

epistaxis (Liveing), and fatal apoplexy (Hilton Fagge); in asthma there has occurred hæmoptysis proportionate to the severity of the dyspnoea (Hyde Salter): and in gastralgia violent hæmatemesis has taken place.<sup>3</sup> Now, in none of these cases is it possible to be sure that the internal vaso-dilation, proximately responsible for the vascular distension and hæmorrhage, is always secondary to, and compensatory of, the widespread vaso-constriction, especially conspicuous in the cutaneous area; it may be that of some cases the converse holds—that the vaso-dilation is primary, the vaso-constriction being secondary and compensatory. But in either case it is certain that the vaso-constriction greatly intensifies the vascular distension in the bleeding area and consequently that a primary indication for treatment consists in the relaxation of the vaso-constriction. Amyl nitrite will undoubtedly effect this relaxation and thus will relieve the vascular distension; that is, the local blood pressure in the bleeding area. The treatment, however, so far as I know, has yet to be tried in these cases, but I can have little doubt of its success, at any rate its partial success.

In the series of papers already referred to it was also argued that the mechanism of the physiological process of menstruation is identical with that of the pathological processes exemplified in migraine, gastralgia, asthma, &c. It was argued that just antecedent to and during menstruation there is an exaggeration of the normal physiological vascular tone or vaso-constriction in wide areas, conspicuously in the cutaneous area, and that such is compensated to some extent, though not fully, by vaso-dilation in the pelvic, more especially the uterine, area. This vascular modification accounts for the physiological increase of blood pressure antecedent to and during menstruation and for the premenstrual and menstrual incidence of the paroxysmal neuroses; it accounts also for the vascular distension of the uterine mucosa and for the eventuating hæmorrhage or menstrual flow. If this view of the mechanism of menstruation is correct, then anything—amyl nitrite inhalation, for example—which tends to cause widespread vaso-dilation, especially vaso-dilation of the surface, would tend to reverse the whole machinery of the menstrual process and would inevitably diminish, if it did not succeed in terminating, the uterine vascular distension and the menstrual flow dependent thereon. Now it is open for any physician to assure himself that amyl nitrite has this power. But I would not suggest that the experiment be made except, perhaps, in very special circumstances; for I have reason to believe that the sudden cessation of the menstrual flow which is liable to result may be fraught with exceedingly distressing, if not dangerous, sequelæ.

While I was deliberating as to the justifiability of testing the influence of amyl nitrite upon the menstrual flow I unwittingly performed the experiment, thus setting at rest any question as to the capacity of the drug to act in some cases in the manner anticipated. I was called in to see a woman, aged 25 years, who was suffering from vaso-motor angina pectoris. Almost immediately after my arrival a paroxysm occurred. I administered a capsule of the nitrite. The result was the instantaneous cessation of the pain, but the attacks continued to recur during the succeeding three or four days. A week later I learned that the patient had been menstruating when I administered the nitrite and that the period had terminated instantaneously. I then obtained the following history. She had suffered from angina on and off for several years. The attacks were especially prone to occur and to be especially severe on the day preceding and on the first day of menstruation. Several physicians had administered amyl nitrite and this invariably gave instant relief. But whenever she had inhaled the drug during menstruation—and she had done so frequently—the invariable result had been the immediate cessation of the flow and the termination of the period. She had made the further important observation that whenever a menstrual anginal seizure was dispersed by the nitrite with concurrent checking of the flow the attacks continued to recur for several days, but whenever the drug was omitted during menstruation the anginal seizures were limited to the day preceding and the first day of menstruation. Menstruation in her case was exceedingly irregular as regards time of onset and she was of opinion that menstrual periods had often been altogether missed through inhalation of amyl nitrite.

<sup>3</sup> See a discussion on the Pathology, Prognosis, and Treatment of Hæmatemesis, Brit. Med. Jour., Nov. 29th, 1902.

Considering the frequency of premenstrual attacks in her case this seems not unlikely.

South Brisbane, Queensland.

## THE RIDEAL-WALKER METHOD OF TESTING DISINFECTANTS, WITH SPECIAL REFER- ENCE TO THE ACTION OF FORMALIN AND CYLLIN ON THE PLAGUE BACILLUS.

By W. J. R. SIMPSON, M.D. ABERD., F.R.C.P. LOND.,  
D.P.H. CANTAB.,

PROFESSOR OF HYGIENE, KING'S COLLEGE, LONDON;

AND

R. T. HEWLETT, M.D., M.R.C.P., D.P.H. LOND.,

PROFESSOR OF GENERAL PATHOLOGY AND BACTERIOLOGY, KING'S  
COLLEGE, LONDON.

