Thesis. 1883.

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Observations on the action of Copaivabalsam and the changes it undergoes in its passage through the system.

Chemical Composition.

Copaivabalsam. is an oleoresin. (1) Stoltze, who seems to have been the first to analyse it, gave its composition as follows:— aethereal oil ..... 38·00
yellow hard resin ..... 52·75
brown soft resin ..... 1·66
water and loss ..... 7·59

(2) Gerber gave a very similar analysis of the same, which analysis differs from that of Stoltze, only in the different proportions of the same factors. According to (3) Bernatzik Copaivabalsam consists of an aethereal oil and a resinous compound of unknown composition. This opinion is more or less held by many writers, as for example by (4) Sachs and Dulk, (5) Blanchet, (6) Wood, (7) Stothmagel and Rossbach.

The oil was according to (8) Weikart first discovered by Hoffman. The Copaivic acid spoken of by almost all writers was discovered in 1829 by (9) Schweitzer, and afterwards also found by (10) Rose and (11) Hesse.

Physiological action.

(12) Mitscherlich made four experiments on rabbits with the O. aeth. Bals. Copaivae, and came to the conclusion

that it increases the quantity of urine secreted.
(8). Weikart made two experiments, one with Copaivabalsam and one with the oil upon himself. He found the resin in the urine again, but the oil he could not find, and came to the conclusion that the oil was oxydezed in the body, and escaped as carbonic acid and water. This led him to conclude that the oil was inactive in a case of Gonorrhoea, and that the Copaivic acid was the active part.
Bernatzik experimented on medical students and himself. He made one experiment with Copaiva oil on a student and one upon himself, two observations with the resin on two separate students and one observation with Copaivabalsam on another. From these observations he was of the opinion that the Copaiva oil causes increased flow of urine, but that the Copaiva resin acts much more energetically on the genito urinary organs. Moreover he found that the resin could not be looked for in the ~~same~~ urine before six hours had elapsed after taking it, and that no more resin is excreted thirty six hours after the dose. The reason why Weikart did not find any copaiva oil in the urine Bernatzik maintains was due to the too early examination of the urine. The flow of urine, when the resin was given never went beyond the normal quantity, and as long as the resin was excreted there was a diminution. He found the Copaivabalsam far more active than the Copaiva oil, and moreover found the resin excreted, when Copaivabalsam was given

to be almost the same in amount as when the resin alone was given. He further maintains that the oil only moderates the active action of the resin, and that it is doubtful, whether the resin alone has a better action than the Copaivabalsam.

Therapeutic action.

(13) Alston says: "Copaivabalsam is an antiseptic, diuretic and purgative. (14) Fothergill does not deny Copaivabalsam this antiseptic action, but thinks that it acts as a stimulant, and that it stimulates the parts to con-
„ tract, and this opinion is founded on his experience. By these two authors it is said to have been made use of in their time for consumption or Phthisis, inter-
„ nal ulcers & gonorrhoea. In 1782 (15) Theden said of Copaiva-
„ balsam "that it is the best medicine known for gonor-
„ rhoea, having been proved by thousands of cases. (16) Brandes thinks it acts by increasing the flow of urine in gonorrhoea. (17) Vogt is of the opinion that it acts by increasing the secretions from the mucous membranes of the genitourinary organs. (4) Sachs and Dulk think it an exciting tonic, increasing the secretions as well as the excretions of the mucous membranes, when they are in a diseased state. Thus it also acts on the mucous membranes of the lungs, and does not act only on the mucous membranes of the genitourinary organs. Nitschelich maintains that it increases the flow of urine, and acts on the mucous membranes of the genitourinary organs. (18) Sigmond says: it (Copaivabalsam) would altogether seem to exert a powerful effect upon the mucous

membranes restoring their power of healthy action.
(19) Pereira considers the action of Copaivabalsam to be on the mucous membranes of the genito-urinary organs. It changes both the quantity and quality of the urine — the quantity being increased, and in quality the urine gets a darker colour, and has a balsamic odour. Its action is moreover perceived by the feeling of warmth and pricking before and after micturition. Moreover on the mucous membranes of the lungs it acts as an irritant. In large doses it produces according to the same writer haematuria and Ischuria. In addition Pereira states that it acts more as an aromatic than turpentine does.
(20) Oesterlen speaks of Copaivabalsam as an excitant to the mucous membranes of the genito-urinary organs, and that it is made use of in Gonorrhoea, Catarrh of the bladder, Catarrh of the airpassages, blenorrhoea, etc., but does not think very highly of it.
(21) Kramer maintains that Copaivabalsam diminishes the flow of urine, even bringing the urine secretion to a standstill, that it moreover causes burning and pain, when used too early in gonorrhoea, and also doubts its good effects.
Weikart thinks that the Copaiva oil has no action at all, and that the action of Copaivabalsam is due to the Copaivic acid present in the balsam. According to him the Copaivic acid is absorbed

by the blood, and coombines then with the potash and soda present in the serum, and so forms soluble salts. As compounds of these alkalies the Copaivic acid is excreted by the urine. He further explains the action of Copaivic acid by stating, that the Copaivic acid salts neither coagulate, nor modify, nor combine with the proteinsubstances in any form, but suck as it were the neutral or acid fats by a process of Endosmosis and exosmosis from the pus-cells, and thus cause shrivelling up of the same, and prevent their further growth, and this he maintains is the reason why Copaivabalsam is of greater use later on in gonorrhoea, when the disease has become chronic, and pus-cells have formed, and less in the early acute stage.

Bernatzik experimented and caused experiments to be made for him on patients troubled with gonorrhoea. The different kinds of resin were tried on 31 patients, the Copaiva oil on 15, and the Copaiva-balsam on two, and injections of urine obtained from persons who had taken either the oil or the Copaivabalsam were made in 12 cases, 60 cases in all experimented on. He found that the Copaiva oil was not inactive, but that it had not the curative action that Copaivabalsam had in gonorrhoea; that neither Copaivabalsam nor any of its constituents had a specific action on gonorrhoea; moreover he found it doubtful whether the resin alone had a better action, than the

the Copaiva balsam, but the Copaivic acid and its salts he maintained are inactive. He explained the action of Copaiba balsam when given internally thus: "it is carried to the diseased parts by the blood, and there stimulates the elastic fibres to contract, and by this contraction reduces the secretion of the mucous membranes of the part, and changes moreover the quality of the secretion. Further by this contraction the parts take on a certain state of callosity and in this manner the young epithelial cells are fixed and form normal epithelium, and are prevented in their further growth. The relaxed state of the diseased part is thus changed and regains its former tone".

(22) Sir Henry Thompson considers it a good diuretic and is supported by (23) Wilks and others in this opinion.

(24) Husemann thinks most authors are of opinion that Copaiva oil is the active part, and building upon the experiments of others maintains that it increases the flow of urine.

