THE SPERMICIDAL POWERS OF CHEMICAL CONTRACEPTIVES

VI. AN IMPROVED TEST FOR SUPPOSITORIES

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CONTENTS

Experiments to find a substitute for human semen

It would be very convenient if a perfectly fresh supply of human semen were always available for testing the spermicidal powers of pure substances and suppositories. Unfortunately no such supply is available, and it is, therefore, desirable that there should be a substitute for it. Up till now we have chiefly used cavy sperms in buffered glucose-saline (B.G.S.), and one of us has shown (1932*b*) that certain substances are much more spermicidal with this than with human semen. The difference does not lie in the sperms themselves, but in the suspension fluids. Human semen provides a strong protection to the sperms against certain poisons. If cavy sperms are suspended in human semen, they react remarkably similarly to human sperms when treated with the most diverse reagents. It has been our object to invent a fluid which would give sperms the same protection that human semen gives, so that cavy sperms from the epididymis, which are always available, may be used in reliable tests of spermicidal power.

It was decided to use sodium oleate for the first experiments, because it is very sensitive to the protective action of human semen. In B.G.S. its killing concentration is 1/32 per cent.: in human semen it is $\frac{1}{2}$ per cent.

The addition of egg-white to B.G.S. in various proportions was tried, and it was found that it provided a protective action. It was only necessary to find in what proportion the egg-white should be mixed with the B.G.S. in order to give the closest approximation to the results given by human semen. The following results were obtained (Table I).

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Table I. *Test of sodium oleate in varying proportions of B.G.S. and egg-white (cavy sperms).*

Volumes of egg-white to one volume of B.G.S.	Concentration (%) of sodium oleate						
	1	1/2	1/4	1/8	1/16	1/32	1/64
0	—	—	—	—	—	0000	222+
0·2	—	—	—	—	000	3	—
2	—	—	—	0	1	—	—
3	—	—	0000	01	—	—	—
3·5	—	0000	011	—	—	—	—
4	0	1	1	2	—	—	—
Egg-white alone	00	01	13	3	—	—	—
Human semen	—	0000	001	2	3	—	—

The reader is referred to earlier papers in this series (Baker, 1931*a*, 1932*a*) for a full description of the standard test, and for the explanation of the meaning of the symbols used in Table I. Here it must suffice to say that the figures indicate the activity of the sperms after being acted upon for half an hour at the temperature of the body, 3+ representing the highest activity and 0 no activity whatever.

It will be observed from the table that the mixture which gives the closest resemblance to human semen is 1 volume of B.G.S. to 3·5 volumes of egg-white. This may be better expressed as 0·7 c.c. of B.G.S. to 2·3 c.c. of egg-white, since 3·0 c.c. of suspension fluid is used in each test. A closer approximation to 1 : 3·5 cannot be obtained without using measurements below tenths of 1 c.c., which would be both troublesome and unnecessary.

It was soon found that it made no difference to the results if 0·9 per cent. sodium chloride solution was substituted for B.G.S. in the mixture with egg-white, and this substitution was therefore made for the sake of simplicity. We call the new suspension fluid albumen-saline.

Albumen-saline

0·9% sodium chloride solution ...	0·7 c.c.
Egg-white	2·3 c.c.

To prepare the egg-white, break an egg, separate the white, remove the chalaza from it, and beat it for a minute. It is preferable (though not necessary) to leave the beaten egg-white for one or two days in a covered glass vessel before using it. Sperms are then more active in the mixture made with it, probably because it becomes thinner. Sperms are not so active in albumen-saline as in B.G.S. Albumen-saline has a higher *p*H (though lower alkaline reserve) than human semen, but this does not matter, as sperms are unaffected by a fairly wide variation of *p*H on the alkaline side.

So far it had only been shown that albumen-saline was a suitable substitute for human semen when sodium oleate was being tested. It was necessary to make a test with other substances. Six others were chosen, differing widely

in chemical composition and spermicidal power. The results are shown in Table II. Some of the figures are copied from an earlier paper (Baker, 1932*b*).

