MILLER (W.D.)

THE IODOFORM QUESTION.

BY W. D. MILLER, M.D., D.D.S., BERLIN.

[Reprinted from the DENTAL COSMOS for December, 1893.]

IN the August number of the DENTAL COSMOS, page 614, Dr. Maxfield, of Holyoke, Mass., makes some criticisms upon my article on the iodoform question (DENTAL COSMOS, Feb., 1893), to which I desire to reply, in view of the fact that the points touched upon are of fundamental importance. The subject is one that has never been dealt with experimentally by any dentist except very superficially, and opinions regarding it being up to date still divided, I did not consider it necessary to offer an excuse for presenting a series of experiments on this subject even "at this late day."*

Dr. Maxfield begins his criticisms with the statement that my article appears somewhat misleading in its presentation of facts. The facts are, however, presented just as revealed by experiments, and I think the following considerations will show that there is no just reason for calling them misleading.

The first three series of experiments dealt solely with the antiseptic action of iodoform under varying conditions, and resulted in establishing the facts hitherto certainly not determined: (1) That iodoform incorporated with putrid matter from dental pulps does not exert a devitalizing action upon the bacteria present; (2) that where iodoform incorporated with pulp-tissue was introduced under the skin of mice, in some cases a marked retarding action upon the development of the bacteria was exerted, traceable, however, to other causes than any antiseptic action on the part of the iodoform.

The present generally accepted opinion regarding iodoform was sufficiently clearly expressed in the following sentence from page 90 of my communication:

"According to the views adopted at present, theory and practice seem to agree pretty nearly that a wound-surface, especially a secreting one, is favorably influenced by iodoform, not so much because of its antiseptic action as because of its power to take up the secretions

* The unqualified statement that iodoform is not an antiseptic indicates only a partial study of the subject. It is now universally conceded to act as a weak antiseptic toward the bacilli of cholera and tuberculosis. It has also been found under certain circumstances to manifest antiseptic action toward the bacilli of septicæmia of mice and rabbits. Behring claims for it antiseptic properties when in a very fine state of division, and others ascribe antiseptic properties to it when in solution. (Consult references below.) At all events, the view that iodoform is under all conditions devoid of antiseptic action is not so universally recognized as to be accepted without question for the conditions present in putrid pulps, or to render experiments relating to it superfluous.

of the wound, as well as the products of decomposition and bacterial poisons (ptomaines, toxalbumins), and to act upon them in such a way that they lose their toxic properties."

Dr. Maxfield does not think that this point was sufficiently emphasized, and finds fault with me for not having called attention to the experiments of "de Ruyter, Senger, and others, that when iodoform was established in a wound, if later anthrax organisms were inoculated, no poisoning resulted." This, he affirms, "would have illustrated the importance of using a remedy like iodoform in the treatment of diseased conditions that we find in the teeth and mouth." Here I am afraid that Dr. Maxfield must submit to the same charge that he brought against me,—namely, misleading facts. In the first place, I am not aware that de Ruyter ever made any experiments on the subject mentioned, and as for the "others," Löte* and Schnirer† arrived at results just the opposite from Senger, nor could Kronacher‡ make his results harmonize with Senger's.

Indeed, Senger himself found that when the animal was first infected with anthrax bacilli, and iodoform applied subsequently, it was utterly powerless to impede the progress of the disease. Now, since we in operations upon the teeth invariably have to do with cases where the infection has taken place days, weeks, or even months before, the only inference possible from Senger's experiments would be that iodoform would be as useless in treating diseased teeth as it was in treating experimental anthrax when applied subsequently to the infection.

Again, if iodoform were proven to be a valuable agent in the treatment of anthrax (although I do not know of a single case of anthrax ever having been cured or even bettered by the use of iodoform), this would not by any means justify the inference that it must be equally valuable in treating diseased conditions of the teeth.

This point illustrates what I must call a serious error that we constantly meet with in dental journals; that is, seizing upon any one fact found somewhere in general pathology or bacteriology, generalizing it and applying it to all possible conditions of the teeth, which often have not the slightest resemblance to the condition to which the fact originally applied. I think that the Duke of Argyll puts it very properly when he says, "We should be awake to the constant liability of even the greatest observers to found fallacious generalizations upon a few selected facts."