(25). Köhler, after giving the various opinions of different observers, concludes that Copaivic acid and its compounds formed in the body have a curative action on the mucous membranes of the genito-urinary and pulmonary organs. The Copaiva oil is not inactive in as much as it is converted into Copaivic acid in passing through the system. The

The Copaivic acid modifies the secretion of the glands, at least those glands of the mucous mem-
2 branes of the genitourinary system. Moreover if the secretion be purulent, the Copaivic acid salts act on the puscells through endos-
" mosis and exosmosis in such an manner as to change the form and contents of the puscells and limit their further growth.

(26) Waldenburg and Simon think it a diuretic.

Wood is of opinion that clinical experience proves that Copaiva balsam has a peculiar stimulative and alterative action on the mucous membranes of the genitourinary organs.

Nothnagel and Rossbach maintains that Copaiva-balsam increases the flow of urine, and acts locally as an astringent on the mucous membranes of the genitourinary apparatus.

Taking all these different opinions together there remains great uncertainty about the action of the balsam. By some it has been, by others it is still made use of in Phthisis, Cystitis, bron-
" chial Catarrh, ulcerative processes, etc. Most writers agree in this that the drug is sometimes of use in gonorrhoea. Bernatzik thinks it is excreted by the skin and the mucous membranes of the genito-urinary and pulmonary systems, so that we may take it for granted that whatsoever the action of Copaiva balsam may be, and whatever factor or factors or products of the drug may be

the active part, that the action will be manifested on the parts where it or they are excreted. In gonorrhoea Copaivabalsam has also been made use of as injections into the urethra and according to (27) Dallas of Odessa, (28) Oates and others with distinct benefit, and according to others without doing the slightest good.
The question therefore is: "how does Copaivabalsam act in gonorrhoea? In the knowledge obtained from the literature on Copaivabalsam we find it applied to processes where we would expect antiseptics to work well, is it therefore possible that Copaivabalsam may act antiseptically? Keeping these questions in mind I commenced my experiments on the drug.

While working in the pharmacological laboratory of Strassburg, I got through the kindness of Professor Schmiedeberg permission to make use of his laboratory in order to enable me to institute experiments on Copaivabalsam. to enquire into the action of it in gonorrhoea, and the changes it undergoes in its passage through the system. In how far I succeeded in clearing up our knowledge on these points the following experiments will show.
I commenced by preparing specimens of urine, and mixing half the number with Copaivabalsam. This I thought would more or less correspond to the direct application of Copaivabalsam in gonorrhoea by means

of injections.

April 25th. The urine of a dog was taken and filtered, and 8 specimens prepared, four of which were put aside without any addition of Copaivabalsam; of the other four one drop of Copaiva balsam was added to one specimen, 2 drops of the same were added to a second, three to a third and four to a fourth, and each of these last four was then well shaken up. There was then noticeable a slight difference in colour in the specimens of urine mixed with Copaivabalsam, as compared with the others prepared without any addition. Most of the Copaivabalsam was soon again seen floating at the top, but there was evidence enough in the colour and opacity of the specimens to show that some Copaivabalsam was held in solution or suspended. The specimens were then all left uncovered in the laboratory. Those put up without the drug were slightly opagne on April 27th. The Copaivabalsam floating on the urine of the other specimens became green on May 1st, and on May 8th all the specimens both those mixed with Copaivabalsam, and those to which none was added were equally decomposed and foul in smell. In those not mixed with Copaivabalsam there was great opacity, a film, and marked streaks. It was difficult here to test the acidity and change into alkalinity of the specimens mixed with Copaivabalsam, hence the reason of the nonappearance of such an important quality. Here I applied the Copaivabalsam, as it were, externally, let us know look at the specimens of

of urine taken from man and animals where the Copaiva balsam was given internally. Before giving the description of these specimens it is best to state that only positive facts have been noted, and where no remarks are found for several days, it is to be understood that there were no noticeable changes. This was done to avoid repetition. I will commence with the specimens of rabbits urine, next take those of human urine, and conclude with dogs urine.

Rabbits urine specimens.

June 28th.

No. 1 is the urine of a rabbit fed on milk for the previous ten days. The urine, which was part of the collection of the previous 24 hours, was filtered, when its properties were: acid, transparent, fresh and no odor.

No. 2 is the urine of two other rabbits, also fed on milk during the previous ten days. Moreover these two rabbits were given each two grams of Copaiva balsam. (injected by catheter into the stomach) each day for the previous two days. The urine, of which the specimen was taken was collected during the previous 24 hours; was filtered and then had the following properties: alkaline, slight opacity, no odor. At the time this specimen was prepared both rabbits were already very ill, and the one died a few hours after the other within 36 hours.

No. 1. July 1st: slight odor of decomposition, a slight film, a slight deposit, marked streaks, moderately opague. July 8th: a floating mould fungus, thick deposit. July 11th.

alkaline, a very foul smell, a thick film, marked streaks, very opague, a heavy deposit.
No.2. July 1st: doubtful smell, a minute film, slight streaks, moderately opague. July 1st: very much the same. July 11th: the same as on July 1st.

Human Urine specimens.

Let us now see what action Copaivabalsam has when taken internally by a human being. As I was unable to get any one, on whom I could depend I took the Copaivabalsam myself.
I Series. June 22nd. I took one gram of Copaivabalsam at 9.30 A.M. and prepared specimens. All the specimens were filtered and had the following properties: moderately acid, transparent, no odor.
No.1. is the urine of my collague passed at 9.30 A.M.
No.2. is my own urine passed at 9.30 A.M. and collected since 8 A.M.
No.3. is my own urine passed at 5 P.M. and collected since 3 P.M.
No.4. is my own urine passed at 7 P.M. and collected since 5 P.M.
No.1. June 24th: slightly alkaline, slightly opague, doubtful smell, slight streaks commencing deposit. June 25th: is a great deal better than No.2. Properties: alkaline, slight odor of decomposition, slight streaks, moderate deposit moderate opacity.
No.2. June 23rd: slightly alkaline, slight odor of decomposition, slight opacity, a commencing deposit.

June 24th.: moderately alkaline, a foul smell., slight streaks, moderate opacity, heavy deposit.

No. 3. Corresponds to No 2 in every respect.

No. 4. June 24th.: neutral, slight odor of decomposition, no streaks, a thin deposit. June 25th.: it corresponds to No 1.

II Series. June 26th.. I took one gram of Copaivabalsam at 7P.M.; on June 27th another gram at 9.30 AM and a third one at 7P.M.; and on June 28th one and a half grams at 10 A.M. The specimens were all filtered into clean glasses, and had the following properties unless otherwise stated: moderately acid, transparent, no odor.

June 27th.: No. 5. is the urine of my colleague passed at 7P.M.: slightly alkaline.

No. 6. is my own urine passed at 7.P.M. and collected since 3.P.M.

June 28th. No. 7. is my own urine passed at 9.30 A.M. and collected since 8.A.M.

No. 8. is my own urine passed at 3.P.M. and collected since 12 noon.

No. 9 is the urine of my colleague passed at 4.P.M. strongly acid.