Table II. *Killing concentrations, per cent.*

	Cavy sperms in B.G.S.	Cavy sperms in albumen-saline	Human sperms in human semen
Toluquinone	1/512	1/256	1/512
Hexylresorcinol	1/64	1/64	1/64
Orthovanillin	1/64	1/8	1/8
Sodium oleate	1/32	1/2	1/2
Chinosol	1/4	1/2	1/2
Potassium borotartrate	1/4	2	2
Borax	Fails at 2	Fails at 2	Fails at 2

The close resemblance between the last two columns is most remarkable, and the actual resemblance is more remarkable than the table shows, for toluquinone killed all sperms in three out of four experiments at 1/512 per cent. with cavy sperms in albumen-saline. In the fourth experiment there was the slightest possible activity (1). If there had been no activity, there would have been identity between the last two columns.

Albumen-saline will be substituted for B.G.S. in future tests of pure substances. No other change in the standard test for pure substances seems advisable. It has been suggested more than once that the time during which the substances are allowed to act on the sperms should be reduced from half an hour, but there is a good reason why it should not. Even allowing half an hour, there are many substances which cannot be fully tested by the standard test, because they do not kill in half an hour at half-saturation (which is the highest concentration that is possible, since a given volume of the solution to be tested is mixed with the same volume of sperm suspension). Now if the time were reduced to five minutes, many more substances would be excluded. This would be most unfortunate in a test which is designed not simply to find the most spermicidal substances, but to disclose the principles underlying the killing of sperms by chemical means.

A new test for suppositories

It is obvious that albumen-saline should be substituted for B.G.S. in tests of suppositories. We decided to devise an entirely new test, embodying the use of albumen-saline and rectifying the defects of our former tests for suppositories. The test for suppositories which we have used up till now have had the defect that they have not provided a definite figure for each make, indicating its spermicidal power. One object of this new technique is to remedy this defect. In the older technique we did not prove whether the sperms were really killed or only immobilised. Acids are particularly apt to immobilise without killing. In the new technique this difficulty is overcome.

Again, some spermicides are sensitive to the *p*H of the fluid in which they act. For instance, methylhydroquinone is extremely spermicidal in alkaline

solution, but not in acid solution. Now the vagina is often acid, and may be sufficiently acid to acidify the alkaline semen. For this reason in this new technique an acid test is provided as well as the normal test. The tests are here described in great detail, because it is hoped that they may be accepted as the standard laboratory tests of the spermicidal power of suppositories. The results which they have already given correspond much better with the clinical results than those of our former tests, and it seems likely that the new test may be one on which clinical workers may rely when deciding whether to try a new chemical contraceptive. We fear that one point in the technique may arouse criticism, namely, the use of saline to represent the vaginal fluid in the normal test. However, it is impossible to represent such a complex fluid accurately. If one were to use a strong protein solution, the filtration, which is a necessary part of the experiment, would take an inconveniently long time. Saline has the great advantage of simplicity, and since there is already plenty of protein present in the albumen-saline, we doubt whether the use of saline changes the results materially. As regards the amount of vaginal fluid we still cling to 2·5 c.c., although this figure has been regarded as too great. No measurement of the amount of vaginal fluid has ever been made, though some workers have measured how much fluid they have obtained from the vagina. Such measurements leave out of account the relatively large amount that must be required to wet the whole surface area of the vagina and leave it wet after the removal of the excess. In different women and in the same woman at different times the amount of vaginal fluid varies considerably, and we must put ourselves on the safe side by choosing a reasonably high figure.

Our previous tests have been criticised on the ground that the spermicide has been allowed too long a time in which to act. Although, for the reasons stated before, we do not think that this is a just criticism of the test of pure substances, yet it is a perfectly just criticism of the previous tests of suppositories, and we have reduced the time in this new test to five minutes. In the practice of chemical contraception quick action is imperative.

