# CURE FOR INFECTIOUS ABORTION IN COWS.

## Methylene Blue is the Remedy --Valuable Bulletin by Vermont Experiment Station.

The Tillamook Headlight gives this week an important bulletin that of great interest to the dairymen of this county, for it gives a remedy r infectious abortion in cows. It was published by the Vermont Agri- ltural Experiment Station, and we add also a letter from the author, . F. A. Rich. As there are only two of these bulletins in the county, d a desire for the information, we reprint it in full :

Abortion among cattle ranks with bovine tuberculosis at dairy ourge. The discovery of an adequate remedy, one which is safe, nple and sure, would be a great boon. As a result of several months' al at this Station it is believed that such a remedy has been found in ethylene blue, an antiseptic dyestuff occasionally used in human edicine.

The writer has made extenaive studies of infectious bovine abortion ring the past fifteen years. These have been pursued more or less asmodically, at times being made paramount to other lines of work, others subsidiary. The causal organism (Bacillus abortus Bang) is isolated many years ago and its identity with the European form scribed by Bang fully established. After many trials its free growth is finally secured and laboratory experiments were carried on in tail. Material has been gathered during all these years wherefrom is hoped that a comprehensive bulletin may be prepared in the not stant future. It is felt, however, that the time is not yet quite ripe for ch a publication ; but it is fully ripe for a preliminary statement as one phase—the latest and most important—to which all else is subor- nate, that is to say a possible remedy for the malady. Hence, without iting for the completion of the larger bulletin, this preliminary state- nt issued with a view of decribing a method of treatment devised by e writer ; one which has proven almost uniformly successful, which is dily administered and apparently entirely free from danger to man d beast. To delay its declaration at this time pending the preparation a complete bulletin would be unjustifiable.

It should be understood that this statement as to the application the proposed remedy is a preliminary and not a final one. Further d more extensive trials are now in progress at this Station. The pro- dure herein suggested, though based on several months' experience th a considerable number of cows reacting to the special test which scloses the liklihood of their aborting, may be modified as a result of e further inquiry now under way. Yet notwithstanding, it seems per- tly certain that no possible harm can befall if the method is followed in e manner herein set forth, but that, on the contrary, success is likely ensue in practically all cases.

Prior to the detailed discussion as to the use of methylene blue for is purpose, it may be worth while briefly to make clear certain points. is entirely safe to say:

1. That infectious bovine abortion seems to be an omnipresent alady wherever dairying obtains; throughout this country, Canada, irope and elsewhere
2. That the waste due to the loss of calves, to the shrinkage in ilk, to subsequent abortions, to the probably contingent failure to eed, are beyond calculation, mounting far into the millions annually.
3. That the claim that 1 percent of Vermont cows abort annually is obably an understatement. This means 3,500 less living calves born nually in Vermont, fully 140,000 pounds less butter made annually. 00 cows less serviceable each year and less serviceable in future ars. It is entirely safe to say the yearly damage in Vermont is not is than $75,000 ; and Vermont is but a speck on the map.
4. That studies at this and other institutions in this and other untries have served to prove the bacterial origin of this malady, to velop means of detecting in advauce the cows which will probably ort, and to direct efforts toward the discovery of simple, safe, cheap d sure remedies.
5. That the only remedies thus far proposed which have been ought to the writer's attention (other that patent medicines of doubt- l efficacy) are:
   (a) Carbolic acid ; internally.
   (b) Carbolic acid and other antiseptics for vaginal douche.
   (c) Cultures of bacillus abortus (living or dead.)

In the writer's search for a satisfactory remedy several chemicals ssessing germicidal powers were used with varying success on the boratory cultures of the organism, including carbolic acid, salicylic id, boric acid, methylene blue, mercuic chlorid, thymol, lysol, septic, iodine, iron sulphate, argyrol, ichthyol, formaldehyde, not to eak of many other similar materials. Many showd marked lethal wers ; several promised success One of these, methylene blue, ood out prominently and constantly proved more effective than its llows (excepting mercuric chlorid which is necessarily out of the ques- n with living animals) especially in the crucial points of rapidity and mpleteness of destruction of the organism under laboratory condi- ns. Compared with carbolic acid as a destroyer of the bacillus ortus the writer found methylene blue to be from 20 to 50 times more fective. It was then tried under stable conditions with very satisfac- ry results, using several cows which reacted to the agglutination test hich indicated that they were harboring the abortion organism.