No. 10. is my own urine passed at 7.P.M. and collected since 3.P.M.

June 29th. No. 11. is my own urine passed at 9.30.A.M, and collected since 8. A.M.

No. 5. June. 28th.: a slight streak on the side of the vessel. June 29th.: moderately alkaline, a slight odor of decomposition, slightly opaque, marked streaks, a commencing deposit. July. 1st.: moderately alkaline, a foul smell, marked streaks, heavy deposit.

No. 6. June 29th.: slightly alkaline and is No. 5. over again, the

latter having kept a little better up to July 1st.
No 7. June 30th: minute streak, a slight opacity, a slight deposit. July 1st slightly alkaline, doubtful smell, slightly opaque slight streaks, a heavy deposit. July 3rd: moderately alkaline, a slight film, quite opaque, a heavy deposit slight streaks. This specimen was kept up to July 11th and no increase in decomposition could be noticed.
No. 8. June 29th: fine streaks, a commencing deposit, June 30th: also slightly opaque, a slight deposit. July 3rd: slightly alkaline, no odor, a minute film, a minute streak, slight opacity, commencing deposit floating mouldfungus. July 4th moderately alkaline, doubtful smell, slightly opaque, slight film, slight streak, moderate deposit, floating mouldfungus. This specimen I kept a few days longer and found no further change.
No. 9. June 29th: a streak on the side of the vessel. June 30th: also slightly opaque, a slight deposit. July 1st: slightly alkaline, a slight odor of decomposition, a thick film, a slight deposit, marked streaks very opaque. July 3rd: very alkaline, decomposed foul smell, thick film, great opacity, heavy deposit, marked streaks.
No 10. June 30th: slightly alkaline, slightly opaque, slight deposit. July 1st: moderately alkaline, a foul smell, thick film, heavy deposit, very opaque, marked streaks.
No. 11. July 1st a mere trace of opacity a slight streak. July 3rd slightly alkaline, no odor, heavy deposit, a slight streak. Further on it corresponded to No 7 and was also kept up to July 11th without any noticeable increase in decomposition.

III Series. July 3rd.

I took one gram of copaivabalsam at 9.30 A.M., a second gram at 12.45 P.M., a third at 3.15 P.M., and a fourth at 7 P.M. All the specimens were filtered, and had the following properties unless otherwise stated: moderately acid, transparent, no odor.

No.12. is my own urine, passed at 12.45 P.M. and collected since 11 A.M.

No.13. is my own urine, passed at 3.15 P.M. and collected since 12.45 P.M.

No.14. is the urine of my colleague, passed at 4.30 P.M.: very acid.

No.15. is the urine of my colleague passed at 7 P.M: slightly alkaline.

No.16. is my own urine passed at 7 P.M. and collected since 3.15 P.M.

No.17. is my own urine passed at 10 P.M, and collected since 7 P.M.

July 4th. No.18. is my own urine, passed at 9.30 A.M, and collected since 8 A.M.

No.19. is the urine of my colleague passed at 10.45 A.M.

No.20. is my own urine passed at 12.45 P.M. and collected since 9.30 A.M.

No.21. is my own urine passed at 3.15 P.M., and collected since 12.45 P.M.

No.22. is my own urine, passed at 7 P.M., and collected since 3.15 P.M.: very slightly acid.

No.23. is the urine of the servant of the laboratory, passed at 7 P.M, and very acid.

No.12. July 5th.: a slight streak, a commencing deposit. July 6th.: also slightly opague, a minute film. July 8th slightly alkaline, no odor, minute streak, minute film, a mere trace of opacity. July 12th.: moderately alkaline, doubtful smell, a slight film, a slight streak, a heavy deposit, a mere trace of opacity. July 17th.: only now the smell is foul.

No.13. July 5th.: commencing deposit. This specimen is No 12

repeated, except in this that it is more opaque.
No.14. July 4th: large white film, very opaque. July 6th: doubtful smell, marked streaks. July 8th: thick film, commencing deposit. July 12th: slightly alkaline, slight odor of decomposition, great opacity. July 15th: very alkaline, foul smell, thick film, marked streaks, strong opacity, slight deposit.
No.15. July 5th: very alkaline, strong sweetish odor, slight streak, slight opacity. July 6th: strong opacity, no film. July 11th: very alkaline, quite decomposed, thick film, heavy deposit. July 12th: The smell is now so foul that it cannot be longer retained.
No.16. July 5th: a mere trace of opacity, a commencing deposit. July 6th: moderately alkaline, doubtful smell, great opacity, a slight film, a slight streak, a slight deposit. July 12th: also slight odor of decomposition. For a couple of days longer no change was noticed.
No.17. is No.16 repeated.
No.18. July 6th: a slight streak, slightly opaque, commencing deposit. July 11th: slightly alkaline, doubtful smell, moderate film, marked streaks, slightly opaque. July 12th: moderately alkaline, slight odor of decomposition, moderate film, heavy deposit. July 20th Smell is now foul.
No.19. July 6th: slightly alkaline, slight odor of decomposition, very opaque, moderate film, marked streaks. July 8th: moderately alkaline, foul smell, marked streaks, moderate film, moderate deposit, great opacity.
No.20. July 6th: a very slight streak, a commencing deposit. July 15th: moderately alkaline, doubtful smell, a mere trace of opacity, a heavy deposit. July 17th: foul smell.
No.21. July 6th: minute streak, commencing deposit, a trace of

opacity. July 8th.: slightly alkaline, no odor, marked streaks, thick film, heavy deposit, very opaque. July 12th.: moderately alkaline, slight foul smell, thick film, slight streak, great opacity.
No. 22. July 6th slightly alkaline, no odor. Further we may say it is No. 21. over again.
No. 23. July 6th.: slight streak. July 7th.: slightly opaque, a commencing deposit, a floating mouldfungus. July 11th.: moderately alkaline, slight odor of decomposition, marked streaks, thick film, thick deposit, very opaque. July 12th.: a foul smell.

II Series. July 12th.: I took 2 grams of Copaivabalsam at 7.45 A.M., two more at 10. A.M., another two at 12.45 P.M. and a fourth equally large dose at 3. 30. P.M. Severe diarrhoea coming on prevented me to take two more doses as I intended. Since 12 o'clock noon on July 12th to 12 o'clock noon the following day I had six watery stools. I suffered moreover during this time from severe headache lumbago, weakness, no apetite and thirst, and these symptoms got so bad on July 12th towards the evening, that I had to lie down at 7 P.M. from which I awoke the next day at 8 o'clock.
The specimens of urine in this series were all filtered, and had then the following properties unless otherwise noted: moderately acid, transparent, no odor.
No. 24. is my own urine, passed at 10. A.M. and collected since 8 A.M.
No. 25. is my own urine, passed at 12.45. P.M., and collected since 10. A.M.
No. 26. is the urine of my colleague passed at 3. 15. P.M.
No. 27. is my own urine, passed at 3. 15. P.M., and collected since 12.45. P.M.
No. 28. is my own urine, passed at 5. 30. P.M. and collected since 3. 15. P.M.
No. 29. is the urine of my colleague passed at 7. P.M.

