

PHYSIOLOGICAL PHENOMENA PRECEDING OR ACCOMPANYING MENSTRUATION, TOGETHER WITH NOTES ON THE NORMAL TEMPERATURE OF WOMEN.

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There is no physiological condition so nearly resembling disease as that which produces every month in an adult woman a change so profound that it has been looked upon as the expression of a morbid condition.—GUERIN.

THE true significance of menstruation still remains among the unsolved problems of medicine, and was mentioned among the most pressing of these problems by Dr. Milne Murray in a recent presidential address before the Obstetrical Society of Edinburgh. We must look primarily to physiology for a solution of this problem and it is encouraging that some progress has been made in this direction in the last year of the nineteenth century, when it was proved that so far as metabolism is concerned vicarious action exists between the ovary and the thymus gland. Many of the physiological phenomena of menstruation have been observed from the dawn of medical science, but it is probable that some still remain unrecognised and undescribed. Women in the possession of perfect health need to pay little attention to the advent of that menstrual epoch on or about the twenty-eighth day which makes itself such a dreaded event to others. It is a remarkable fact that phenomena appear regularly for many years and yet pass unnoticed because they are supposed to occur in everyone and are therefore considered of no importance. Besides, few persons are born observers and what the profession have not seen the laity are not always able to bring to their notice. Among known phenomena are: neuralgia (King); disinclination for society (Dalton); weariness and pain in the back and in the limbs (McKendrick); general malaise and irritability of temper (Pozzi and others); headache, nausea, and leucorrhœa following menstruation (Garrett); increase of pigmentation, the complexion dull or sallow, and black rings round the eyes (Barnes); diminution of the production of urea more than 20 per cent. during menstruation, slower pulse, and a fall of at least 1 per cent. in temperature (Rabuteau); the discharge anterior to the flow of a quantity of vaginal mucus, brown and rusty in colour and probably of a peculiar odour (Flint); tension in the region of the uterus and ovaries, which are sensitive to pressure, alternate feeling of heat and cold, slight increase in temperature of the skin, retardation in the process of digestion, and variation in the secretion of sweat (Landois and Stirling); and vertigo, herpes, parotitis, pruritus vulvæ, flashes of heat, swelling of the thyroid gland, increased frequency of urination, painful swelling of the mammæ, changes in individual character, angina of menstruation, and a form of subacute tonsillitis (Cushing and Cumston in the Twentieth Century Medicine). Longet also gives one instance of periodical enlargement of the thyroid gland during menstruation. Barnes's well-known cases of hernia of the left ovary, in which the sphygmograph applied to the herniated ovary showed a high blood-pressure preceding menstruation, has been frequently referred to, and there is also an interesting case reported in the Transactions of the Edinburgh Obstetrical Society, February, 1893, which bears on the same point. Dr. Young there gives notes of the case of a patient, otherwise healthy, aged 29 years, who at the menstrual period suffered from a headache so severe that she could not lift up her head and was unfitted for duty for several days. The sphygmograph record showed a high blood-pressure. Dr. Young then removed during menstruation 10 ounces of blood by venesection and this gave instant relief. The operation was again performed shortly before another menstrual period and several months thereafter the patient reported herself as being as well as could be desired. M. Cautier before the Académie de Médecine at Paris in 1900 also mentioned that the approach of menstruation may be recognised by changes in the hair. Flint¹ refers at length in the following passage to the evolution of carbonic acid in the female:—