It would now seem in order in this preliminary statement, in which has already been remarked it is not designed to discuss the nature or vages of the disease or to describe the causal organism, to outline the ature and application of the remedy. Methylene blue is a well known, ough not widely used, antiseptic. Its penetrability and activity have ng been recognized in bacteriological laboratories. Its use as an in- rnal antiseptic in human medicine is thoroughly established. The ighest purity medicinal grade is best adapted to internal use, since it guaranteed to be free from zinc and arsenic ; and only this medicinal rade should be used. Do not confound methyl blue, which is an utterly ifferent thing.

The application of methylene blue in the laboratory in the destruc- on of the abortion organism and the rapidity and completeness with hich its deadly work is accomplished may be seen from the following xcerpt from laboratory note books.

EFFECT OF METHYLENE BLUE—TABLE I.

| Date | Strength used | Time exposure | Result |
|---|---|---|---|
| October 2, 1912..... | 1: 1,000 | 1 to 3 min. | no growth |
| ,, ..... | 1: 2,000 | 1 to 5 min. | ,, |
| ,, ..... | 1: 4,000 | 4 to 8 min. | ,, |
| ,, ..... | 1: 5,000 | 30 min. | ,, |
| November 30, 1912..... | 1: 6,000 | 1 hour | ,, |
| ,, ..... | 1: 8,000 | 2 hours | ,, |
| ,, ..... | 1:10,000 | 3 hours | ,, |

After determining the specific bactericidal effect of methylene blue pon the abortion organism in the laboratory, the writer tried divers ex- eriments with the chemical upon different cows in the Experiment arm herd, in order to ascertain the effect upon the animals and their roducts, and to determine the proper dose of the medicine and the best ay to administer it.

The powder was fed in the grain, and upon the silage, and saline so- utions thereof were injected under the skin, into the gravid uterus and nto the jugular vein. It has been fed in small doses and in mammoth loses, fed occassionally, intermittently, constantly, fed to cows that re- cted to the special test and to those which did not, fed to young and to ld, to sick and to well, to cows of all breeds and of no breed, to calves, ulls, steers to human beings. No ill effects whatever have followed the se even of several times the necessary amount continued beyond the ecessary length of time. Indeed, methylene blue was fed to 4 healthy ows in exorbitant amounts and for 16 consecutive days. They liked it, hey increased in weight, their appetites were if anything sharpened and he milk yields were entirely normal. No stress is laid on these occur- ences, no claim is made that this material is a wonder working feed or onic, Reference is made to them simply to emphasize the harmlessness of the remedy. When thus fed in extraordinary amounts, several times what we believe is needed to accomplish the desired end, in a few cases he milk has been slightly tinged. This color does not appear in the but- er nor in the taste of the milk altered. No harm can come from the use of such milk, since methylene blue is freely given by medical practition- rs as an antiseptic of the human urinary tract. Furthermore, there is o need of giving a dosage sufficient to be manifested in the milk.

It has been given in 4 neighboring herds in which abortion has been more or less prevalent, to 92 which have shown evidence of the presence of the organism. The results of the treatment appear in the final nu- merical summary.

Summarizing the results to date at this point it may be said that methylene blue was first used by the writer for the treatment of infec- tious abortion in cows on Oct. 15, 1912, since which time it has been in almost constant use in four herds selected for a preliminary test of the treatment.

HERD No 1.

This herd was selected because seven cases of abortion had occurred therein within a few months previous to the treatment and occasional abortions had happened for two or three years. To make the interpreta- tion of the results of the treatment more clear, it was deemed best to make agglutination and complement fixation tests of the blood of the pregnant animals in this herd and to treat only those giving reactions to both of these tests. After testing the blood of the 53 animals in this herd, it was found that the results of the two tests agreed except in cows No. 8 and No 9. The blood of the former reacted to the agglutination but not to the complement fixation test, while that of the latter reacted only to the complement fixation test. These two cows were not treated and both aborted.