No. 30. is my own urine, passed at 7.30 P.M. and ~~collected~~ collected since 5.30. P.M.

No. 31. is my own urine, passed at 9.30 P.M. and collected since 7 P.M. July 13th: No. 32. is my own urine, passed at 9.45 A.M. and collected since 8 A.M.

No. 33. is the urine of my colleague, passed at 10.30 A.M.: slightly acid.

No. 34. is my own urine, passed at 12.45 P.M. and collected since 9.45 A.M.

No. 35. is my own urine, passed at 4 P.M. and collected since 2 P.M.

No. 36. is the urine of my colleague, passed at 6 P.M.; slightly alkaline.

No. 37. is my own urine, passed at 7 P.M. and collected since 4 P.M.

No. 38. and No. 39. were also prepared on this occasion, but as I neglected to note down to whom it belonged I will not include these two numbers.

No. 24. July 24th: a mere trace of opacity. July 15th: slightly alkaline, slight odor of decomposition, slight deposit. July 17th: very alkaline, foul smell, marked streaks, thick film, heavy deposit moderately opaque.

No. 25. July 14th slightly opaque. July 15th slightly alkaline, a slight streak. July 17th: a film, moderately opaque, slight odor of decomposition, slight deposit. August 3th: it has remained the same.

No. 26. July 14th: slightly opaque. July 15th neutral, anise seed smell, a slight film, marked streak, a slight deposit. July 17th: slightly alkaline, moderate opacity. This specimen became gradually worse, so that on July 20th I could note: moderate film, moderate streaks, moderate opacity, a slight deposit, a foul smell, which last had been much obscured by the strong anise seed smell.

No. 27. July 14th: slightly opaque. July 15th: slightly alkaline,

slight odor of decomposition, a minute film, a slight streak, very opaque, no deposit. July 17th.: alkaline, foul smell, marked streak, moderate film, moderate opacity, commencing deposit.

No. 28. July 14th.: slightly opaque. July 15th.: slightly alkaline, slight odor of decomposition, minute film, slight streak, very opaque, no deposit. In this state it remained up to August 5th.

No. 29. July 15th.: slightly alkaline, slight odor of decomposition, a marked film, a slight streak, very opaque, a commencing deposit. This specimen got soon so bad, that I could not keep it longer than July 17th.

No. 30. July. 14th.: slightly opaque. July 15th.: slightly alkaline, slight odor of decomposition, a minute film, slight streak very opaque. July 17th.: moderately alkaline, marked streak, a slight film, moderate deposit. In this state it remained up to August 5th.

No. 31. corresponds to No 30. in every respect, but there was no odor in this specimen on July 17th.

No. 32. July 15th.: minute opacity, a commencing deposit, July 17th.: slightly alkaline, doubtful smell, slightly opaque, a floating mouldfungus. July 18th.: slightly alkaline, slight foul smell, a thick film.

No. 33. July 15th.: a minute opacity, minute film. July 17th.: slightly alkaline, a foul smell mixed with a sweet one, a very thick film, a marked streak, moderate opacity, commencing deposit.

No. 34. July 15th.: a minute film, a commencing deposit. July 17th.: neutral, doubtful smell, slight streak, slight opacity, a floating

mould fungus, . July 18th: moderately alkaline, a foul smell, a thick film, great opacity, a slight deposit.
No. 35. July 15th.: a slight opacity. July 17th.: alkaline, a foul smell, a minute film, great opacity, heavy deposit.
No. 36. July 15th.: slight odor of decomposition, slightly alkaline, marked streak, moderately opaque, commencing deposit. July 17th.: moderately alkaline, a very foul smell, thick film, marked streak, moderate opacity.
No. 37. July 15th.: minute streak, July 17th.: slightly alkaline, doubtful smell, slight streaks, slight opacity. July 18th.: moderately alkaline, moderately opaque, a foul smell, a thick film.
No. 38. & No. 39 I believe are both specimens of my own urine, passed at 10 P.M. in the evening and at 8 A.M. on the day after respectively. Both specimens kept up to July 18th when they rapidly changed for the worse

V. Series. July 17th.: I took 2 grams of Copaiva balsam at 9.30 A.M. & an equally large dose at 1 P.M. Lumbago, headache, diarrhoea, thirst, and loss of apetite setting in prevented me from continuing to take the drug for that day. The specimens prepared were all filtered, and then had the following properties: moderately acid, transparent, no odor.
No. 40. is my own urine passed at 1 P.M. and collected since 11 A.M.
No. 41. is urine of my colleague passed at 3 P.M.
No. 42. is my own urine, passed at 3 P.M. and collected since 1 P.M.
No. 43. is my own urine, passed at 5 P.M. and collected since 3 P.M.
No. 44. is my own urine, passed at 7 P.M. and collected since 5 P.M.
No. 45. is urine of the servant of the laboratory, passed at 7.30 P.M. slightly alkaline.

No. 46. is my own urine, passed at 10. P.M. and collected since 7. P.M. July 18th.: No. 47. is my own urine, passed at 10. A.M. and collected since 8. A.M.; slightly alkaline.

No. 48. is the urine of my colleague, passed at 10.30 A.M.

No. 49. is my own urine, passed at 1. P.M. & collected since 10. A.M.

No. 50. is my own urine, passed at 3.30. P.M. & collected since 1. P.M.

No. 51. is urine of my colleague, passed at 4. P.M.: slightly alkaline.

No. 52. is my own urine, passed at 7. P.M. and collected since 3. P.M.

No. 40. July. 19th.: a slight film, minute streak, a slight opacity. July 20th.: slightly alkaline, moderately opague, a slight odor of decomposition. July. 21st.: moderately alkaline, a slight film, minute streaks, moderate deposit. In this state it remained up to August 5th.

No. 41. July. 18th.: doubtful smell, marked film, moderately opague. July 21st.: slightly alkaline, a sweet foul odor, moderate streaks, several floating mouldfungus balls, moderate opacity, heavy deposit.

No. 42. July 19th.: neutral, slight opacity. July 20th.: slightly alkaline, July 21st.: moderately alkaline, doubtful smell, minute film, minute streak, moderate opacity. In this state it remained up to July 24th, when it had the following properties: alkaline slight ammoniacal foul smell, minute film, slight streaks, slight opacity, slight deposit.

No. 43. July 19th.: neutral, no odor, slight opacity a thin film. July 20th.: slightly alkaline, slight odor of decomposition, slight opacity. July 22nd.: moderately alkaline, foul smell, thick film, marked streaks, very opague, moderate deposit.

No. 44. July 19th.: a mere trace of opacity. July 20th.: slightly alkaline

doubtful smell, slight opacity. July 21st.: moderately alkaline, minute film, no streak, slight opacity, commencing deposit. July 24th.: minute streaks, slight deposit. In this state it remained up to August 5th.