The principles of general surgery do not by any means *always* apply unchanged to operations upon the teeth, and much has been written about asepsis and antisepsis, or even asepsis *versus* antisepsis, which a proper appreciation of this fact would have shown to be illogical.

The general surgeon has it in his power, in a fair proportion of his cases, to operate upon an aseptic field, while the dentist, in treating cavities of decay and putrid root-canals, has to work upon infected tissue. The surgeon is sorely restricted in the use of antiseptics because of their action upon the living tissue, while the dentist, in the operations just referred to, is much less hampered by such considera-

* *Centralblatt für Bacteriologie und Parasitenkunde*, Bd. ii, 1887, No. 7, p. 189.

† *Münchener med. Wochenschr.*, 1887, No. 29.

‡ *Wiener medicinische Presse*, 1887.

tion, and *with proper precautions* can employ antiseptics in almost any desired concentration. Furthermore, the small quantities required by the dentist in operations upon the teeth permit of using antiseptics in concentrations which the surgeon would not dare to think of employing through fear of a general toxic action. The surgeon, again, is usually able to take advantage of the most important factor, drainage, while we, in our operations, except where a fistula has been established, are exceedingly restricted in this particular. It will, furthermore, seldom happen that the surgeon will be called upon to treat an abscess through an opening only a fraction of a line in diameter, or to apply his medicaments through narrow and sometimes tortuous tubes like the canals in the roots of teeth.

All this makes the treatment of diseased teeth *in some respects* an operation *sui generis*, and it may not always be permissible to take for granted that methods and materials which have given the best results in general surgery or pathology can be relied upon, unmodified, to give the best results in the treatment of the teeth. When, for instance, one author tells us that he succeeded in curing an ulcer of the leg with oil of cloves where everything else had failed, he is not justified in concluding from this that oil of cloves must be superior to all other medicines in the treatment of putrid conditions in the canals of teeth.

It is true that in my article I might have given more attention to the question of the action of iodoform upon bacterial poisons (ptomaines, toxalbumins), but, as I stated, "it would lead me too far to attempt to consider even a small proportion of the communications that appeared on this subject."

Furthermore, my fourth series of experiments deals directly with the subject, with the result that "the experiments so often turned out in favor of the iodoform, especially where very putrid material had been used, that its good effects could not be mistaken," a result which I attributed "more probably to a destruction of the poisonous chemical substances in the putrid pulp-tissue" by the iodoform.

Dr. Maxwell would accordingly have found in my own article arguments much more in favor of his position and much more to the point than any results obtained from experiments on anthrax, even if they had been positive instead of negative.

Let us now examine more closely the question of the action of iodoform upon ptomaines in its relation to the treatment of diseased teeth. It was pointed out by Grawitz* and Scheuerlen† that certain bacterial products, in particular cadaverin, putrescin, furthermore sterilized putrefying solutions from rabbit-meat, sterilized and concentrated extracts from staphylococci, possess the power of exciting suppuration without the presence of the bacteria themselves. This suppuration is, however, wanting in the progressive character shown by suppurative processes where bacteria are present, and where, consequently, new quantities of ptomaines may be constantly being formed. I also found and pointed out‡ that suppuration produced by pieces of putrid pulps was always much more severe than that produced by pure cultures of the bacteria obtained from such pulps, and I may here add that putrid pulps produce more severe reaction than simply

* *Virchow's Archiv*, Bd. cx, 1887, S. 1.
† *Fortschritte der Medicin*, 1887, No. 23.
‡ *Independ. Pract.*, 1888, p. 341.

abscessed ones. Behring,* following up the experiments of Scheuerlen and de Ruyter,† found that the ptomaine cadaverin, as well as ptomaines which he isolated from pus and infected blood-serum, lost the power to produce suppuration when mixed with iodoform. Although this discovery did not establish the fact that *all* ptomaines are so decomposed by iodoform, it was looked upon as furnishing at least an indication of the cause of the undoubted beneficial action exerted by iodoform upon suppurating surfaces, particularly when much decomposition was present.