In this paper we use the term "suppository" for any solid object intended to be placed within the vagina and to act by chemical means. It thus includes foaming tablets as well as types with fatty or gelatine vehicles.

The normal test

1. A thermostat is maintained at 37° C. It contains two glass capsules with covers; a bottle of 0·9 per cent. sodium chloride solution (called saline throughout the rest of this description of the normal test); a bottle of alkaline diluting fluid, consisting of equal parts of B.G.S. and 6 per cent. aqueous $Na_2HPO_4.12H_2O$; a filter with paper and receptacle; a damp chamber containing a rack holding two small specimen tubes; four cavity slides, two marked "control" and two marked "experimental"; coverslips; and pipettes (graduated and ordinary).

2. Regulate a thermostatic heater to deliver a constant stream of water at 37° C. through a hollow microscope stage.

3. Open a hen's egg. Place the white in a beaker. Remove the chalaza. Beat the white for about a minute with forceps, to break the membranes. It is preferable, but not necessary, to break the egg a day or two before the experiment, and to keep the beaten white in a covered glass vessel. (The beaten egg-white may be kept a month or more in a refrigerator maintained near freezing-point.)

4. Transfer 2·5 c.c. of warm saline with one of the graduated pipettes to one of the glass capsules in the thermostat. This represents the vaginal fluid, which is postulated to amount to 2·5 c.c. (see above). In this "normal" test an indifferent fluid is used to represent the vaginal fluid.

5. Throw one suppository into the saline in the capsule. It is legitimate to use twice or several times as much saline, and to throw a proportionate number of suppositories into it. This is sometimes necessary with foaming tablets, in order to get sufficient filtrate to use in section 17. Two suppositories are used instead of one, when it is directed that two suppositories are to be used at each coition (*e.g.* with Finil).

6. Kill an adult male cavy by a blow on the head, and damp the fur in the pelvic region to prevent hairs from getting in the way. Set it aside so that post-mortem reflexes shall not interfere with the dissection.

7. Meanwhile mix 2·3 c.c. of egg-white, prepared in section 3, with 0·7 c.c. of 0·9 per cent. sodium chloride solution in a capsule (not one of the capsules in the thermostat). In this mixture, called albumen-saline, sperms behave to the most diverse chemicals almost exactly as they do in human semen.

8. Cut out the tails of both epididymides of the cavy and place them in the albumen-saline.

9. Cut each across once with scissors. Press each fragment several times with flat-pointed forceps to cause the sperms to come out. Lift the fragments of epididymis out of the suspension and throw them away.

10. Suck the fluid into a pipette and press it out again three or four times to break up any clumps of sperms and form an even suspension.

11. Transfer 0·5 c.c. of sperm suspension to each of the two empty specimen tubes in the damp chamber in the thermostat, and leave it to warm up. These two tubes are called respectively the control tube and the experimental tube. Note the time.

12. Shake the capsule containing the suppository, holding the cover firmly in position. (With foaming suppositories it is best to use a watch-glass placed concave side up as a cover, as it is less easily displaced than a flat cover by the effervescence.)

13. If the suppository has not completely disintegrated, shake the capsule containing it from time to time until it has done so.

14. When the suppository has completely disintegrated, filter the contents of the capsule in the warm filter in the thermostat.

15. At least fifteen minutes after section 11 (*i.e.* when the sperm suspension in the control and experimental tubes has had time to warm up), transfer 0·25 c.c. of warm saline to the control tube mentioned in section 11. The saline represents vaginal fluid in the *absence* of any spermicide. 0·25 c.c. is used, with 0·5 c.c. of sperm suspension. These amounts represent, on the scale of one-tenth, the 2·5 c.c. of vaginal fluid and 5 c.c. of semen, which are postulated as being present in normal coition.

16. Suck part of the contents of the control tube into a warm pipette and press out again three times to mix the fluids. With the same pipette bubble air through the contents of the tube three times to aid the respiration of the sperms.

