needle-shaped crystals and has a melting point of 182°C. It is easily soluble in alcohol, is slightly soluble in cold water but more so in hot water. A 2.0 per cent. solution in chloroform is optically inactive. Vasicine hydrochloride occurs in light cream-coloured crystals and has a melting point of 180°C.; it is very soluble in water. Vasicine tartarate is also prepared and is a soluble salt. The molecular weight of vasicine was determined and found to be 188 which agrees with the empirical formula of C_{11} H_{12} N_2O found by analysis.

Pharmacology of Vasicine.

The alkaloid vasicine and its salts are not very toxic to undifferentiated protoplasm. It has little or no effect on the free living protozoa such as *Paramæcium caudatum* nor has it any toxic or inhibitory effect on the cultures and growth of streptococci, staphylococci, *B. coli. B. diphtheriæ* or *B. tuberculosis*. It is possible that the antiseptic properties of the leaves recorded by previous observers may be due to the volatile principle. Solutions of concentrations of 1 to 5 per cent. are not irritant to the mucous membrane. The alkaloid has a bitter taste but has no marked effect on the movements of the alimentary canal. In high concentrations (1 in 20,000) the peristaltic movements of the isolated gut are inhibited, probably owing to depression of the vagal endings. Intravenous injections in animals produce a slight fall of blood pressure due partly to direct depressing effect on the cardiac muscle and partly to depression of the terminations of the vagi in the heart. There is no effect on the blood vessels.

In lungs of experimental animals the alkaloid, when given intravenously, produces a slight but a persistent broncho-dilation. This action is in all probability due to depression of the vagal terminals in the bronchi as it is absent after small doses of pilocarpine. After administration of atropine the broncho-dilator effect is very much pronounced. The drug has a well marked expectorant action and it is probable that the essential oil plays an important part in this direction.

Therapeutic Uses of *Adhatoda Vasica*.

We have tried clinically an alcoholic extract made from fresh and dry adhatoda leaves during the last three years. Previously a tincture made from the leaves was given an extensive trial in various civil hospitals and dispensaries in different parts of India at the instance of the Indigenous Drugs' Committee. Most of the evidence produced showed, and our own conclusions are in accord with it, that the drug has a well marked expectorant action. In acute bronchitis we found that it always afforded relief, specially where the sputum is thick and tenacious, acting in very much the same way as ipecacuanha. In chronic bronchitis the cough is relieved, the sputum is liquefied so that it is brought up more easily. The depression of the vagal terminations further relieves irritation and spasm of the bronchioles. We have also tried the extract in a number of cases of bronchial asthma but relief given by it was not very marked. As our animal experiments have shown the synergistic action of atropine and vasicine we are now trying a combination of the extract with belladonna preparations in cases of vagotonic origin and the results will be published in due course.

As regards the effect of the drug in tuberculosis of the lungs our conclusions are also in accord with those of the Indigenous Drugs' Committee. The drug is absolutely useless in curing or preventing the progress of this disease in experimental animals or human beings. There is no doubt, however, that it relieves the irritable cough by its soothing action on the nerves and by liquefying the sputum which makes expectoration easier.

Conclusions.

(1) Chemical analysis of *Adhatoda vasica* shows the presence of two active principles:—

(*a*) An alkaloid vasicine whose empirical formula we have found to be C_{11} H_{12} N_2O = molecular weight 188.

(*b*) Traces of a volatile principle of the nature of an essential oil.

(2) Vasicine has no marked action on the alimentary canal or on the circulation. It produces slight but persistent broncho-dilation in experimental animals and this effect is considerably increased after administration of atropine.

(3) Clinically a fluid extract prepared from the leaves has well marked expectorant properties and relieves bronchial spasm. It has no effect whatever in pulmonary tuberculosis.

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MERCUROCHROME 220 IN THE TREATMENT OF MALARIA.

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Since the introduction of mercurochrome 220 as a urinary antiseptic, it has been propelled by its enthusiasts along the path which is traversed by many of the new drugs, until it would seem that a veritable panacea is now available for suffering humanity.

Malaria has been included in the inventory of diseases which are amenable to treatment by this dye, which is a fluorescent compound of mercury—the di-sodium salt of 2.7-dibromo-4-hydroxymercurifluorescein—and reports of the

action of mercury and of fluorescent substances in the treatment of malaria would indicate that it should not be without action as a plasmodicide.

