right central and the canal instrumentated. Penicillin was applied with the hypodermic needle as previously described and the teeth were sealed with instructions to return in 48 hours. Again the patient failed to return on schedule and appeared on May 10th. Both of the teeth had been comfortable. She agreed to keep her appointments so the above treatment was repeated five times in eleven days. Each culture taken was positive. There were no streptococci or staphylococci, or gram positive organisms after the second treatment, but a gram negative rod continued to culture out. The patient's final examinations started at this time so camphorated mono-choral-phenol was sealed in, supposedly for one week, but the patient did not return until October 4th. Cultures were taken which were still positive, although the teeth had been comfortable, and the area at apex of teeth had lessened. The teeth were treated with streptomycin and then cultured on October 8th. They were negative, and the two subsequent cultures on October 10th and October 15th were also negative. The teeth were treated each time with streptomycin and after these three negative cultures the canals were filled.

Another case of a male, age 33, reported on a Tuesday for treatment of a chronically infected upper right lateral incisor. The tooth was opened under a rubber dam and formo cresol sealed in the pulp chamber. On Wednesday, when he returned his face

was swollen and the tooth extremely painful to pressure. The tooth was opened for drainage and the patient instructed to return the following day. I saw the case on Thursday when he returned. Pus was draining from the tooth and there was still some edema. The rubber dam was placed, the tooth was instrumentated, and the foramen was enlarged. Penicillin was injected through the foramen and sealed in the tooth. He reported the following day that he had slept well the previous night and he could bite on the tooth without discomfort. The swelling had practically disappeared. After the second treatment the cultures were negative, and the case carried uneventfully to completion.

One case of a male, dental student, age 23, lower left first bicuspid. The treatment had been started by his dentist. The tooth had become very painful and the treatment removed with the advice of his dentist to have the tooth extracted. He had seen some of the cases treated in the clinic with streptomycin and wanted to try it for his tooth. Another student isolated the tooth with the rubber dam, instrumentated it in the usual manner and deposited the streptomycin solution at the apical foramen of the tooth and sealed as described. This was done at the first sitting after the tooth had been open for over two weeks. At the end of 48 hours, the culture showed negative as did the three succeeding ones. He said that for a short time after the treatment, the tooth was a little uncomfortable but didn't really hurt.

In the treatment of teeth accompanied with fistulae the procedure is similar. However in these cases the streptomycin or penicillin is injected through the apical foramen until it flows from the fistula. The color and tone of the tissue and the closing of the fistula is only short of miraculous.

The usual procedure of treating the chronic cases is to isolate the tooth with the rubber dam open and enlarge the canal and treat with streptomycin

or penicillin at the first sitting. In none of the cases thus treated have we had any soreness after the first hour, and even then only rarely, and in none have we had any edema.

This result alone is worth a great deal to the dentist. In the past whenever the treatment of an infected pulp canal was started it was with much apprehension. The dread of a possible acute infection developing was always present. With the use of penicillin or streptomycin this dread is eliminated. Even in the few cases that cultured positive after penicillin treatment there was no clinical evidence of infection. The use of these antibiotics cuts the number of sittings by an average of three. The average number of sittings necessary for treating and filling the canal with streptomycin is $4\frac{1}{2}$. The average number of sittings necessary for treating with formocresol or camphorated mono-chloral-phenol is 8. The privilege of being able to open the tooth, completely removing the canal contents, and instrumentating and enlarging the canal at the first sitting will save at least two sittings, as compared to the conventional method with the older germicides.

From the limited number of teeth treated with these antibiotics it would

seem unwise to draw definite conclusions, but it does appear they have possibilities in pulp canal therapy.

The result that we have obtained with penicillin is not the same as reported by some other workers. Some have reported a 100% success, while others have had a much higher percentage of failures. Some of these differences may be due to different methods of application.

Streptomycin and penicillin are compatible which makes for the possibility that the *combination of the two may be the answer*, not only in pulp canal therapy but also in other mixed infections. At the present time streptomycin is not available on the market, and is being released for experimental purposes only. We are indebted to the Schenley Laboratories Inc. for supplying us with the penicillin and streptomycin for carrying on this work.

From our results to date, it appears likely that streptomycin may be more effective than penicillin, but more work must be done with them to determine what rating they will receive in pulp canal therapy, and if they have sufficient merits to be one of the accepted methods of pulp canal therapy.

Review of Literature

Adams, Fred R.: Pulp Canal Therapy
Eighteen months experience with penicillin
J. Dent. Soc. of State of New York 12:63;1946

An experience of a year and a half of penicillin treatment of over 150 cases of infected teeth and periapical areas seems to indicate that this method is superior to any heretofore used, with the possible exception of hot sulfanilamide solution. It may be superior to the hot sulfanilamide and certainly it is technically easier.

The method of applying penicillin is simple. A 27 gauge needle of sufficient length is used to carry the solution through the apex of the tooth. The root canal must be cleaned and enlarged, always under aseptic condi-

tions. The syringe is filled with a solution of 5,000 or 10,000 units of penicillin to 1 cc. distilled water. Novocain and epinephrin may be added to the solution to desensitize the periapical tissues and produce vaso-constrictor action thus prolonging the antibacterial concentration of the solution.

