will, I maintain, be fostered by a pre-natal quininization of the patient.

It has been shown previously that subinvolution (or non-involution) is almost an invariable symptom of puerperal fever, and that quinine injections will frequently correct this failure of involution and cure the infection. How much more effective should be a preliminary quininization, which will at least tend to prevent such failure of involution!

There are two other points of great importance bearing upon this subject which have only come to light in this current year. First, it has been shown by Burt-White and Armstrong⁸ that streptococci present in the cervix and vagina at full term (and this is not infrequent) increase rapidly in the uterus up to the third or fifth day after labour, and then diminish. This may possibly be correlated to the other fact, pointed out by Miller and Whitaker,⁹ that the bactericidal power of the blood, after steadily rising during pregnancy, undergoes a rapid fall at or near the time of labour. These two points have prompted me to suggest that the quinine routine should be extended to the end of the first week after labour.

And now, for a moment, let us be thoroughly pessimistic. Let us imagine: (1) poor uterine retraction; (2) blood clot in the uterus (an ideal culture medium); (3) the presence of streptococci—rapidly increasing in the first few days after labour; and (4) a sudden fall in the bactericidal power of the blood. Surely the stage is completely set for puerperal septicaemia! And this after normal labour with no interference!

"Poor uterine retraction" can almost certainly be prevented by quininization, and it is almost equally certain that blood clot will not be present in the uterus. It would be interesting to investigate whether the sudden fall in the bactericidal power of the blood could be delayed or prevented by quinine administration. It does not seem impossible. Now it may be that a mixture of enthusiasm and optimism have led me to exaggerate the possibilities of this method, but personally I do feel most grateful to Dr. Jones for introducing the method to me. In any case the routine is so simple, and so obviously harmless, that any who may be interested can have no possible argument for not trying it out for themselves.

REFERENCES.

- ¹ Mapleston: *Med. Journ. of Australia*, March 19th, 1927, p. 420.
- ² Kessler: Die Leistungsfähigkeit der expectativen chinin-therapie bei septischen Aborten. *Zentralbl. f. Gynäk.*, 1926, 1, 3003-3009.
- ³ Conitzer: Erfahrungen aus der Praxis über Chinin als Wehenmittel. *Arch. f. Gynäk.*, 1907, lxxx, 11, 349.
- ⁴ Haig Ferguson: *Practitioner's Encyclopaedia of Midwifery and Diseases of Women*, 1921, pp. 70 and 76.
- ⁵ Gordon Luker: *Journ. Obstet. and Gynaecol., Brit. Empire*, Winter Number, 1923.
- ⁶ Green-Armistage: *Tropical Midwifery*.
- ⁷ Hewetson: *British Medical Journal*, January 28th, 1928, p. 157.
- ⁸ Burt-White and Armstrong: The Problem of Puerperal Sepsis: the Bacteriology of the Puerperium. *British Medical Journal*, March 30th, 1929, p. 592.
- ⁹ Miller and Whitaker: The Bactericidal Power of the Blood during Pregnancy and the Puerperium. *British Medical Journal*, July 20th, 1929, p. 85.

THE SODIUM SALICYLATE LIVER TEST.

BY

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FOLLOWING the work of Roch and Schiff in 1921, and H. Thiers in 1927 (see *British Medical Journal*, 1928, vol. i, p. 231), it was decided to test the value of the peroral administration of sodium salicylate and its subsequent recovery from the urine in cases of (1) clinically definite liver disease; (2) normal men; (3) clinically suspected liver disease; and to control the results with the levulose tolerance test of Spence and Brett. It is claimed by the authors of the test that sodium salicylate in doses of 0.04 gram can be swallowed by a healthy man and no trace of salicylic acid or sodium salicylate be detected in the urine afterwards, owing to the destruction of the drug by the liver; but in the case of a subject of liver disease quantities of unchanged salicylates would appear in the urine.