Ehalation of CO₂.—Influence of Sex.—All observers have found a marked difference between the sexes, in favour of the male, in the proportion of CO₂ exhaled. Andral and Cavarret noted an absolute

difference of about 45 cubic inches per hour, but did not take into consideration the differences in the weight of the body. Scharling, taking the proportion exhaled to the weight of the body noted a marked difference in favour of the male. The difference in the degree of muscular activity in the sexes is sufficient to account for the greater evolution of CO₂ in the male, for this principle is exhaled in proportion to the muscular development of the individual, but there is an important difference connected with the variations with age which depend upon the condition of the generative system of the female. The absolute increase in the evolution of CO₂ with age in the female is arrested at the time of puberty and remains stationary during the entire menstrual period, provided the menstrual flow occur with regularity. During this time the average exhalation per hour is 714 cubic inches. After the cessation of the menses the quantity gradually increases, until at the age of 60 it amounts to 950 cubic inches per hour. From the age of 60 to 82 the quantity diminishes to 793 cubic inches, and finally to 670 cubic inches. When the menses are suppressed there is an increase in the exhalation of CO₂ which continues until the flow becomes re-established. In a case of pregnancy observed by Scharling the exhalation was increased to about 885 cubic inches.

Quantity of CO₂ Exhaled by the Male.

Age.	Cubic inches per hour.	Age.	Cubic inches per hour.
12-16 years	915	32-60 years	1220
17-19 "	1220	63-82 "	933
25-32 "	1343	102 "	671

Dr. Engelmann of Boston, in a recent article entitled "What is Normal Menstruation?"² gives statistics concerning 5000 women most of whom were in school or college or employed in departmental stores and about the age of from 18 to 22 years. Dr. Engelmann found that in 24 per cent. of these menstruation occurs at intervals of less than 28 days, in 31 per cent. at intervals of 28 days, and in 45 per cent. at intervals of more than 28 days. From 66 to 70 per cent. suffer more or less pain during menstruation; this number varies with age and intensity of occupation. Dr. Jacobi finds about 65 per cent. suffer more or less and De Boismont (quoted by Dr. Jacobi) finds that 77 per cent. have more or less pain. Pain, however, can hardly be considered physiological and is therefore not included in the present inquiry. There are also variations described in pulse-rate, production of urea, and temperature, which are referred to later under the head of "Temperature." With the exception of parotitis, swelling of the thyroid gland, and the excretion of CO₂ the phenomena mentioned and a few others to be presently described have been investigated in 100 cases, the results of which are submitted herewith.

In regard to the production of urea a few experiments made under the direction of the assistant in chemistry at the chemical laboratory of the University of Toronto confirm the results referred to hereafter, as do also a few observations on pulse-rate and blood-pressure. The phenomena of which no description is given in literature to which the writer has had access are: loss of sleep; a tendency to pessimism and mental depression; disturbances of the special senses; cutaneous hyperæsthesia; a tendency to constipation or diarrhœa; a great tendency to "take cold," as shown by frequent attacks of coryza, occurring in some women at every menstrual epoch; a feeling that any work in hand must be all "finished up" (a feeling as if you could not do enough); and letting things fall or "slip through the fingers" in some unaccountable manner.

On Nov. 29th, 1900, 150 temperature charts, and 150 copies of the following list of questions, each accompanied by a letter of explanation, were sent to the nurses and graduates of Toronto General Hospital Training School for Nurses by the kind permission of the superintendent. Twenty-two of the answer papers were returned filled up. At the end of March, 1901, 150 additional copies of the questions were sent to the nurses of St. Michael's Hospital (by kind permission) to the students of the Women's Medical College and other colleges, and to several women physicians in practice in Toronto, as well as to a number of women teaching in the Toronto Public Schools. Sixty-eight replies were returned, and the additional papers required to make up 100 were then easily secured, most of the replies being dictated. All those answering the questions were well enough to do a hard day's work, and almost all of them were less than 30 years of age, few or none being married. The questions were as follows:—

Besides the well-known phenomena of menstruation, such as hæmorrhage, slight mammary changes, weariness and lassitude, sensations of pressure and pain in the pelvis, &c., are any of the following symptoms

¹ Human Physiology, pp. 147 and 148.