No. 45. July 19th.: slightly alkaline, doubtful smell. July 19th.: moderately alkaline, slight odor of decomposition, minute film, slight opacity. July 20th.: moderately alkaline, foul smell, slight film, slight streaks, slight opacity, moderate deposit.

No. 46. July 19th.: a mere trace of opacity. July 20th.: slightly alkaline, doubtful smell, slight opacity. July 21st.: moderately alkaline, doubtful smell, minute film, minute streaks, moderate opacity, heavy deposit. In this state it remained up to the end of July.

No. 47. July 20th.: slightly alkaline, foul smell, slight film, very opaque, commencing deposit.

No. 48. July 19th.: a minute streak. July 20th.: doubtful smell, slight opacity. July 21st.: slightly alkaline, slight odor of decomposition, minute film, minute streaks, moderate opacity, commencing deposit. July 24th.: moderately alkaline, foul smell, thick film, marked streaks, very opaque, moderate deposit.

No. 49. July 19th.: minute streak. July 20th.: a trace of opacity. July 22nd.: slightly alkaline, doubtful smell, minute film, minute streaks, slight opacity, commencing deposit. July 24th.: moderately alkaline, floating mouldfungus, moderate deposit. July 28th.: moderately alkaline, slight ammoniacal odor, moderate opacity.

No. 50.: corresponds to No. 49. being however less opaque, and having no mouldfungus.

No. 51. July 19th.: slightly alkaline, doubtful smell, thin film, slight opacity. July 20th.: slight odor of decomposition, moderate film,

moderate streaks, moderate opacity, commencing deposit. July 24th: moderately alkaline, foul smell, marked film, marked streaks, moderate opacity, moderate deposit.
No. 52. July 19th: neutral. July 20th: slightly alkaline, doubtful smell, minute film, minute streaks, moderate opacity, commencing deposit. July 21st: moderately alkaline, foul smell, slight film, minute streaks, moderate opacity, very heavy deposit.

VI. Series. July 26th: At 10 A.M. I took 2 grams of Copaivabalsam, at 1 P.M. another 2 grams, and at 4 P.M. an equally large dose. On this occasion I suffered less, having merely colic pains during the night, and a watery stool in the morning. The specimens were all filtered and had the following properties:
moderately acid, transparent, no odor.
No. 53. is my own urine, passed at 1 P.M. and collected since 11 A.M.: slightly acid.
No. 54. is urine of my colleague, passed at 1 P.M.: slightly acid.
No. 55. is my own urine, passed at 3.15 P.M. and collected since 1 P.M.: very slightly acid.
No. 56. is urine of my colleague passed at 5 P.M.: slightly acid.
No. 57. is my own urine, passed at 5 P.M. and collected since 3.15 P.M.: slightly alkaline.
No 58. is my own urine, passed at 7.30 P.M. and collected since 5 P.M.: very slightly acid.
No. 59. is my own urine, passed at 10 P.M. and collected since 7.30 P.M.: very slightly acid.
July 27th. No. 60. is my own urine, passed at 6 A.M. I collected since 10 P.M of the previous night: very slightly acid.
No. 61. is my own urine, passed at 10 A.M. and collected since 8 A.M.

No. 62. is my own urine, passed at 1. P.M. and collected since 10 A.M.
No. 63. is my own urine, passed at 3. P.M and collected since 1. P.M.
No. 64. is urine of my colleague, passed at 3.30. P.M.
No. 65. is my own urine passed at 7 P.M and collected since 3 P.M.
No. 66. is urine of the laboratory servant, passed at 7.30. P.M.
No. 67. is my own urine passed at 10. P.M, and collected since 7 P.M.
No. 53. July 28th: slight opacity. July 29th: neutral, doubtful smell, slight film, minute streaks, moderate opacity, commencing deposit. July 31st: moderately alkaline, foul smell, thick film, minute streak, moderate opacity.
No. 54. July. 27th: minute streak. July 29th: doubtful smell, minute film, marked streaks, slight opacity, commencing deposit. July. 31st: neutral, foul smell, thick film, marked streak, moderate opacity commencing deposit.
No. 55. July 28th: a mere trace of opacity. July. 29th: slightly alkaline, slight odor of decomposition, a thick film, marked streak, slight opacity, commencing deposit. July. 31st: moderately alkaline, foul smell, thick film, minute streak, moderate opacity, slight deposit.
No. 56. July 27th: minute streaks. Further it corresponds closely to No. 54.
No. 57. is No 55. repeated.
No. 58. July. 28th: a mere trace of opacity. July. 29th: slightly alkaline, doubtful smell, minute film, minute streak, slight opacity, commencing deposit. August. 2nd: slightly alkaline, foul smell, slight film, marked streaks, moderate opacity, slight deposit.
No. 59. corresponds to No. 58.
No. 60. was like No 58 up to July 29th, when it became worse. August. 2nd: very alkaline, very foul ammoniacal smell, thick film, marked streaks, slight opacity, heavy deposit.

No. 61. July 29th: a mere trace of opacity, commencing deposit. July 31st: minute film, minute streak. August 2nd: slightly alkaline, slight odor of decomposition, moderate film, moderate opacity, minute streak, moderate deposit. August 5th: no additional change.

No. 62. July 28th: a minute streak. July 31st: a floating mould fungus. August 5th: no further change.

No. 63. July 29th: slight opacity, commencing deposit. July 31st: slightly alkaline, doubtful smell, minute film, minute streak, and in this state it remained up to August 5th.

No. 64. July 28th: minute film, marked streak. July 31st: doubtful smell, slight opacity, slight deposit, mould fungi. August 2nd: neutral, slight odor of decomposition, marked opacity. August 3rd: slightly alkaline, foul smell, minute film, marked streaks, moderate opacity, moderate deposit.

No. 65. July 28th: minute streak. July 31st: slightly alkaline, no odor, minute film, minute streaks, slight opacity, commencing deposit. August 3rd: slightly alkaline, doubtful smell, moderate streaks, moderate deposit. August 5th: no further change noticeable.

No. 66. July 29th: slight streak. July 31st: doubtful smell, moderate film, moderate streaks, slight opacity, slight deposit. August 2nd: slightly alkaline, foul sweetish smell, moderate film, moderate streaks, slight opacity, moderate deposit.

No. 67. July 29th: a slight streak. July 31st: minute film, floating mould fungus, commencing deposit, no smell, transparent, slightly acid. This condition was observed on August 5th.

Specimens of dogs urine. The Copaivabalsam was given to a middlesized dog. May 3rd. at 3 P.M the dog was given 2 grams of Copaivabalsam, a similar dose on May 4th at 10.30 A.M, one gram at 1.P.M and another at 7.P.M. As the dog had on each of these nights following severe diarrhoea, no Copaiva= balsam was given on May 5th.