The test as described had an attractive simplicity. The subject ingested 0.04 gram of sodium salicylate dissolved

in water at 8 a.m.; all urine passed was then collected until 1 p.m. and tested for the presence of salicylates with acidified ferric chloride (as in the authors' method). Twelve patients were examined, strictly following the authors' instructions. Two had very great enlargement of their livers, due in one case to a severe liver abscess, and in the other case to advanced obstructive jaundice. The remainder were normal men. In no case were salicylates detected in the urine.

It was decided to examine the technique of the authors in detail, with the object of discovering any possible flaws in the method as published. With this end in view solutions of known concentration of sodium salicylate were made in distilled water and in normal and pathological urines, and acidified to varying degrees with a number of different acids, with the result that HCl and H₂SO₄ were found to give the best colour (at an optimum reaction of pH 3 to pH 2 judged by freshly made Congo red and methyl orange paper) on extraction with ether and addition of the reagent. Cooling the treated urine and ether on ice, before use and during separation, materially improved the colour. The optimum strength of the reagent was next the subject of experiment, and it was finally decided to use the following mixture: liquor ferri perchlor. fort. 1 c.cm., concentrated hydrochloric acid 1 c.cm., and distilled water to 500 c.cm. The reaction was made quantitative, a standard depth of colour called "K" being chosen; this was produced by mixing sodium salicylate and the reagent in the relative proportions of 1 gram of the sodium salt to 1,000 c.cm. of the reagent (or 0.001 gram sodium salicylate to 1 c.cm. reagent). It was found that the most accurate results were obtained by keeping the volume of reagent and sodium salicylate as low as possible. A 2 c.cm. quantity of the reagent was used as routine, since it contained enough ferric chloride to produce the full colour from 0.0025 gram sodium salicylate, and experience had shown that it was unlikely that amounts larger than this would be found in 20 c.cm. of the urine. Also 2 c.cm. of the reagent gave a little bulk with which to wash the ether and to retain the extractives after evaporation of the ether. A graph was constructed showing the variation in "K" with dilution; by this curve the quantity of sodium salicylate in any dilution of the reagent could be found in terms of "Ks."

Having thus improved the method of estimation, it was now necessary to discover the optimum amount of ether required for extracting the maximum amount of salicylate that was likely to be found in 20 c.cm. of urine. A number of experiments showed that maximum amounts of salicylate were extracted by 15 c.cm. of ether used in three washings of 5 c.cm.; this quantity of ether was then adopted as the routine. The following procedure was employed.

Treatment of Patient.

The patient fasted from 10 o'clock the previous night. At 6 a.m. the bladder was emptied and the urine collected in marked measuring cylinders. The patient then swallowed 0.04 gram of sodium salicylate in 8 oz. of water. He was given 8 oz. of water to drink every hour from 7 a.m. The urine passed at 6 a.m., 8 a.m., 10 a.m., 12 noon, 2 p.m., and 4 p.m. was collected in separate measuring cylinders, and the volumes noted. The amount of salicylate was then estimated in an aliquot portion of each specimen, using the 6 a.m. specimen to make the standard solution.

The steps in this investigation were as follows. A sample of urine measuring 25 c.cm. was taken, chilled on ice, and filtered through paper; exactly 20 c.cm. was then measured out and rendered acid to Congo red paper (blue colour) with hydrochloric acid. It was then poured into a separating funnel, and extracted with 15 c.cm. of ether in three quantities (keeping on ice). After separating the urine from the ether emulsion the emulsion was broken up with absolute ethyl alcohol and the lower portion was discarded, the ether remaining being measured. Then 2 c.cm. of the reagent was added; the mixture was well shaken and allowed to stand at room temperature until the ether had evaporated. The eventual colour was compared with the standard "K" in a colorimeter, and the result expressed as a decimal of "K." The quantity of sodium salicylate was then calculated from the graph.