² New York Medical Journal.

present, say, from the twenty-first to the twenty-eighth days?—
 1. Disturbed sleep. For example: Are you more wakeful than usual?
 2. Vertigo. 3. Headache. 4. Neuralgia. 5. Mental depression. Is there any change in your feelings? Do you prefer being alone?
 6. Increased nervous energy, feeling you must "finish up" everything.
 7. Lessened nervous or muscular power. Do you let fall things you are holding or carrying? 8. Cutaneous hyperæsthesia, feeling as if clothes irritated the skin. 9. Vaso-motor disturbances, flashes of heat and cold. 10. Digestive disturbances—flatulence, &c. 11. Constipation. 12. Diarrhœa. 13. An increased quantity of urine. 14. Cutaneous eruptions. If so, where (lips, face, chest, &c.)? Of what character (vesicles, pustules, acne, herpes)? 15. Disturbances of the special senses. Is the sense of smell more acute? Are you eyes more easily tired? 16. Subacute tonsillitis. Any tendency to sore-throat? 17. Do you take cold more easily? 18. Differences in pigmentation. Is the complexion dull or sallow? Are there rings round the eyes? 19. Are there changes in the hair? Is it dull, harsh, wiry, or less glossy? 20. Is there an irritating watery discharge before the discharge of blood? 21. Is there an irritating watery discharge after the discharge of blood?

Please qualify your answer, if affirmative, by the words "occasionally," "frequently," "generally," "always." If any of the above symptoms occur at any other time than from the twenty-first to the twenty-eighth days please mention the time. Are there any other phenomena which you can suggest for observation?

Summary of Answers.

Question.	No answer.	"No."	"Yes."	"Occasionally."	"Generally."	"Frequently."	"Always."
1	0	47	53	13	1	8	8
2	8	58	34	18	0	4	1
3	4	41	55	19	5	7	7
4	5	73	22	5	5	1	3
5	5	38	57	11	3	6	12
6	7	49	44	4	0	3	9
7	7	57	36	6	4	6	6
8	11	61	28	9	2	2	6
9	9	49	42	18	0	4	5
10	6	39	55	13	2	11	6
11	5	54	41	10	8	2	6
12	9	48	43	21	2	3	3
13	13	39	48	5	6	5	5
14	9	50	41	13	3	5	1
15	6	34	60	4	3	8	11
16	6	76	18	7	3	0	1
17	9	44	47	1	1	4	9
18	4	21	75	8	5	6	14
19	27	59	14	1	1	2	2
20	11	50	39	6	3	2	8
21	7	55	38	7	22	0	11

Notes on individual replies to the questions in numerical order.—1. One hardly sleeps at all the first night of menstruation. Three sleep more heavily than at other times. Two specially mention dreams at this time. 4. One reports sciatica. 5. Six specially mention irritability, one writing as follows: "I find that I am more easily provoked by small annoyances. Loss of patience is the chief difference." 6. One reports that the "feeling as if you couldn't do enough" comes after menstruation is over. 7. This condition (lessened nervous or muscular power) is very marked in some cases. One mentions that great domestic inconvenience is caused by many dishes being thus broken by one who shows this phenomenon markedly. 10. Apparently some articles of diet, especially fish, cannot be easily digested at this time. 13. One reports the quantity of urine as being diminished. 14. A large number report eruptions on the face, lips, and chest, especially on the face. Probably those on the chest and shoulders often escape observation—they frequently resemble petechiæ. Two report "red spots seldom coming to a head." One reports roughness of the skin in small spots on the face and another describes what is probably the same phenomenon as "shell-corn" on the face. (Dr. Goodman speaks of red splotches on the chest and of swollen and tender varicose veins at the knee. Bergh of Copenhagen has seen, from 1866 to 1887, 887 cases of vulvar herpes. Many said it occurred at every menstruation. It was not dependent on syphilis. In most of these cases it must be considered a menstrual exanthema, probably

depending on troubles of innervation.) 15. A large number speak emphatically about the eyes being very tired—"Cannot read at night." A number also report hyperosmia. 17. One reports coryza always present with menstruation. Another reports coryza nearly always present. 19. The change most frequently mentioned is the loss of the natural glossy appearance. One reports that the hair "looks dead."