No.1. May 6th. at 9.30 A.M, the urine passed during the previous 24 hours was collected, being free from faeces, filtered and had the following properties: acid, transparent, no odor. ~~Thereafter~~ May 22nd: a minute trace of opacity. May 24th a minute film. June 1st: very slightly acid, slight opacity, slight film, good smell, no streaks, a thin deposit. June 5th: slightly alkaline, doubt= ful smell, heavy deposit. June 10th: strongly alkaline, strong ammoniacal odor, slightly opague, heavy deposit, slight film. Thus it remained for a long time after the ammonia= cal odor getting stronger, but no opacity nor foul smell set in.

On May 10th the dog was given one gram of Copaivabalsam at 7.A.M, another at 1.P.M, a third at 7.P.M.; a fourth on May 11th at 10.A.M, a fifth at 7.P.M, and a sixth on May 12th at 10.A.M. All the specimens prepared, were drawn off by catheter from the dogs, filtered and had the follo= wing properties: slightly acid, no odor, transparent.

May 12th. No.2 is the urine of a dog not experimented upon, and drawn off at the same time as No.3 & No.4.: very acid.

No.3 is the urine of a second dog, not experimented upon.

No.4. is the urine of the dog to which the Copaivabalsam was given: slightly alkaline.

The urine of all the specimens still to be mentioned was treated, and got like those already mentioned, from dogs kept in the laboratory, and fed like the dog which was given the Copaivabalsam. These dogs had never been experimented upon in any way, and the urine was in each case drawn off by catheter and then filtered.

No. 2. May 19th: slight streaks. May 22nd: slight odor of decomposition. May 27th: marked streaks, slight opacity. June 1st: foul smell, acid, moderate film, numerous streaks, moderately opague, heavy deposit.

No. 3. May 15th: neutral, slight film. May 20th: slightly alkaline, slight odor of decomposition, marked streaks. May 22nd: moderately alkaline, foul smell, moderate deposit with a cloud, very opague, moderate film.

No. 4 May 16th neutral. June 1st floating mouldfungous balls and deposited ones. June 5th: slightly acid. June 10th: slightly alkaline. June 17th moderately alkaline, transparent slight ammoniacal smell. June 21st: moderately alkaline transparent ammoniacal smell, plenty of mouldfungi, minute streaks. In this state it remained for a few weeks longer.

May 16th: The dog had no copaivabalsam during the previous three days, and was given two grams of Copaivabalsam at 10 A.M..

Both specimens of urine here mentioned were drawn at 5 P.M, filtered and had the following properties: slightly acid, transparent, no odor.

No. 5* is a specimen of urine of a dog, not experimented upon

No. 6. is a specimen of the urine of the dog, that was given

the Copaiva balsam. The dog had not passed urine since 6 A.M.
No. 5. May 20th.: slightly opaque, slight streaks. May 22nd.: neutral, slight odor of decomposition, slight deposit. May 27th.: a film, moderate streaks. June 1st.: strongly alkaline, a strong odor of decomposition, a moderate film, slight opacity; moderate streaks, a few mouldfungus balls floating, a slight deposit.
No. 6. May 10th.: slightly acid. May 22nd.: a mouldfungus floating. June 10th.: neutral, no odor, minute film, transparent, commencing deposit. June 17th.: slightly alkaline, a mere trace of opacity, doubtful smell. June 24th.: moderately alkaline, a strong ammoniacal odor, floating mouldfungus and several fungi deposited, a mere trace of opacity, a minute film, no streaks, commencing deposit.

May 23rd. On May 21st the dog got no Copaiva balsam; on May 22nd however he was given ½ gram of the drug at 8.30 A.M. and another at 7 P.M.; and on May 23rd two grams were given to the dog at 8 A.M. Both specimens here mentioned were drawn off at 7 P.M by catheter, filtered, and had the following properties: acid, transparent, no odor.
No. 7. is a specimen of urine taken from a dog, not experimented upon.
No. 8. is a specimen of urine of the dog that was given the Copaiva balsam.
No. 7. May 27th.: neutral, slightly opaque, a film, slight streaks, slight odor of decomposition, commencing deposit. June 1st.: moderately alkaline, foul smell, a film, marked streaks, very opaque, a slight deposit.
No. 8. June 1st.: slightly alkaline, a minute film, transparent, no streaks, no odor. June 2nd.: slightly opaque. June 10th.:

moderately alkaline, slightly opaque, slight odor of decomposition, a marked film, a slight deposit.

June 21st:. The dog had one gram of Copaiva balsam in the morning, and one in the evening, and had severe diarrhoea in the forenoon. He had been similarly treated the previous three days.

No. 9. is a specimen of urine of a dog, not experimented on. The urine was drawn, filtered and had the following properties: acid., transparent, no odor.

No. 10. is a specimen of urine taken from the dog, which was given the balsam Copaivae, and had the same properties as No. 9.

No. 9. June. 22nd:. slight odor, minute streaks. June 24th:. neutral, doubtful smell, numerous crystals. June 26th:. strongly alkaline, ammoniacal odor, slight opacity, thick film, slight streaks, commencing deposit.

No. 10. June 26th:. a mouldfungus floating. July 1st:. several mouldfungi floating. July. 6th:. slightly alkaline, no odor, a slight film, a slight deposit. July. 10th:. moderately alkaline, July 15th:. very alkaline, ammoniacal odor, transparent, a thin film, no streaks, several mouldfungi floating.

July. 4th:. On July 3rd. and July 4th:. the dog was given on each day one gram of Copaiva balsam at 9. A.M, and another at 7. P.M.

No. 11. is a specimen of urine of another dog, not as yet in any way experimented upon., and kept in the laboratory. The urine was filtered, and had the following properties: neutral, transparent, no odor. This and the next number were both

drawn off by catheter at about 7. P.M.

No. 12. is a specimen of urine of the dog fed on Copaivabalsam, was filtered and had these properties: moderately alkaline, transparent, no odor.

No. 11. July 6th.: slightly alkaline, slight odor of decomposition, slightly opague. July 8th.: moderately alkaline, ammoniacal odor, slight film, slight deposit, slightly opague.

No. 12. July 6th.: slightly opague. This specimen corresponds to No. 11.

July. 11th.: On July 10th and July 11th. the dog was given one gram of Copaivabalsam at 10. A.M and one at 7. P.M. on each of these days.

No. 13. is the urine taken from another dog, not as yet in any way experimented upon. It was filtered, and had the following properties: slightly alkaline, transparent, no odor.

No. 14. is a specimen of urine of the dog fed with Copaiva balsam. It was filtered and had these properties: acid transparent, no odor. Both urines were drawn off by Catheter at 7. P.M.

No. 13. July. 13th.: slight odor of decomposition. July 15th.: moderately alkaline, a foul smell, a slight film, a slight deposit, slight streaks, moderately opague.

No. 14. July 18th.: slightly acid, commencing deposit. July 31st.: neutral. August 1st.: slightly alkaline, many crystals deposited, no odor, transparent, no film, no streak. August 5th.: it has remained the same.

July. 19th.: No. 15. is a specimen of dogs urine, drawn off at 7. P.M. The dog was given Copaivabalsam on this and the previous four days at the rate of one gram at 10. A.M.

and another at 7.P.M on each day. The urine was filtered and had the following properties: slightly acid, transparent, no odor.