The preparation of the standard was as follows. Of the 6 a.m. urine (previously tested, as in estimation for presence of salicylate) 20 c.cm. was cooled and filtered; 0.006 gram sodium salicylate was added, the urine extracted as in estimation, and the final result used as the standard. (Sometimes as many as five standards were made from one urine.)

Eleven patients were examined by the improved method, and the following results were obtained.

1. *Case B.*—A patient with catarrhal jaundice of more than two months' duration was examined three times by the salicylate method and twice by the levulose tolerance test. He had a most obvious lesion of his liver, and when first examined by the levulose test showed a very marked divergence from the normal. Some weeks later, at a time when he showed obvious clinical improvement, his levulose reaction was nearly normal. His response to the salicylate test was quite impossible to correlate with either his clinical course or the results of the levulose tests. When his illness was at its height he excreted most of the salicylate (8 a.m., 0.0045 gram; 10 a.m., 0.0023 gram; 12 noon, 0.0013 gram; total 0.0081 gram); when he was almost convalescent he only excreted 0.004 gram of sodium salicylate (8 a.m., 0.00225 gram; 10 a.m., 0.00103 gram; 12 noon, 0.00075 gram; 2 p.m., 0.003 gram). Midway between these two occasions he only excreted 0.002875 gram (8 a.m., 0.00125 gram; 10 a.m., 0.001 gram; 12 noon, 0.000625 gram).

These results would appear to bear out the authors' conclusion that the healthy liver led to the excretion of less salicylate in the urine than the diseased liver.

2. *Case W.4, C.2.*—A patient with a large liver abscess gave a very high curve with the levulose tolerance test, and, clinically, had a much enlarged and severely damaged liver. He reacted to the salicylate test by excreting 0.004 gram (8 a.m., 0.0023 gram; 10 a.m., 0.0015 gram; 12 noon, 0.0006 gram). Clinically and by the levulose test this man had more severe liver injury than Case B (1).

3. *Case M.F.*—A healthy male, who excreted 0.0075 gram of salicylate in response to the test—that is, he excreted nearly as much as "B," who had a severe liver disorder, and nearly twice as much as "W.4, C.2," who had a much more severe lesion than "B."

At this stage it was suspected that the salicylate test could not be called one of liver function proper, but was dependent for its results on some unknown individual idiosyncrasy.

4. *Case M.A., W.4, C.8.*—A patient with catarrhal jaundice only excreted 0.00448 gram of salicylate (8 a.m., 0.00195 gram; 10 a.m., 0.00116 gram; 12 noon, 0.00137 gram).

5. *Case P. H. S. W.*—The patient, who was admitted with bronchitis, excreted 0.003 gram of salicylate (8 a.m., 0.0009 gram; 10 a.m., 0.000246 gram, 12 noon, 0.0013 gram). Tested by the levulose test he gave a perfectly normal result.

6. *Case W.8, C.21.*—Admitted with ascariis infection; excreted 0.004475 gram (8 a.m., 0.000397 gram; 10 a.m., 0.0025 gram; 12 noon, 0.00052 gram; 2 p.m., 0.000458 gram).

7. *Case W.8, C.20.*—Convalescent after a mild attack of malaria, and responding easily to quinine; this patient excreted 0.00658 gram of salicylate (8 a.m., 0.00327 gram; 10 a.m., 0.00215 gram; 12 noon, 0.00116 gram).

8. *Case W.8, C.22.*—A patient with symptoms suspicious of liver abscess excreted 0.001152 gram of salicylate (3 a.m., 0.000708 gram; 10 a.m., 0.000228 gram; 12 noon, 0.000216 gram).

9. *Case M. M.*—A healthy control had taken 10 grains of aspirin (unknown to the experimenter) thirty-eight hours before beginning the salicylate test. The 6 a.m. urine already contained salicylate. The ingestion of 0.04 gram of sodium salicylate was followed by a most profuse diuresis, in this patient only, and the urinary salicylate excretion totalled 0.025 gram (6 a.m., 0.00224 gram; 8 a.m., 0.01870 gram; 10 a.m., 0.00225 gram; 12 noon, 0.00236 gram).