17. Transfer 0·25 c.c. of the filtrate obtained in section 14 (experimental vaginal fluid) to the experimental tube containing sperm suspension, mentioned in section 11. The experimental tube now contains, on the scale of one-tenth, the soluble part of one suppository to 2·5 c.c. of vaginal fluid and 5 c.c. of sperm suspension. The spermicide is now said to be present in standard (*S*) concentration.

18. Treat the contents of the experimental tube as those of the control tube were treated in section 16.

19. Note the time at once. It is convenient to have a timer which one may set at 0 minutes.

20. Three minutes later bubble air three times through the contents of the control tube with a clean pipette, and with the same pipette transfer two drops to the hollow of the cavity slide marked control.

21. Apply a warm coverslip. Two drops of fluid do not fill the hollow of the slide. A bubble of air is included below the coverslip, which prevents the sperms from becoming inactive rapidly from inability to respire.

22. Leave the slide on the floor of the thermostat.

23. Three and a half minutes after section 19, repeat sections 20, 21 and 22 with the contents of the experimental tube, transferring two drops of it to the cavity of the slide marked experimental.

24. Four minutes after section 19, determine the activity of the sperms in the control slide by examination under a 4 mm. objective on the hot stage mentioned in section 2.

25. Record the activity of the sperms on the usual principles. If the sperms show activity of 3 or 3+, proceed to section 26. If they show an activity of less than 3, it is clear that an immature or diseased cavy has been used, so discard the experiment.

26. Five minutes after section 19, determine the activity of the sperms in the experimental slide by examination as before, and record the result.

27. Dip strips of red and blue litmus paper in the experimental tube, and record whether its contents are acid or alkaline.

28. If the experimental sperms show any activity whatever (from 1 to 3+), the experiment is at an end.

29. If the experimental sperms show no activity whatever (0), one must proceed to find out whether they are really killed or only immobilised, as follows:

30. Add 2·25 c.c. of warm alkaline diluting fluid to both the control and the experimental tubes and suck the mixture in and out of the pipettes three times to mix thoroughly.

31. If the contents of the experimental tube were acid in section 27, test again now with a strip of red litmus paper. If the fluid is not alkaline, add more alkaline diluting fluid gradually with a graduated pipette, noting the amount, until the paper goes blue. Add the same amount of alkaline diluting fluid to the control tube.

32. Eight minutes after section 19, prepare a slide from the contents of the control tube, exactly as in sections 20, 21 and 22.

33. Eight and a half minutes after section 19, prepare a slide from the contents of the experimental tube in the same way.

34. Nine minutes after section 19, examine the activity of the sperms on the control slide under the microscope on the hot stage.

35. If the sperms show an activity of 2+, 3 or 3+, proceed to section 36. If they show an activity of less than 2+, discard the whole experiment.

36. Ten minutes after section 19, examine the activity of the sperms on the experimental slide.

37. Record the activity of the sperms on the experimental slide. If the sperms are all completely inactive (0), then they have been killed and not merely immobilised, for the spermicide is now at only one-quarter (or less) of the concentration present during the first five minutes. Most substances have little effect on sperms at one-quarter of the least concentration at which they immobilise them.

38. Enter the figures representing the activity of the sperms before and after dilution with a line between them, thus 0/0, or 0/1, etc. The figure before the line represents the activity before dilution.

39. If all the sperms were found in section 37 to have been killed, the experiment is repeated at half the concentration ($S/2$ concentration: see section 17). This is done by diluting part of the filtrate obtained in section 14 with the same volume of warm saline, and using this diluted fluid instead of undiluted filtrate in section 17. It is in preparation for this dilution that two capsules are provided in section 1 instead of one.

40. If all the sperms are once more found to be killed, repeat the experiment at $S/4$ concentration. This is done by diluting part of the filtrate obtained in section 14 with three times its volume of warm saline.