No. 16. is urine of a dog, not experimented upon in any way. It was filtered and had the same properties as No. 15.

No. 15. August. 2nd.: neutral, commencing deposit. the same condition was found on August. 5th.:

No. 16. July 20th.: neutral, doubtful smell. a trace of opacity. July 29th.: slightly opague, marked streaks, minute film, slight deposit, slight odor of decomposition. August. 2nd.: neutral, a foul smell, slight film, marked streaks, slight deposit, slightly opague.

It may look remarkable, that some specimens decomposed so much sooner at one time, than others at another, but this can be accounted for to a great extent by the great changes in the temperature. Towards the end of June the temperature rose as high as 30°C (86° Fahr.), and for several days about that time it was over 25°C. (77° Fahr). Let us take up the specimens in the order given. In the first 8 specimens with four of which copaivabalsam was mixed, I found not the slightest difference in the rate of decomposition of all the specimens, as they all became equally soon foul and decomposed. It cannot be said that the copaivabalsam had no effect, because it did not mix with the urine, for the urine from its colour did evidently take up some copaivabalsam., though the quantity so taken up was very small, as the greater part of the copaivabalsam floated on the top. The quantity of urine, in each specimen here taken amounted to only 45 cubic

centimetres. The copaivabalsam pure and simple has therefore no preservable effect on urine.

Rabbits urine.

Here the action of the copaivabalsam, when given internally was evident. No.1. got gradually from bad to worse, although it was very strongly acid when prepared. In contradistinction to this, we have the urine specimen No.2. taken from the rabbits, that got copaivabalsam., which (No 2) though it was moderately alkaline when put up and got opaque within the first three days, nevertheless kept in a good state as long as it was kept, and it was kept a few days longer than No. 1.

Human urine specimens.

On looking over these specimens, 67 in all, it strikes one at once as to how much better many of the specimens prepared the day after which the Copaivabalsam was taken, kept, than those put up on the same day. This was the more remarkable, as often though the diarrhoea I had the greater part of the drug must have been removed from my alimentary canal, and therefore could not be absorbed into the blood, and eliminated by the kidneys. Only some of the specimens, calling for special attention will be noted here. I will compare those specimens with each other, which were put up within a couple of hours of each other, or those prepared the same forenoon, or the same afternoon, as by so doing the specimens are viewed under very much the same conditions and the same influences.

To show with more force the antiseptic action of copaivabalsam on human urine, let us take a glance first at the following specimens: thus comparing No. 2. & No. 3. with No. 1.; No. 10. with No. 9.; No. 24. with No. 26.; No. 47. with No. 48.; No 52. with No. 51 I find that my urine decomposed far sooner than that of my colleague; and that these specimens enumerated here were prepared rather soon or very late after the copaivabalsam was taken so that probably either the products of the copaiva-balsam were not eliminated as yet, or were already all eliminated.

Next let us look at another set of specimens. Thus comparing No. 4. with No. 1.; No. 5 with No. 6.; No. 12 & No. 13. with No. 14.; No. 22 with No. 23.; No. 27. with No 26.; No. 32. with No. 33.; No. 35. with No. 36.; No. 42. & No. 43. with No. 41.; No. 53. with No. 54.; No. 55 & No. 57 with No. 56.; No 63 with No. 64.. I find that all these specimens decomposed about equally soon: whether they were my own or those of my colleague or those taken from the servant of the laboratory, and when these specimens of mine were prepared, the probability is, that, some of the products of the copaivabalsam were already in the process of elimination. This probability, according to Prof Bernatzik's experiments becomes a certainty.

Comparing the following specimens with each other: No. 7. with No. 5; No. 8. and No. 11. with No. 9., No. 16. and No. 17 with No. 15.; No. 18, No. 20 and No 21 with No. 19., No 25 with No. 26, No. 30. & No. 31 with No. 29., No. 34. with No. 33., No. 37. with No. 36., No. 40. with No. 41., No. 44. & No. 46 with No 45, No 49 with No. 48., No. 50. with No. 51., No. 58, No. 59. & No. 61 with No 56, No. 63. with No. 64., No. 65. with No. 66. I found that my own specimens had become a few days, after the specimens of my colleague had turned foul, moderately alkaline, having

a sort of doubtful smell, and in some cases ~~as in some cases~~ a minute film, while in others neither film nor the slightest or the minutest streaks were to be seen. These specimens cannot be well explained why they ~~change~~ should change thus far and no further. There is no doubt however that these specimens of urine were in every respect far better, than those taken from my colleague, and other specimens of urine of myself taken too soon or too late after the copaivabalsam had been administered.; that moreover they kept better, and could be kept in the laboratory for a much longer time, than those specimens of my colleague, without my finding the slightest increase in decomposition. As these specimens did not withstand the decomposition so well, as other specimens presently to be mentioned did, it becomes a question whether I was the proper person for experimenting on, as moreover I often suffered from an indefinite fever during the time I devoted myself to this subject.

The numbers 28, 31, 62, 867 are most satisfactory to look at, as they remained acid ~~clear~~ transparent and without odor for a long time. About the last two numbers it was a regret that the laboratory was to be closed, else they might have been observed for some time longer, as three days after their respective number of normal urine had become quite foul, they still showed no change. In these specimens if it were not the action of the copaivabalsam or its products on the urine it is difficult to account for the long preservation, in a fresh state of these specimens. It is therfore clear that the copaivabalsam products excreted by the urine retards the decomposition and act as a weak antiseptic to the human urine.

With these specimens before and comparing those numbers of mine mentioned first, with those mentioned later on, there is also a very marked difference, in the rate of decomposition which speaks in favour of the copaivabalsam products, acting as a weak antiseptic. Another reason probably of the not altogether satisfactorily results, which I had expected, after the experiments made on dog's urine lie no doubt in this, that I did not continue to take copaivabalsam, and the quantity I took was too small to do justice as an antiseptic to the quantity of urine excreted during 36 hours. after the copaivabalsam was taken, recollecting moreover that according to Bernatzik part of it is removed by the lungs, and part probably by the skin, and in my case by the stools through the diarrhoea I had at different times after taking the Copaivabalsam. In the 4th-13th experiments I was obliged to cut short the experiment, as I felt myself totally unfit for anything in the afternoon. I may draw this the following conclusion from my experiments on human urine: that in my case the specimens of urine prepared very soon or very late after the copaivabalsam was taken, decomposed far sooner than those specimens taken from my colleague, that other specimens of my urene taken when in all probability some of the copaivabalsam products were already eliminated took the same length of time, as those of my colleague to become foul; that another set of specimens of my urine passed when more copaivabalsam products were eliminated kept a few days longer than those of my colleague before they became foul; and lastly there were some specimens amongst my urine passed when probably most copaivabalsam products were eliminated in which no changes at all were observed until some days

had elapsed after the specimens of urine taken from my colleague were decomposed. Nevertheless from the specimens of human urine alone I claim only a weak antiseptic action for the copaivabalsam products.