Thirty of the 53 cows reacted to both tests and were treated with methylene blue. Half of them received one-half ounce daily on grain or silage for a period of thirty days, while to the other half it was administered in gelatine capsules for a period of six or seven days, the dosage being repeated after a period of four weeks One, a young heifer, No. 28, was seen to present marked signs of impending abortion on the second day of the treatment. She aborted a four and a half months' calf on the fifth day of the treatment. It seems probable that this case had proceeded too far for a favorable issue with any kind of treatment.

Fourteen of the treated reacting cows in herd No. 1 have calved at full time while the remaining 15 are still under treatment and observation.

HERD NO. 2.

Seventeen cows in this herd aborted during 1912 four having aborted within two weeks prior to the initial treatment with the methylene blue. Twelve of the aborters have been sold out of the herd. Samples of blood were taken from each of the remaining 57 pregnant cows in this herd and subjected to the agglutination test. The samples of 30 out of the 57 cows produced complete agglutination in dilutions of from 1 to 50 to 1 to 500, while one gave only a 1 to 20 reaction.

Each of the 31 reacting animals was given one-half an ounce of the methylene blue on the feed daily for 30 consecutive days, So great was the owner's faith in the treatment that it was fed, though irregularly, without the writer's knowledge, to the 26 non reacters.

Everyone of the 31 reacting cows treated has calved normally ; and all but one of the non-reacters have also calved at full term.

HERD NO. 3.

Abortion appeared in this herd in 1912. Up to the time of applying the methylene blue treatment, 17 cows had aborted. There then remained 28 pregnant cows in the herd. Their blood was subjected to the agglutination test. Positive reactions of from 1 to 50 to 1 to 500 were secured with 23 of the 28. These reacters were immediately placed on the methylene blue treatment. Ten grams was fed to each cow on silage night and morning for six consecutive days and after four weeks interval, the treatment was repeated, the methylene blue being given in gelatin capsules with a balling gun.

None of the 28 reacters treated have aborted. At the present writing 8 have calved normally at full term. One cow aborted on April 6, two months from date of service, but she had neither been tested or treated, since there seemed to be some doubt as to her being pregnant. The methylene blue treatment will be continued on the 15 remaining reacting cows until they calve.

HERD NO. 4.

This herd consists of about 25 cows, 10 of which had aborted within a few months prior to beginning the experimental treatment with methylene blue. Samples of blood were obtained from 9 pregnant cows in the herd and subjected to the agglutination test. The samples of all but one caused complete agglutination up to 1 to 50 At the request of the owner, the entire 9 pregnant cows were included in the treatment, One-half ounce of methylene blue was given to each cow in a gelatin capsule once a day for six days, followed by an interval of four weeks as in herd No. 3.

Up to the present writing 3 of the nine cows have calved at full term, and no cases of abortion have occurred in the herd since beginning the methylene blue treatment.

No other form of treatment whatsoever has been employed in any of these herds. The stables have not been disinfected. It has been our purpose to let infected cows, infected stables and methylene blue have it out to the bitter end.

It may here be stated for the benefit of readers who may be anxioue to find out in advance whether abortion is likely to appear in their herds and what cows may be expected to abort that the agglutination and complement fixation tests are used as a detective agency to determine the likelihood of abortion. They are complicated laboratory tests. They involve specially taken samples of the blood of each cow, taken moreover with certain precautions. They call for special apparatus and special training in the bacteriological technique. These tests which reveal the probable aborters are nothing which the farmer can use for himself. On the contrary the methylene blue treatment is one which can be used by any man who is capable of feeding a cow. There being no provision for state tests of this character, it would seem to be the wisest procedure, in case one has in his herd a serious epidemic of abortion, to treat the whole herd. This, because of the considerable cost of the chemical, would be a somewhat costly proposition, yet, on the other hand, assuming that it accomplishes its end, it would be perhaps less so than to permit this serious malady to go through the herd ; and certainly would be less costly than to secure the special tests necessary to separate those who are likely from those who are not likely to abort, even though such a course were possible.