41. If all the sperms continue to be killed, perform the experiment at $S/8$, $S/16$, $S/32$, etc., by diluting the filtrate with seven, fifteen, thirty-one, etc., times its volume of warm saline.

42. Continue these experiments until active sperms are found in the experimental slide in section 37.

43. The lowest concentration, in the series S, $S/2$, $S/4$, $S/8$, etc., which suffices to kill (not merely immobilise) all sperms in three consecutive experiments is called the killing concentration.

44. Perform the experiment twice at half the killing concentration, up to section 26. The results enable one to compare suppositories whose killing concentration is the same.

The results so far obtained with this test are given in detail in Appendix I, and shortly in Table III on p. 483. "M 3" is a suppository of our own, not on the market. It is prepared by mixing 2 g. of methylhydroquinone with 98 g. of a proprietary fat called "cocola," and casting in a "15 grain" mould. Each suppository weighs approximately 1 g. The manufacturers of Finil direct that two tablets should be used at each coition, and therefore we have used two tablets instead of one in each test.

Moulds grow rather quickly in the alkaline diluting fluid, which should therefore be filtered occasionally.

The acid test

Since the vaginal contents may be sufficiently acid to acidify the alkaline semen, a spermicide would not be reliable unless it were effective both in alkaline and acid media. The normal test is in an alkaline fluid. In the acid test the vaginal fluid is represented by a fluid called lactic-saline, which is

sufficiently acid to acidify the albumen-saline sperm suspension, but not sufficiently acid to immobilise all the sperms.

Commercial lactic acid of specific gravity 1·21 contains not only lactic acid but also water and (neutral) lactide. On dilution part of the lactide is converted into lactic acid, and we find that after even a month at 37° C. the diluted solution is still getting more strongly acid. Now it is very important to have an exact amount of lactic acid present in our experiments, for if there is too much acid, the sperms will be immobilised, while if there is too little the experiment will be performed in alkaline instead of acid solution, owing to the alkalinity of the albumen-saline in which the sperms are suspended. Mr C. E. J. Crawford suggested that we should boil the diluted lactic acid to bring it quickly to a constant acidity. We find that 24 hours' boiling with reflux condenser are necessary to produce a stable solution. The boiled solution may be kept indefinitely in the thermostat at 37° C. or at room temperature without further change of acidity.

The artificial vaginal fluid for the acid test is called lactic-saline B. (A similar fluid, lactic-saline A, is used in the acid test for pure substances.) Lactic-saline B is prepared as follows. Add precisely 3 c.c. of strong lactic acid, of specific gravity 1·21, to 100 c.c. of distilled water. Add 18 c.c. of this solution to 82 c.c. of 0·9 per cent. sodium chloride solution, and boil for 24 hours with reflux condenser. Keep in a glass-stoppered bottle in the thermostat at 37° C.

Lactic-saline B has approximately the same osmotic pressure as mammalian blood, and just the right acidity to fulfil the requirements mentioned in the last paragraph but one. The acid test need only be applied when in section 27 of the normal test an alkaline reaction is given at the killing concentration. If the reaction in section 27 is acid at the killing concentration, we already know that the suppository is active in acid solution, and the acid test would be superfluous. If a suppository fails to kill at *S* concentration in the normal test, we do not consider it worth while to perform the acid test.

The acid test is performed in exactly the same way as the normal test, with the following exceptions:

In section 1, the thermostat must contain a bottle of lactic-saline B in addition to the other objects mentioned.

In sections 4, 5, 15, 39, 40 and 41 lactic-saline B is substituted for saline.

In section 25 the control sperms should show an activity of 1+, 2, or 2+. If they are 0 or 1, discard the experiment. If they are 3 or 3+, it is clear that an egg with abnormally alkaline white was used in the preparation of the albumen-saline, and the lactic acid has been neutralised.

In section 35, the experiment is counted if the control sperms are 2+, 3, or 3+. It is discarded if they are less active than 2+.

Ordinary saline, not lactic-saline, is used in section 7. This is most important.