It would be interesting to know whether the hair normally excretes toxic products at this time as it normally excretes arsenic. It was shown by Professor Brouardel in 1891 that arsenic is eliminated through the skin, hair, and nails, and is probably stored up there. Dr. J. Reid of Redhill recently stated³ that in the case of patients taking small doses of arsenic, if the medulla of the hair after being treated by ammonia copper solution be viewed by a one-sixth of an inch objective, particles of arsenite of copper may be seen as small green granules. This matter of the excretion of arsenic by the hair has recently been discussed by Mr. Edmund Knecht, Ph.D., and Mr. W. F. Dearden, in connexion with the Manchester epidemic of arsenic poisoning by beer, and M. Gautier of Paris has shown that it is a normal function of the hair to eliminate arsenic from the system. In connexion with the elimination of arsenic at menstruation it must be mentioned that M. Gautier and M. Donser⁴ have shown that menstrual blood contains four times as much iodine as normal blood, and that the total amount of arsenic eliminated in the menstrual blood at each menstruation is 0.14 milligramme, and this is equal to the entire quantity of arsenic normally contained in the thyroid gland. Iodine is also furnished by the thyroid gland.

Several interesting phenomena are suggested for observation by the replies received. In one pre-menstrual hunger is mentioned. Six report feeling cold, with shivering and chills, at the onset of menstruation, while swollen feet, stiffness of joints, and the assumption of a coarser appearance and texture by the skin are respectively mentioned by three correspondents. In one reply a hæmorrhage which occurs regularly within the external ear (concha) is reported. The first hæmorrhage is small and the blood soon coagulates, but if the coagulum be removed the hæmorrhage continues for some time, and though small is somewhat difficult to stop. This and the petechiæ upon the chest and shoulders are evidently connected. (Increased permeability of capillary walls?) Another correspondent reports a spot of hyperæsthesia over the right ear. This is interesting in connexion with the work of Dr. Fleiss of Berlin, who in 1897⁵ stated that there were certain "nasal genital spots" which became swollen at the time of menstruation and which on being touched at this period (in rare cases at intermenstrual periods also) gave rise to pain. Touching the anterior end of the inferior turbinated bone gave rise to pain in the hypogastric region, and touching the tuberculum septi gave rise to pain in the sacral region. Cocainisation of these spots relieves the pain of that type of dysmenorrhœa which does not cease with the flow of blood, and cauterising these spots completely will effect a cure of the same type of dysmenorrhœa. Dr. Fleiss's results have been completely confirmed during the last three years by Dr. Schiff of Vienna and other observers. It would seem that the mucous membranes are specially affected in menstruation. Thus the throat is frequently affected; the nasal mucous membrane is congested and swollen, and Goodman quotes two cases of hæmorrhage from the throat and upper part of the œsophagus. A similar case occurred in practice in Toronto recently.

Another interesting topic is the action and reaction of menstruation on disease and disease on menstruation—that is, the action of a physiological function on a pathological condition and *vice versa*. Typhoid fever precipitates menstruation, generally bringing it on within a few days after the onset of the fever. Other examples are as follows. Acne.—"Not infrequently patients give a history of their faces being worse at the menstrual period" (Dr. P. Abraham, surgeon to the Hospital for Diseases of the Skin, Blackfriars, and dermatologist to the West London Hospital). Gonorrhœa.—"Examine suspected cases in female patients near the menstrual period, because a case in which the gonococcus is usually difficult to find will at this time show it in

³ THE LANCET, March 23rd, 1901, p. 878.

⁴ Académie de Médecine, 1900.