Thus Barlow (1916) has described beneficial results from the exhibition of mercuric chloride in malaria. Greig and Ritchie (1917) showed that a combination of mercuric chloride and quinine was more effective than quinine alone in reducing the size of malarial spleens, though they were less sanguine than Barlow of the therapeutic value of mercury. Cremonese (1918) claimed that mercury is a powerful curative agent for malaria. Attempts have been made to increase the effect of quinine on the parasites by the injection of fluorescent substances such as fluorescein or eosin and Rusznyak (1920) found that such substances increased the value of quinine both in vitro and in vivo.

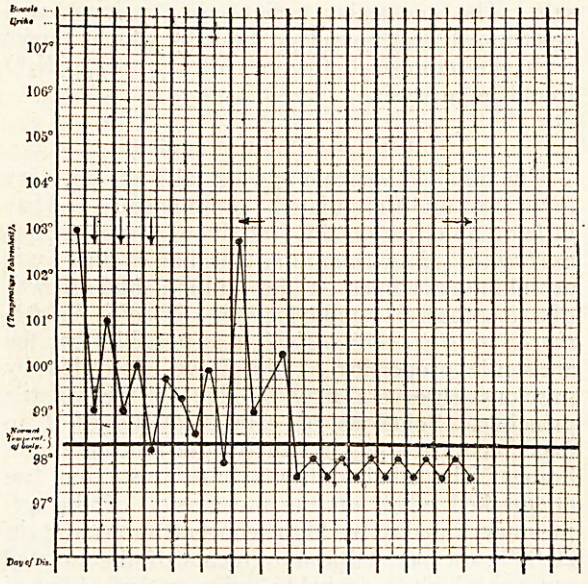
In view of the possibilities of mercurochrome we decided to test its value as a curative agent in malaria and thanks to the courtesy of Dr. E. A. O. Travers, we were enabled to select a benign tertian and a malignant tertian case. The drug was made up to a strength of 0.5 per cent. and a daily intravenous dose of 20 c.c. was given.

Case I.—Double benign tertian infection. The patient was a Tamil, 20 years of age, and weighed 95 lbs. He had had an attack of malaria three months previously and his spleen was enlarged to the costal margin. The temperature on admission to hospital (March 2nd) was 103.1°F.; he was given a purgative and aspirin grs. x. The following morning a double benign tertian infection was diagnosed from blood films, and mercurochrome was administered on the 3rd, 4th and 5th of March. Aspirin was also exhibited to control the temperature. On the 6th of March mercurochrome was discontinued as a stomatitis developed which required energetic treatment. The following day aspirin was withdrawn and quinine grs. xxx daily prescribed, but the patient refused to swallow it. On the 8th of March the temperature rose to 102.9°F., there was a rigor, after which the patient took the quinine, and the temperature rapidly fell to normal. On the 16th of March he was discharged at his own request.

Daily blood examinations were carried out on the patient and the percentage of infected corpuscles showed little, if any, diminution from the 3rd until the 9th of March. The *P. vivax* cycle continued in a normal manner and the mercurochrome had no influence on the staining properties of the parasites. The exhibition of quinine was followed by a speedy disappearance of the parasites. From the blood examinations we concluded that the partial control of the temperature was due to the aspirin rather than to the mercurochrome.

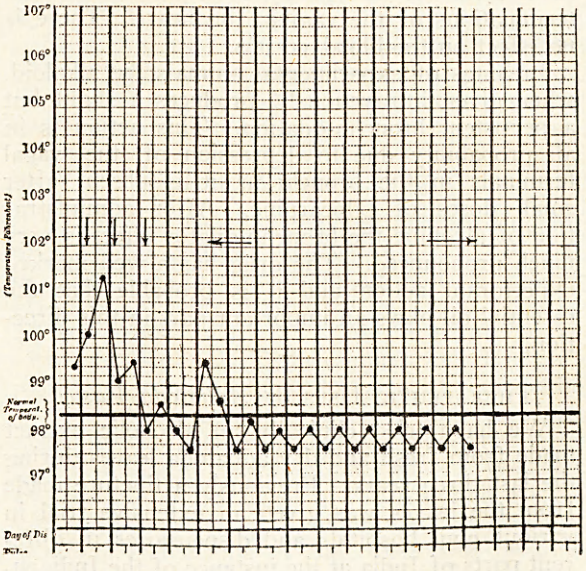
Case II.—Malignant tertian infection. This case was of Chinese (Hokian) nationality, who had had occasional attacks of fever since his arrival in Malaya 15 years before, but his spleen was not enlarged. His age was 45 years and he weighed 140 lbs. He was also admitted to hospital on the 2nd of March and his temperature was then 99.4°F. He was given a purgative and the following morning malignant tertian rings were found. On the 3rd, 4th and 5th of March intravenous mercurochrome was given

Chart I.