Even with the modifications instituted (for help in the improvement of which the author of this paper wishes to express his gratitude to Mr. A. Laird, B.Sc., of the Chemical Research Laboratory, Masjid-i-Suleiman) the colour on adding the reagent to the ether extract was often very poor. The preparation of a good standard was also a great difficulty; five attempts having frequently to be made.

The method of steam distillation of Thoborn and Hanzlik was suggested by Mr. J. Henderson, refinery analyst, Abadan. This gave a very good colour, but in my hands a yield of only 17.5 per cent.

The experiments were not carried any further, as it was obvious that the claims of the original authors were not borne out by the results attained.

ANAESTHESIA FOR SHORT OPERATIONS ON CHILDREN, ESPECIALLY TONSILLECTOMY.

BY

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THE choice of the anaesthetic to be used for an operation of short duration on a child always presents a serious problem, especially where it is necessary that full surgical anaesthesia shall be obtained. The operation most frequently performed on young children is that of tonsillectomy by the blunt guillotine method, and, to be successful, the anaesthetic used for this operation must comply with the following conditions, especially where time is an important factor.

1. Simplicity of administration.
2. Rapid induction.
3. Full surgical anaesthesia for not less than one minute after the mask is removed.
4. Rapid return of the cough reflex.
5. Safety.

In the majority of clinics where tonsillectomies are done in large numbers ethyl chloride is the anaesthetic most commonly used, and all those who have employed it will realize its disadvantages when given by the ordinary open or closed methods. Two years ago, after reading Gwathmey's¹ figures of the decreased toxicity of all anaesthetics, including anethol, when administered in conjunction with oxygen, I began to use closed ethyl chloride and oxygen as an anaesthetic for tonsillectomies in children; and, once a technique had been evolved and the necessary dosage discovered, I adopted this anaesthetic as a routine for all short operations on children up to 12 years of age.

Ethyl chloride and oxygen is by no means a new anaesthetic, as in 1906 Rosenthal and Berthelot² reported a series of experiments on animals in which a mixture of oxygen and ethyl chloride was used; and Lotheissen³ has described his experience of five years' use of ethyl chloride narcosis by means of the simultaneous inhalation of ethyl chloride and pure oxygen, employing a modification of the Roth-Drager apparatus.

I have found that closed ethyl chloride and oxygen narcosis possesses the following advantages over the ordinary methods of using this drug.

1. Safety. In over 300 cases anaesthetized by this method not one has developed those unpleasant symptoms of syncope which are so often met with when ethyl chloride is used without oxygen.
2. Complete muscular relaxation.
3. Increased time of full surgical anaesthesia after withdrawing the anaesthetic.
4. Freedom from post-anaesthetic complications.

Apparatus Used.

I use a Guy's inhaler with the following modifications: (1) an ordinary two-gallon gas bag with a bottom tube, which is connected to an oxygen cylinder fitted with a fine adjustment valve; (2) a slightly larger phial graduated up to 8 c.cm.

Dosage.

I have found that a considerably larger dose of ethyl chloride is necessary with oxygen than without, when it is administered by the closed method—namely:

3 to 5 years of age	...	...	4 c.cm.
5 to 8 years of age	...	...	6 c.cm.
8 to 12 years of age	...	...	8 c.cm.

These doses are varied within certain limits according to the size and physique of the patient.

Technique.

All hospital cases are given a hypodermic injection of atropine forty-five minutes before operation, but this can be omitted in cases of emergency, as there is very little mucus formation with this anaesthetic.

The necessary dose is first measured into the phial and the bag half filled with oxygen. The child is then induced to bite on a Doyen's gag, and, after allowing the ethyl chloride to run into the bag of the inhaler, the facepiece is closely applied to the patient's face. Personally I use a celluloid facepiece without a rubber pad, and cover the child's face with a sheet of gamgee tissue, which has a heart-shaped hole cut in the middle for the nose and