Penicillin calcium is preferred to the sodium salt since it is less toxic to the cellular elements. Spectacularly rapid regeneration of bone is possible since disinfection without irritation has occurred. A sterile and properly filled root canal is essential for success.

E. A. Archer.

Treatment of Toothache In 1815

"We shall now proceed to treat of caries in its effects, and the various remedies. The usual consequence of decay in teeth is the too well known pain of *tooth-ach*, and which frequently is only cured by extracting the offending tooth; as this is always an operation to which everyone submits with reluctance, various palliative remedies have been proposed, but with so little success, that their inefficiency is universally regretted.

"In making application to a decayed tooth, we should be careful to use nothing that will injure the others; the hollow, if possible, must be kept filled with cotton or lint, so as to exclude the air, which may be moistened with laudanum, oil of thyme, brandy, or any ardent spirits, or which generally answers better, equal parts of brandy and laudanum. Pain in a tooth is mostly attended with inflammation of the gums, and parts surrounding it; for this the patient may hold in the mouth a little aether, or camphorated spirit of wine; this will produce a considerable flow of saliva, or running of water from the mouth, and give considerable ease. If the gums are much swelled or tumified, discharging a little blood from them will often give relief. Figs toasted, or boiled in milk, or boiled bread and milk, applied warm to the gums is very serviceable, especially if there is an appearance of a gum-boil, this method will hasten its maturity, when, if it does not break of itself, it may be easily opened, and the contents discharged, till which little cessation of pain will be obtained; but for this purpose, whichever of these applications is adopted, it should be constantly applied; as fast as it dissolves, more should be taken. The figs toasted, and applied to the gums as warm as convenient, appears the best; indeed the effect of these, in either reducing inflammation, or bringing to maturity swelling and tumours of the gums, has often far exceeded expecta-

tion. The mouth, during the use of such remedies, should be kept perfectly clean, by frequently rinsing it with warm milk and water, or very weak brandy and water, as is most convenient.

"Blisters behind the ears are often of great service in reducing the inflammation and pain, if attended with swelling of the face, &c.; but in the simple tooth-ach they do very little good, and though a safe application are very sore and troublesome. If the pain is very violent in the night, the affected side of the head should be fomented for about twenty minutes, previous to going to bed, with hot flannels wrung out of a decoction of chamomile flowers, with which a poppy head may be boiled; it must likewise be kept warm; but no application of plaisters or poultices to the *outside* of the cheek should be permitted; for if there is a disposition to form a gum-boil, or abscess, such methods will induce it to break externally; these external openings are long in healing, and when they do they leave very unsightly scars which, in the face particularly, is an object of considerable attention. By some or other of these remedies, a fit of the tooth-ach may generally be overcome; but till the sensibility of the nerve in the cavity is entirely destroyed, either by patiently bearing long-protracted pain, or progress of the decay, a perpetual recurrence of tooth-ach will be experienced upon any little exciting cause; such persons must be particular not to take cold or be wet in the feet, the head likewise should be kept moderately warm, and never exposed to the draft or current of air; a damp state of the atmosphere, and the prevalence of keen north-east winds, seem particularly unfriendly to the teeth".

(Popular Essay on Structure, Formation, and Management of the Teeth, By John Fuller, London, E. Cox & son, 1815, p. 60).

1946 *Standing and Special Committee Members of the
American Association of Endodontists.*

P R O G R A M

- R. F. Sommer, *Chairman*, Ann Arbor,
Mich.
P. P. Sherwood, Cleveland, Ohio
L. R. Cahn, New York, N. Y.

S T U D Y C L U B

- J. Henry Kaiser, *Chairman*, Columbus,
Ohio
N. Weir Burkman, Birmingham, Mich.
George Qua, Detroit, Mich.

M E M B E R S H I P

- L. A. Lucas, *Chairman*, Oklahoma
City, Okla.
O. J. McCormack, Syracuse, N. Y.
H. H. Pearson, Montreal, Canada

L O C A L A R R A N G E M E N T S

- R. G. Kesel, *Chairman*, Chicago, Ill.
T. C. Starshak, Chicago, Ill.
V. B. Milas, Chicago, Ill.

C O N S T I T U T I O N R E V I S I O N

- R. L. Girardot, *Chairman*, Detroit,
Mich.
J. R. Blayney, Chicago, Ill.
L. I. Grossman, Philadelphia, Pa.

E X E C U T I V E C O M M I T T E E

- To 1949: Frank Inskipp, San Francisco, Cal.
John R. Pear, Detroit, Mich.
M. D. Wolfshohn, Buffalo, N. Y.
To 1948: L. I. Grossman, Philadelphia, Pa.
R. R. DeKruif, Los Angeles, Cal.
E. A. Jasper, St. Louis, Mo.
To 1947: Edgar D. Coolidge, Chicago, Ill.
George C. Sharp, Pasadena, Cal.
Morton F. Yates, Cambridge, Mass.