The results of the acid test are shown in Appendix II. The value of the test is strikingly shown by the results with M 3. This is an extremely spermicidal suppository in alkaline solution, but does not kill below the standard con-

centration in the acid test. Rendell is slightly less spermicidal in acid than in alkaline solution.

It seems worth while to mention that if an artificial suspension fluid is required, with the same alkaline reserve as an average sample of the same amount of human semen, it may be prepared as follows:

Phosphate albumen

$Na_2HPO_4.12H_2O$, 6% in water ...	1·4 c.c.
Egg-white	1·6 c.c.

This is more alkaline than albumen-saline. Since different eggs differ slightly in the alkaline reserve of their white, it is a good plan to mix the white of two or three eggs.

It is important that the rate of disintegration of suppositories should be known. In general, it is best for suppositories to disintegrate rapidly; but fairly slow disintegration would not necessarily be harmful if the proper time were allowed in practice. In our former tests of the spermicidal powers of suppositories, we allowed a definite time for disintegration, after which the fluid was filtered whether disintegration was complete or not. We now think it fairer to allow disintegration to be complete before filtration, and this is done in the new test. The rate of disintegration is measured in a series of experiments quite separate from the tests of spermicidal power.

The rate of disintegration is measured in distilled water, owing to the impossibility of representing the vaginal fluid accurately in a laboratory experiment. One suppository is thrown into 50 c.c. of distilled water in a glass vessel in the thermostat maintained at 37° C. It is very important to make sure that the distilled water has reached 37° C. before the suppository is thrown in. A large volume of water is taken, because a cold suppository appreciably reduces the temperature of the water if only a small quantity is taken. The vessel is covered with a glass plate. The time taken to disintegrate completely is noted. If five minutes elapse before complete disintegration, the vessel is shaken ten times, and this is repeated every five minutes. Disintegration is watched through the closed glass door of the thermostat.

When disintegration is complete, the water is filtered. A measured part of it is titrated with decinormal acid or alkali, and the amount necessary to neutralise the soluble contents of the suppository is calculated.

The rate of disintegration and the degree of acidity or alkalinity of the suppository are tested three times, and the means calculated. The results are shown in Table III, with the killing concentrations.

It will be noticed that the results of this new, improved test are different from those obtained by the old test (Baker, 1931*b*). The much shorter time during which the spermicidal substances act is probably the main cause of the difference. The results show that it is not surprising that little confidence is felt in chemical contraceptives used alone. Rendell and Finil are the most spermicidal of those few on the market which we have tested. Rendell kills nearly

Table III

	Killing concentration		Time of disintegration (min.)	Reaction	Amount of decinormal solution required to neutralise (c.c.)
	Normal test	Acid test			
M 3	$S/32$	S	5	Neutral	0
Rendell's Wife's Friend	S	Fails at S	20	Acid	2·4
Finil (2 tablets)	S	—	1½	Acid	7·7
Vimule	Fails at S	—	10	Acid	0·2
Speton	Fails at S	—	2½	Acid	0·6
Semori	Fails at S	—	9	Acid	1·5
Prorace (chinosol)	Fails at S	—	14	Acid	0·3
Martindale's Lactic Acid Pessaries	No effect at S	—	14	Faintly acid	0

Those who are interested in the details on which the first two columns are based will find them in the Appendix.

all sperms even at $S/16$ in the normal test. Its spermicidal power is reduced by acidity, although the suppository itself is acid. Semori, which gave the highest spermicidal power of all the suppositories tried by the old test, does not retain its position. Apparently it acts too slowly. It is remarkable that the specimens of Martindale's "Lactic Acid Pessaries" which we tested not only have no spermicidal power, but also are so nearly neutral that each requires less than one-tenth of 1 c.c. of decinormal alkali to neutralise it.

We have not made tests of harmfulness to the vagina.