Rovsing‡ sharply criticises the conclusions of de Ruyter, and points to the fact that the admixture of iodoform to cultures of virulent pyogenic cocci or to infectious pus does not in any way diminish the pathogenic effects of the material. Also Baumgarten (*Verschiedene Jahresberichte*) repeatedly seeks to enforce the idea that too much importance is attached to the results obtained by de Ruyter and Behring, and points to the fact that even Brieger§ was not able to find toxines in pure cultures of pyogenic cocci, and that these organisms are able to produce suppuration entirely without the help of any ptomaines.|| This celebrated bacteriologist and pathologist (Baumgarten), as well as Kunz¶ and others, emphasize the fact that the action of iodoform is restricted chiefly to such cases where saprophytic bacteria are present or where putrefactive processes accompany the suppuration. This view agrees with the results obtained by me, for I found that "especially where very putrid material had been used, its (iodoform's) good effects could not be mistaken."**

Schnirer†† found that iodoform did not appreciably diminish the deleterious action of pyogenic staphylococci and streptococci, or anthrax bacilli, in the animal body. Neisser‡‡ states that iodoform in the animal body possesses antiseptic action in relation to the bacilli of cholera, anthrax, mice and rabbit septicæmia, but not in relation to staphylococci and streptococci.

Jeffries§§ found that iodoform has no devitalizing action upon bacteria, though in some cases he found their growth retarded by it. Tilanus|||| comes to the conclusion, after a study of the more recent communications on this subject, that iodoform has a very doubtful value in the treatment of acute infections of wounds. At the Seventh International Congress of Hygiene and Demography (1891) the opinion was advocated that iodoform acts by attracting phagocytes, while in

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* *Deut. med. Wochenschr.*, 1887, No. 20.

† *Centralbl. f. Bact. u. Parasitenk.*, 1887, Bd. ii, No. 23, and *Arbeiten aus der chirurgischen Klinik der niversität Berlin*, Theil iii.

‡ *Fortschritte der Med.*, Bd. vi, 1888, No. 15.

§ *Berliner klin. Wochenschr.*, 1886, No. 18.

|| Manfredi and Traversa succeeded later (*Giornale internaz. delle Sci. med.*, 1888) in obtaining toxic effects from sterile filtrates of streptococcus cultures in bouillon.

¶ *Beiträge z. pathol. Anat. u. Physiol.*, Bd. ii, Heft 2, 1887.

** DENTAL COSMOS, February, 1893, p. 95.

†† "Ueber die antiseptische Wirkung des Iodoforms," *Wiener med. Presse*, 1887, Nos. 36–38.

‡‡ "Zur Kenntniss d. antibacteriellen Wirkung d. Iodof.," *Virchow's Archiv*, Bd. cx, 1887.

§§ "The Antibacterial Action of Iodoform." *Amer. Journ. of the Med. Sciences*, Jan. 1888.

|||| *Münchener med. Wochenschr.*, 1889, p. 545.

a recent communication to the Academy of Paris Dr. Maurel reports experiments which "tend to show that the action of iodoform can be explained by the fact that it increases the vitality and destructive power of the leucocytes upon the organisms, and at the same time diminishes their virulence."* Others again ascribe the favorable action of iodoform to its desiccating power. Finally, Baumgarten† concludes his remarks with the statement that "this is in full accordance with the fact that iodoform as a surgical antiseptic (in the treatment of wounds), at least when employed alone, has been almost universally discarded."

It would be easy to fill up a whole number of the COSMOS with citations relating to the action of iodoform, but the above will suffice to show that the question is by no means so simple a one as Dr. Maxfield appears to assume. They also show that the view that iodoform is a remedy which is to be indiscriminately used in all cases of inflammation or suppuration is by no means universal among authorities on the subject.

To return to the dental uses for iodoform, even taking for granted that it has the power to destroy the bacterial poisons produced in diseases of the teeth, what uses can be made of it?

It would be worthless, first, for sterilizing cavities of decay, because it does not possess the power to penetrate the dentine; second, its use in treating exposed pulps would be limited to the cases mentioned in my first article.

The chief question, however, is, What advantage could we take of its antitoxic power in the treatment of putrid canals? Our first endeavor, in treating such cases, is to thoroughly remove the putrid matter mechanically; having done this, there will be little need of an agent to act upon the ptomaines. We *do* need an antiseptic, however, to destroy any chance bacteria which may remain sticking to the walls, and which, especially if at the apex, may, by proliferating at any future time, endanger the success of the operation.