Specimens of dogs urine.

Glancing over the specimens of dog's urine (I had 8 specimens of urine taken from the dog which was given the copaivabalsam compared with an equal number of specimens of urine of dogs not so or otherwise experimented upon in any way, and also kept on similar food), there cannot be the slightest doubt, that the products of copaivabalsam acted antiseptically, and prevented the setting in of decomposition, keeping the urine of the dog which was given the copaivabalsam, twice thrice, four & five times as long in a fresh state, and without any change, as the urine taken from other dogs could and did remain before it was foul. The only specimen that failed to show this was No. 12. and it may be that the dog had that morning an unusual severe diarrhoea. Customarily it was for the dog to have severe diarrhoea each night so that I did not think it necessary after the first couple of weeks to note down the occurrence of this symptom. The good effect in the dog's urine will be due in a great deal to this that the dog was given each day (Sundays excepted), 2 grams of copaivabalsam, and that his blood thus got saturated with the drug. It is plain from these specimens, that copaivabalsam does act as an anti-septic, or better said that the form in which copaivabalsam is excreted by the kidneys acts as an antiseptic. Although antiseptic action cannot be claimed for the copaivabalsam or its products as decomposition is not postponed indefinitely

though the antiseptic action was very well manifested.
P. in the specimens of dog's urine. The action of copaiva balsam
in gonorrhoea is thus easily understood, when it acts
antiseptically, for it will thus prevent the urine becoming
foul, and render the products of gonorrhoea urine innocuous.
and dispense with the different theories of authors on this
subject.

The question now arises; in what form does copaiva balsam, or what products of the drug act antiseptically? For the investigation of this question, the dog was given the copaiva balsam, day after day and the urine collected. Following the process of (29) Prof Schmiedeberg and Dr Meyer, and (36) Wiedemann for the detection of the changes the camphor undergoes in the body, the urine was taken, and basic acetate of lead and Ammonia were added alternately as long as any precipitate resulted. It was then filtered and the precipitate carefully and well washed out with distilled water. The precipitate was next taken into a vessel and diluted sulphuric acid then added, until the solution became strongly acid, but still left some lead unprecipitated by the sulphuric acid. The precipitate was next filtered off, and washed out with distilled water, and the resulting filtrate was then taken and sulphuretted hydrogen allowed to pass through when the remaining lead present in the filtrate was precipitated down. When this was finished air was blown through the fluid to remove any excess of sulphuretted hydrogen, and the solution was then filtered. This having been done the filtrate is then evaporated on a water bath. This whole process is repeated once more to get the

substance purer, and the last filtrate is evaporated to a syrup, when a black tarry mass separated, evidently, from its balsamic odor, a product of copaivabalsam. If the syrup, when not too far down evaporated, be taken, poured into into a test tube, hydrochloric acid added and then boiled, the solution turns brown and black. Another portion placed in a testtube and treated with Cupric oxide and caustic potash produces a green solution. This on being slightly heated turns immediately yellow, and afterwards brown and black. but no red oxyd of Copper is precipitated. This proves the presence of ~~copaiva~~ Copaiva-glycoronic acid (the so called "gepaarte Copaivo-glykuronic" acid of the Germans). The amount however was too little for extended examination.

The filtrate, resulting from the filtering off of the Sulphide of lead is concentrated to some extent and hydrate of Barium added, and then heated to drive off the Ammonia present, and again filtered to get rid of the excess of Barium hydrate present; the filtrate resulting from this process is then subjected to the passage of pure Carbonic acid to ~~get rid of~~ precipitate the excess of Barium as Carbonate of Barium and then filtered; if the filtrate resulting from this second procedure be evaporated on a water-bath crystals of a Barium salt are produced. These crystals were too few to work upon, and on adding Hydrochloric acid to them, a precipitate resulted which was only partially soluble in aether, and the aether extract of the precipitate poured off and evaporated gave a resin as residue, probably Copaivic acid.

If the filtrate resulting from the removal of the Sulphide of

lead be evaporated to a syrup, and to a portion of the syrup be added Chloride of Barium no change is noticeable, but if in addition some Hydrochloric acid be added, and the solution heated, Sulphate of Barium is soon formed, and an aromatic odour is noticeable. The same was found with the Barium salt already alluded to, that when Hydrochloric acid be added a precipitate results which is partly soluble in aether, the insoluble part being Sulphate of Barium, corresponded to it, the soluble part was no doubt a resin. By heating the same syrup with acetic acid no change took place. These tests would according to (3) Baumann prove that there is "paired sulphuric acid (Gepaarte Schwefelsäure" of the Germans) present in the syrup, and that the amount present in the syrup was great. Normally "paired sulphuric acid" is present in the urine, but here it is increased. It must therefore also be considered that Copaivabalsam increases the quantity of paired sulphuric acid.

Paired Glycuronic acid, which may be called Copaivaglycuronic acid (corresponding to the Campho-glycuronic acid of Prof. Schmiedeberg), and paired Sulphuric acid are thus found present in large quantities in the urine when Copaivabalsam be given to a dog, and these are probably the products of Copaivabalsam that act antiseptically on the urine.

Already reference has been made to a black tarry mass separating on evaporating down the filtrate on a waterbath. This tarry mass must be considered a product of decomposition

of the original ~~pas~~ past, is only seen when the filtrate be far evaporated when it becomes syrupy or tarry. It is soluble in alkalies. From this tarry mass or syrup an aetherextract was made, and the aether then poured off, and this repeated several times. The aether extract was next well shaken up with Sodium Carbonate, and the aether poured off. The aether was then well washed with water and distilled off. The watery solution was next mixed with some more distilled water, and several times filtered through charcoal. An extract with aether from this purified filtrate was then made, and the aether poured off, this being repeated several times. The resulting aetherextract was then slowly evaporated, when long needlelike crystals of an irregular form and size, and quite colourless made their appearance. They are soluble in both water and aether. The crystals resemble the Camphor oil crystals found by Prof. Schmiedeberg in ~~urine of~~ dogs to whom camphor was given; and moreover are obtained by a similar process. These crystals are no doubt crystals of Copaiva oil, corresponding to the Camphor oil.

There are thus two products of decomposition of the paired Glycuronic acid (Copaivo-glycuronic) and paired Sulphuric acid found in the syrup, viz: the Copaiva oil corresponding to the Camphor oil, and the black tarry mass soluble in alkalies probably Copaivic acid.

The Copaivabalsam, not being excreted either as Copaivabalsam, or Copaiva oil or Copaivic acid by the urine

must act in some other form, and it follows therefore that the Copaivabals-am. must act antiseptically through its products: paired Glycuronic acid and paired Sulphuric acid. These products I found greatly increased in the urine, by giving the dogs Copaiva balsam. The dog was always fed on horseflesh, so that from the food no such increase could have come. The oil and the blacktarry mass, were only found as endproducts, when the filtrate was evaporated very far.

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