Several pertinent questions arise:

1. How does methylene blue do its work?
2. What becomes of it? What is its metabolic destiny?
3. How is it administered?
4. What cows should be dosed?
5. How much is given and how often?
6. What is its cost? Where may it be obtained?
7. What effect, if any, has it on stable sanitation?

1. HOW DOES METHYLENE BLUE DO ITS WORK? A portion of the dose is absorbed by the blood, appearing therein within 30 minutes. The blood thus laden with the antiseptic chemical pumped to every organ and tissue in the body for purposes of nourishment, warmth, secretion and excretion; and incidentally any abortion organisms existing in the blood or other tissues of the body are almost of necessity overtaken by the bactericidal substance and destroyed.

It destroys the abortion organisms in the digestive tract, a most important consideration, because it is now believed that the digestive tract is the principal avenue of infection. Even the unabsorbed portion of the chemical thus performs a valuable service in the infestinal tract and likewise in the trench of the infected stable.

2. WHAT BECOMES OF IT? The absorbed portion is principally excreted by the kidneys and is discharged from the body in the urine. On this account and because of its pronounced antiseptic properties, it has been extensively employed in both man and domesticated animals, to overcome infection of the urinary tract.

While in the opinion of the writer, the vulva is not the principal avenue of infection of cows with the abortion organism, the infection doubtless does obtain by this route in some cases, against which, the excreted methylene blue must exert a distinct preventive influence. Thus it would seem to serve to a considerable extent the purpose of antiseptic vaginal injections so extensively employed in combatting infectious abortion. The manure is colored by the unabsorbed portion of the methylene blue which, of course, stains the contents of the several stomachs and intestines.

A distinct blue is only noted in the urine from 2 to 6 hours after extreme doses of methylene blue have been given. Ordinary amounts color the urine green. On standing in closed jars the green color disappears, first from the bottom and last from the top. The original color is quickly restored by aeration either by continued pouring or an air blast.

Careful and repeated observations made with the colorimeter and otherwise show that:

a. The intensity of the color in the urine increases with the dose.
b. The maximum color is obtained from 3 to 10 hours after dosage.
c. The specific gravity of the urine is reduced in some cases.
d. Individual animals vary in their ability to absorb and eliminate the material.
e. About 4 days seems necessary for the complete elimination of a medium dose.
f. There seems reason to believe that a cumulative effect occurs when doses are given night and morning for a period of a week.
g. When 20 grams (⅔ oz.) are administered daily for 7 days, within 14 hours from the first dosage the methylene blue content of the blood exceeds the effective strength of the fluid which in the laboratory tests was found sufficient to kill the abortion organism.

3. HOW IS IT ADMINISTERED? During early trials it was mixed with either the grain or silage ration. During later trials it was given in capsule introduced into the throat with a balling gun. This is the preferable way of administering the remedy as the exact amount given can easily be controlled and all chances of loss in manger and through refusal to eat the food are eliminated.

4. WHAT COWS SHOULD BE DOSED ? Reacters should certainly receive the treatment, but in our judgment, as has already been stated, it is often well to treat the entire herd wherein abortiou has occurred or is occurring. The added expense seems to be the only reason for omitting any animals that have been exposed to infection.

5. HOW MUCH IS GIVEN AND HOW OFTEN ? The opinion of the writer to date is that the treatment should begin early in pregnancy ; that 10 to 15 grains (⅓ to ½ oz ) doses should be given night and morning for 7 days, and that after a 4 weeks' interval the treatment should be repeated for another 7 days and continued at 4 week intervals during the period of gestation.

6. WHAT IS THE COST ? WHERE OBTAINED ? The approximate cost of the methylene blue (medicinal) is $2.50 per pound. Each gram costs about a half cent, making the daily dosage to cost about 10c. and each week's treatment cost about 70c. per cow. The material can be obtained of **CHAS. I. CLOUGH, Tillamook, Oregon** The medicinal, not the commercial grade, should be used.