Case 1.—Double benign tertian infection treated with mercurochrome,

Chart II.



Case 2.—Malignant tertian infection treated with mercurochrome.

and on the 6th of March injections were discontinued on account of stomatitis. The temperature was normal on the 5th and 6th, but rose again on the 7th. Quinine grs. xxx was then exhibited daily until the 17th, when he asked for his discharge.

Blood examinations showed the presence of parasites until the day following the prescription of quinine though the percentage of infected cells in the peripheral blood fell somewhat from the 3rd to the 6th.

This patient was given no aspirin, but it is doubtful if the fall in temperature can be ascribed to the mercurochrome. We have seen a number of malignant tertian cases which after admission to hospital lose their fever and parasites decrease, sometimes even disappear from the peripheral blood, even if specific treatment is withheld. This we regard as evidence of partial immunity which, aided by rest in bed and good feeding, is able to deal with the infection sufficiently to cause such a reduction in the number of parasites that all symptoms are lost.

Conclusions.

In the above case of benign tertian malaria, a total of 0.3 grammes of mercurochrome was given over three days. On the withdrawal of aspirin and three days after the last mercurochrome injection a typical rigor occurred with a temperature of 102.9°F. The malignant tertian case received a similar quantity of mercurochrome and fever recurred two days after the last injection. The dye appeared to have little effect on the number of malaria parasites in the peripheral blood and caused no modification in their staining properties.

In neither case did albuminuria develop.

We consider that the action of mercurochrome on malaria parasites is practically negligible, and that, in view of the unpleasant sequelæ which result from its exhibition, it should not be given in cases of malarial fevers.

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CATARACT EXTRACTION.

Notes on 17,000 *Operations.*

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Bamdah is a Santal village in the district of Monghyr in the Province of Bihar. The Mission Hospital is one of three that are maintained by the Santal Mission of the United Free Church of Scotland Santal Mission. As the work of this Mission lies mainly among the Santals, an aboriginal tribe living in small villages in the more remote parts of the country, the stations are located, not in populous centres, but in the "jungle". Bamdah with a population of about four hundred people is larger than most of the villages in the neighbourhood, but it is about the average size of the Indian village. It must not be supposed that cataract is a very common disease in this part of the country. Of the 17,000 operations to which these notes refer, only two were performed on people living in Bamdah. Blind people and other eye cases travel very long distances to hospital, often begging their way, and the railway authorities often give them free passes. (There is a railway station, Simultala, on the East Indian Railway, about fifteen miles from Bamdah.) The fact that the hospital is situated on a popular pilgrim route by which every year hundreds of thousands of Hindus travel from North India to Baidyanath, twenty miles from Bamdah, and thence to Jagannath or Puri, has no doubt helped to make it known and made patients disposed to come to it. It is a very common occurrence for a patient to come to the Christian hospital to have his sight restored and then to travel on to a Hindu shrine to offer thanksgiving. The total here recorded is the accumulation of thirty-four years' work, and has been of slow growth. Beginning work in 1890, I carried on for four years without a hospital, operating on my writing table and finding accommodation for the patients in odd corners. For nine years longer the verandah of the hospital served as an operating room, but a proper operation room was built in 1903. In the first year, after the opening of the hospital, the number of cataract operations was 34. The numbers increased till they reached 1,440 in 1921, and that average was maintained for the two following years, 1924 promised to be the record year; 900 cataracts were extracted in the first two months, but I left for furlough in March. It may be noted here that there are seasons for cataract operations (and for other operations for chronic conditions not demanding immediate relief) in India. At least 90 per cent. of the people are cultivators of the soil and they choose a time for operation when there is not much work to be done in the fields. The favourite season, in North India at least, is the interval between the harvest and the sowing, from January to June. Then parties of patients often come from one village or locality, personally conducted by a former patient, who shows his gratitude by bringing more grist to the mill and claims a share in the religious merit which is supposed to be the supreme object of our work. Thus it happens that in the busy season as many as fifty or more operations may have to be performed in a day. It should be explained that the hospital is a general one; although the great majority of the operations are on the eye a fair amount of general surgery and a large medical practice have also to be undertaken. In 1923 the total number of operations was 3,400, of which 2,890 were eye operations. Of these 1,426 were for cataract. Next to the cataracts the most numerous operations were 526 iridectomies (for corneal opacities and glaucoma); 382 expressions for trachoma; 194 entropions; and 149 tattooings for leucomata. (When both eyes were operated on, that was