Our product, M 3, is enormously more spermicidal in the normal test than any of the commercial products, but its spermicidal power is greatly reduced in the acid test. It has the disadvantage of staining semen dark brown unless the semen is acidified. We are continuing to try to find a really good spermicide for practical use.

THE AMOUNT OF THE HUMAN EJACULATE

There are so few records of the amount of human ejaculates, that it was thought worth while to record the following figures, which do not include those recorded in one of the previous papers (Baker, 1931). In the series of measurements there reported upon, the mean amount of twenty-three ejaculates was found to be 6·7 c.c. Since then forty-eight more ejaculates have been measured, all from the same man as the previous twenty-three. The semen was caught in a rubber sheath and measured to the nearest tenth of 1 c.c. The decimal figure is not quite dependable, as some of the semen tends to remain in the sheath. The mean amount of each ejaculate in this second series was 5·4 c.c. The greatest amount was 8·9 c.c. and the least 2·2 c.c. The latter was ejaculated less than an hour after an ejaculate of 6·7 c.c. The amounts were distributed as follows:

	Number of ejaculates
2·0–2·9 c.c.	2
3·0–3·9 c.c.	7
4·0–4·9 c.c.	6
5·0–5·9 c.c.	17
6·0–6·9 c.c.	10
7·0–7·9 c.c.	5
8·0–8·9 c.c.	1
	48

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At a period when ejaculates were not being measured, an ejaculate was obtained which was measured on account of its obviously large volume, namely 12·4 c.c. (It is quite certain that this represents a single ejaculate, not two mixed together.) This large amount is not included in the figures given above, since it was only measured on account of its being extraordinary, and it would therefore weight the mean unfairly. It was produced after a period of 30 days during which no ejaculation occurred. Such large ejaculates must be kept in mind when one is deciding on the margin of safety required of a suppository.

Summary

1. A fluid is described in which cavy sperms react to the most diverse substances almost exactly as do human sperms in human semen. This fluid, called albumen-saline, consists of:

0·9% sodium chloride solution	...			...	0·7 c.c.
Egg-white	...	...	...	...	2·3 c.c.

2. A detailed description is given of a new technique for comparing the spermicidal powers and rate of disintegration of suppositories (including foam tablets).

3. The new test differs from the old chiefly in allowing only five minutes for the spermicide to act, and in requiring the actual killing of the sperms and not only their immobilisation.

4. Of the commercial suppositories tested, Rendell and Finil are the most spermicidal, followed by Vimule, Speton, Semori, Prorace (chinosol) and Martindale, in that order. None of them is sufficiently spermicidal to encourage complete reliance in the absence of other contraceptive methods.

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APPENDIX I

The normal test of suppositories

	S	*S*/2	*S*/4	*S*/8	*S*/16	*S*/32	*S*/64	*S*/128	*S*/256
M 3	—	—	—	—	—	0/0, 0/0, 0/0	0/0, 1	1, 2	3
Rendell's Wife's Friend	0/0, 0/0, 0/0	0/0, 0/1	0/0, 1	1	1	—	—	—	—
Finil (two tablets)	0/0, 0/0, 0/0	1, 1	—	—	—	—	—	—	—
Vimule	0/0, 1	1, 1 +	1	—	—	—	—	—	—
Speton	0/1, 1	1	—	3	—	—	—	—	—
Semori	1, 1	1 +	—	3	—	—	—	—	—
Prorace (chinosol)	1, 2	—	3	—	—	—	—	—	—
Martindale	3, 3	—	—	—	—	—	—	—	—

APPENDIX II

The acid test of suppositories

	S	*S*/2	*S*/4	*S*/8	*S*/16	*S*/32	*S*/64	*S*/128	*S*/256
M 3	0/0, 0/0, 0/0	1, 1	1	—	—	—	—	—	—
Rendell's Wife's Friend	0/0, 0/1	1	—	—	—	—	—	—	—

The significance of the symbols used in the Appendices is referred to in the text (see p. 475 and sections 38–41 of the description of the normal test).

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