7. WHAT EFFECT HAS IT ON STABLE SANITATION ? Being a powerful antiseptic its use tends to improve stable conditions If it gets—as it does when it is fed with the grain ration—on the muzzles of the cows, tinging them sky blue and coloring the mangers, so much the better from the standpoint of the health of the herd.

No claim is made that feeding methylene blue to cows confers immunity ; hence it is important that the stables and everything contained therein should be rid of the infection as speedily as possible. To this end it is recommended that the stables be thoroughly disinfected with mercuric chloride, carbolic compound, lyseptic, or other reliable germicide.

The writer found in laboratory trials, that 1 part of mercuric chlorid in 10,000 parts of water destroys the bacillus abortus in from 1 to 3 minutes. This is one of most reliable substances for STABLE DISINFECTION and for this purpose should be used in the proportion of 1 to 1,000 parts of water.

A 1 to 1,000 lyseptic solution kills the organisms in from 3 to 5 minutes and on account of their non-corrosive and less poisonous properties of lyseptic prove very efficient for WASHING THE ANIMALS AND STABLE UTENSILS. Lyseptic contain soap which enhances their value for this purpose. A 1 per cent solution of lyseptic has been found safe and efficient for these purposes.

To summarize the present status of this series of trials :

1. Methylene blue has been administered in amounts varying from 5 to 60 grams to cows in 4 different herds in all of which abortion had been prevalent.

2. To-day (June 30 1913), 8½ months after the inception of these trials, 92 cows in all stages of pregnancy have been treated. All of these had reacted to the agglutination test showing the probable presence of the abortion organism. Only one animal of the 92 reacters to which methylene blue has been fed has thus far absorted, while at the present date 56 of them have calved at full term and 35 have not as yet calved.

NUMERICAL SUMMARY.

| | Herd 1 | Herd 2 | Herd 3 | Herd 4 | Total |
|---|---|---|---|---|---|
| Cows in experimental trials (Reacters) ..... | 30 | 31 | 23 | 8 | 92 |
| Cows receiving methylene blue treatment.. | 30 | 31 | 23 | 8 | 92 |
| Cows receiving methylene blue treatment calving at full term..... | 14 | 31 | 8 | 3 | 56 |
| Cows receiving methylene blue treatment still carrying their calves ..... | 15 | 0 | 15 | 5 | 35 |
| Aborted ..... | 1 | 0 | 0 | 0 | 1 |

LATEST ADDITION TO BULLETIN.

The writer's treatment for infectious abortion in cows as administered at present consists in giving each cow a heaping teaspoonful of medicinal methylene blue, on silage or moistened feed once a day for four or five weeks.

After calving, the treatment is resumed for a few days ; and within a few hours after freshening, preferably immediately after expulsion of afterbirth, the cow's uterus is washed out with a methylene blue solution, consisting of a heaping teaspoonful of the blue and an ounce of table-salt to the gallon of boiling water. The solution is cooled to about 105 deg. F., and strict aseptic precautions are observed in its introduction into the cow's uterus (womb).

The stables are thoroughly cleaned and disinfected and the disinfection is repeated after each occurrence of abortion therein. The calving pen is cleaned and sprayed with mercuric chloride (corrosive sublimate) solution, each time after occupation, and on the return of each fresh cow to her stanchion, the platform and trench behind her are sprinkled daily with 1 to 1000 mercuric (corrosive sublimate) solution for at least ten days, or carbolic compound used according to direction.

The afterbirth is burned or deeply buried and the calf and soiled hind parts of the cow are carefully sponged with warm, one percent lyseptic solution.

The sheath of the bull is washed with one per cent lyseptic solution, and either this or the above described methylene blue solution is injected into it.

In herds which have been subjected to the complement fixation and agglutination tests, only those animals giving reactions to the same are treated ; otherwise every cow in the infected herd is given full treatment.

Yours very truly,
F. A. RICH, Veterinarian.