In case we do not succeed in removing the entire remains of the putrid pulp (let us say that the canal is cleansed only two-thirds of the way to the apex), how does iodoform then act? We cannot sterilize the remaining third by the use of iodoform; but can we render the bacterial poisons contained in the pulp-tissue inert by it? I think we must answer, No, unless we can *thoroughly* incorporate the iodoform with the pulp-tissue in every part, which, in the category of cases under consideration, is extremely difficult and often impossible.

Both experiment and experience have demonstrated that iodoform does not possess any penetrating action on a column of dead matter. It was a very common experience at a time when iodoform was indiscriminately used by all for treating all possible cases, to split open a tooth which had been extracted on account of acute pericementitis, and to find the canal packed one-half to three-quarters full of iodoform, smelling as strong as it did the day it was put in.

I am perfectly willing to admit, and indeed must admit in conformity with the results of my own experiments (fourth series, p. 94 in the DENTAL COSMOS), that iodoform thoroughly incorporated with

* *Journal of the British Dental Association*, September, 1893, pp. 651, 652.
† Seine Berichte, Jahrgang 1891, p. 771.

putrid pulp-tissue does *usually diminish* the intensity of the infection caused by it, but the difficulty of accomplishing this incorporation in narrow root-canals, in my opinion, offsets any probable advantage which would be derived from it.

In the treatment of alveolar abscesses, it might be reasonably expected that iodoform would be of service if it could be freely applied; but to fill the root-canal with iodoform in the hope that it will work through the apical foramen in sufficient quantity to come into contact with all parts of the abscess, would be very like punching a bit of iodoform through a glass tube upon an ulcerating surface or into an abscess-cavity, and the successes reported from such use of iodoform when it was first introduced are to be attributed chiefly to the mechanical cleansing of the canal and to the antiseptics employed in connection with the iodoform. (Dr. Maxfield recommends "thoroughly cleansing the parts with some germicide, such as corrosive sublimate solution and hydrogen peroxid," before applying the iodoform. No doubt such treatment would be successful in the vast majority of cases.)

When, however, we are able to thoroughly inject the abscess with a solution of iodoform (in glycerin or in alcohol and ether, etc.), I am quite willing to acknowledge the possibility of a favorable action.

Smreker* injects an emulsion of iodoform in oil of eucalyptus or in carbolic acid; he has had no success, however, in torpid cases.

Smreker remarks that my conclusions regarding the value of iodoform in the treatment of pericementitis, etc., have turned out a little too harsh.

Brubacher (*Deutsche Monatsschrift für Zahnheilkunde*, October, 1893) uses a paste consisting of iodoform 5.0, salol 3.0, and cacao butter 10.0. He claims that this penetrates to and even through the apical foramen.

With regard to poisoning through iodoform, which Dr. Maxfield is inclined to doubt, I need only call attention to the fact that in the first year following its introduction, when it was used altogether regardless of quantity, cases of intoxication, frequently ending fatally, were reported by the score, or, as Kolaczek† expressed it, the cases were piled up in such a startling manner that König‡ issued an appeal to his colleagues warning them against such an indiscriminate use of the drug. I am not of the opinion, however, and have never expressed myself so, that there is danger of intoxication from the small quantities used in dental practice.

This fact, we must remember, applies as well to other drugs. We make constant use of drugs and concentrations in dentistry which on account of their poisonous character have a much more limited use in general surgery.

I do not agree with Dr. Maxfield that iodoform has been slighted by the dentists. There is certainly no material which has been more universally used, though of ten who formerly used it nine may have put it aside for some other drug. This fact, however, resulting from clinical experience, does not speak well for iodoform, at least as hitherto employed in dental operations.

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* *Oesterreichisch-ungarische Vierteljahrsschrift für Zahnheilkunde*, Jahrgang 1893, Heft i, S. 32, *et seq.*

† Guttmann's Jahrbuch der Medicin, 1882, S. 111.

‡ *Centralbl. f. Chirurgie*, 1881, No. 52.