LAST year Mr. Rideal and Mr. Walker<sup>1</sup> described a simple and ingenious method for testing the germicidal action of disinfectants. The method was so devised that a number of tests with different strengths of the substance at stated intervals could be carried out with a minimum of labour and with the least expenditure of time. The method was also especially devised to compare the disinfecting action of different substances, and as a comparison these authors adopted carbolic acid as a standard. They were thus able to obtain a figure which they term "the carbolic acid coefficient," and which is of especial value for comparative purposes. This figure is obtained thus: the particular strength of the disinfectant which will kill in a given time is divided by the strength of carbolic acid which under the same conditions will kill the same microbe in the same time. Thus if a 1 in 80 solution of disinfectant x will destroy the typhoid bacillus in five minutes and the strength of carbolic acid which will act similarly is 1 in 100, the carbolic acid coefficient of x is  $\frac{80}{100} = 0.8$ ; if a solution of

disinfectant y of strength 1 in 150 is similarly equal to carbolic acid 1 in 100, the carbolic acid coefficient would be  $\frac{150}{100} = 1.5$ . The cost of disinfecting can thus also be estimated. If disinfectant x costs the same as carbolic acid, the cost of disinfecting with x would be two-tenths more than with carbolic acid; with y in the same circumstances carbolic acid disinfection would cost half as much again. Briefly, the details of carrying out the method are as follows. A special test-tube rack is made use of. It consists of a lower tier with five holes for five test-tubes and an upper tier with two rows (one behind the other) of 15 holes each and divided by spacing into three groups of five (or tens reckoning both rows). Into the bottom row test-tubes containing five cubic centimetres each of various strengths of the disinfectant and of carbolic acid for comparison are placed and into each are dropped at intervals of half a minute five drops of a broth culture of the organism chosen—e.g., the typhoid bacillus, bacillus coli, or micrococcus pyogenes aureus, &c. Having finished the addition of the culture to the tubes subcultures are made in nutrient broth, the broth tubes having previously been placed in the rack in the upper tier of holes, a loopful being taken from each tube containing the disinfectant and sown into a broth tube at intervals of half a minute. In this way a subculture is made from each tube after intervals of two and a half, five, seven and a half, ten, 12½, and 15 minutes. The inoculated tubes are then incubated; if growth occurs it is assumed that the organism has not been killed, if no growth occurs it is assumed that it has been killed, and the results may be charted on appropriate forms as shown below. Sterile test-tubes are employed for the disinfecting solutions, the dilutions of the disinfectant are made with sterile tap water with sterilised pipettes, and in this way contamination with extraneous microbes is practically excluded.

Smith and Sommerville<sup>2</sup> have tested the method and have

<sup>1</sup> Journal of the Sanitary Institute, vol. xxiv., Part 3, p. 424.

<sup>2</sup> Journal of State Medicine, vol. xii., No. 1, January, 1904, p. 41.

found it work well. Sommerville<sup>3</sup> also gives the results of further experiments carried out by the method demonstrating its accuracy. The bacillus typhosus, together with the bacillus coli communis, form diffuse abundant growths with more or less isolated microbes in broth cultures 24 hours old. We thought it desirable to test the method on a microbe which did not form such satisfactory cultures and we chose for this purpose the plague bacillus which, as is well known, in broth gives a flocculent sticky deposit at the bottom of the tube. We used as disinfectants formalin, cyllin, and carbolic acid and broth cultures of plague, 48 and 72 hours old, well shaking and mixing before use. Our results were disappointing. We often obtained no growth at all in the subculture tubes and the experiments were therefore blanks, or we obtained quite erratic results which were useless for the purpose of arriving at the carbolic acid coefficient. Investigating the causes of these results we found in the first place that, contrary to our preconceived idea, broth did not form a suitable culture medium for the test cultures. Apparently, in our broth at any rate, a minute trace of plague does not grow at all freely in this medium and we found that nutrient agar was a much more suitable culture medium, giving results when the broth cultures under the same conditions were blanks. Similarly a broth culture of plague even 72 hours old contains relatively few organisms, or these are aggregated into relatively few masses, compared with the broth cultures of typhoid, &c., and the chances therefore of obtaining a culture from the disinfecting solutions, even though the organisms are not destroyed, are small. We therefore substituted for broth cultures suspensions of agar cultures, but as is well known there is great difficulty, owing to the stickiness of the growth, of preparing a uniform suspension and we found it necessary to add much larger quantities of the suspension, 0·5 cubic centimetre of a 48-hour agar culture, to the tubes of disinfectant, thereby reducing their strength somewhat. This, however, for comparing disinfectants is of small moment, as the results are still comparative, which is all that is required. We also found it necessary to incubate the culture tubes for a much longer time, at least seven days, as after even five or six days a growth sometimes developed in what previously appeared to be a blank tube. Having after a considerable amount of labour and the use of some hundreds of tubes of culture media thus cleared the way, we may give some of the results which we have obtained. The results are best charted as follows:—

Test No. 25, June 20th, 1904.—*Bacillus Pestis* (Laboratory Culture).

Sample.	Dilution.	Time culture exposed to action of disinfectant—minutes.					
		2½	5	7½	10	12½	15
Formalin	1 in 10	*	*	*	*	*	*
"	1 „ 20	*	*	*	*	*	*
"	1 „ 30	x	*	*	*	*	*
Phenol	1 „ 70	*	*	*	*	*	*
"	1 „ 80	*	*	*	*	*	*

x = growth.

\* = no growth.

Test No. 26, June 20th, 1904.—*Bacillus Pestis* (Laboratory Culture.)

Sample.	Dilution.	Time culture exposed to action of disinfectant—minutes.					
		2½	5	7½	10	12½	15
Cyllin	1 in 1500	*	*	*	*	*	*
"	1 „ 2000	*	*	*	*	*	*
"	1 „ 2500	*	*	*	*	*	*
"	1 „ 3000	*	*	*	*	*	*
Phenol	1 „ 90	*	*	*	*	*	*

In all cases the subcultures were incubated for at least seven days at 37° C. These two tests, which were preliminary ones

after having arrived at the proper method, yield no result, the disinfectants being used in too great a strength.

Test No. 29, July 1st, 1904.—*Bacillus Pestis* (Laboratory Culture).

Sample.	Dilution.	Time culture exposed to action of disinfectant—minutes.					
		2½	5	7½	10	12½	15
Formalin	1 in 30	x	x	*	*	*	*
"	1 „ 40	x	x	x	*	*	*
"	1 „ 50	x	x	x	x	x	*
Phenol	1 „ 100	*	*	*	*	*	*

Test No. 30, July 1st, 1904.—*Bacillus Pestis* (Laboratory Culture).

ample.	Dilution.	Time culture exposed to action of disinfectant—minutes.					
		2½	5	7½	10	12½	15
Cyllin.	1 in 3500	x	*	*	*	*	*
"	1 „ 4000	x	x	*	*	*	*
Phenol.	1 „ 100	*	*	*	*	*	*
"	1 „ 110	?	x	*	*	*	*

From these two tests, performed at the same time, we see that 1 in 30 formalin and 1 in 4000 cyllin have the same germicidal action as 1 in 110 carbolic acid.<sup>4</sup> The carbolic acid coefficient of formalin would therefore be  $\frac{30}{110} = 0\cdot27$  and of cyllin  $\frac{4000}{110} = 36\cdot36$ .

Test No. 34, July 15th, 1904.—*Bacillus Pestis* (Virulent Culture).

Sample.	Dilution.	Time culture exposed to action of disinfectant—minutes.					
		2½	5	7½	10	12½	15
Cyllin.	1 in 4000	x	x	*	*	*	*
Formalin.	1 „ 40	x	*	*	*	*	*
Phenol	1 „ 110	x	*	*	*	*	*

From this test we may assume that a slightly stronger solution of cyllin—say, 1 in 3500—would have had a germicidal action equal to 1 in 110 carbolic acid. The carbolic acid coefficient for formalin works out at  $\frac{40}{110} = 0\cdot37$  and for cyllin at  $\frac{3500}{110} = 31\cdot8$ .

Our conclusions are therefore: 1. That the method, while a very simple and accurate one for organisms which form abundant, uniform, diffuse growths in young broth cultures, is not nearly so satisfactory for an organism that forms a scanty, flocculent, coherent growth in broth like the bacilli of plague or anthrax, in which cases a suspension of an agar culture is to be preferred. 2. As the result of a large number of tests the carbolic acid coefficient of formalin for the plague bacillus averages 0·3 and that of cyllin averages 34·0.

<sup>4</sup> The fourth tube in the first column (i.e., 1 in 110 carbolic acid acting for two and a half minutes) happened to be a bad tube of agar—very watery—and this probably accounts for the slight irregularity.

HOSPITAL SATURDAY AT NEWTON ABBOT.—£190 were received as a result of the recent Hospital Saturday collections at Newton Abbot (Devon), the amount being much in excess of the total of any previous year.

HABITUAL INEBRIATES.—At the meeting of the Monmouthshire Discharged Prisoners' Aid Society held at Newport Town Hall on July 28th it was reported that five women belonging to Newport had been discharged from the Brentry Homes and in each case within seven days of their discharge they had been reconvicted of drunkenness.

<sup>3</sup> Brit. Med. Jour., July 2nd, 1904, p. 15.