⁵ The Relation of the Mucous Membrane of the Nose to the Sexual Organs in Females.

⁶ THE LANCET, Sept. 22nd, 1900, p. 860.

great profusion" (Dr. W. H. Burrage.)⁷ Uterine myomata.—"About 10 to 14 days before menstruation a uterine myoma may frequently be found to increase in size, and a corresponding decrease occurs immediately after menstruation" (Dr. Thienhaus⁸). Tuberculosis.—"Not rarely it is possible in suspected persons in whom an examination previously had been negative to demonstrate positive signs during the menstrual period. In other patients the symptoms in the beginning of menstruation are not modified, but towards the end show a marked improvement" (Neumann.) Effusion into the knee-joint.—Sir W. H. Bennett⁹ reports 20 cases of a quiet, passive effusion into the knee-joint occurring in women and young girls which is always associated with menstrual irregularity or uterine trouble. In no case did recovery occur while the uterine or catamenial irregularities continued, but in every case their correction was followed by prompt improvement in the condition of the knee.

Temperature.

It is long since the question of variations of temperature more or less connected with the onset of menstruation first attracted attention. Longet was of opinion that women have habitually a higher temperature than men. And though these variations are slight they are not always unimportant. Thus the accompanying observations show that in persons enjoying the most robust health a temperature of from 99° to 99·6° F. is not uncommon from 2 to 8 P.M. three or four days before menstruation, and in 13 out of 17 charts the afternoon temperature frequently reached 99° F. Yet a temperature of 99° F. is often looked on with suspicion. "Charts were here exhibited showing that in some cases a pre-menstrual rise of temperature might indicate early phthisis" (address delivered by Professor Clifford Allbutt before the British Medical Association at Portsmouth August, 1899¹⁰). "A rise of temperature to about 99° F. between 2 and 6 P.M. is one of the three earliest symptoms of tuberculosis" (address delivered by Dr. G. A. Heron before the Section of Sanitary Science and Preventive Medicine at the Congress at Southampton¹¹). "Dr. Kingston Fowler has shown that the only form of pyrexia which can be absolutely said to be tuberculous is that in which the morning temperature is higher than that of the evening."¹²

In seeking information about normal temperature one turns to the classical work of Jürgensen¹³ undertaken in 1866 and 1867. The measurements of temperature were taken from three healthy men, aged 24, 41, and 42 years respectively. Variations of 0·8° C. and even of 1·4° C. were found between the readings of the temperature of the same individual at different hours. Jürgensen was able to establish not only the average normal temperature of men in health, but also to show that even when there are "extreme conditions of life" the average temperature remains the same, if a long enough range be taken. Thus fasting and cold bathing, though they temporarily lower the body temperature, do not in the long run affect the average. Exercise too, often raises the body temperature, but not always, as Dr. W. Hale White has shown in the Croonian Lectures for 1897 on "The Means by which the Temperature of the Body is Maintained in Health and Disease." This fact was also noticed in some of the charts now dealt with. Another investigator who pursued the same subject was Georg Hormann.⁴ Hormann finds the maximum temperature between 5 and 7 P.M. and the minimum between 5 and 6 A.M. His results are as follows: 1. Usual way of life, nourishment and exercise, 38·1° to 36·0° C. 2. Usual way of life, no food or drink for 36 hours, exercise, 36·5° to 36·0° C. 3. Usual way of life, hard work, nourishment, 38·1° to 36·3° C. 4. Usual way of life, nourishment, rest, 37·5° to 36·2° C. 5. Rest, nourishment withdrawn, 36·4° to 37·3° C. 6. Rest, nourishment withdrawn, constant outer temperature, 37·7° to 35·9° C. Sometimes the maximum temperature occurs at 2 or 3 P.M. and sometimes the temperature is low at 6 P.M. Something must depend on the dinner-hour and upon mental exertion, which sometimes, especially in warm countries,

produces a rise of temperature of from half a degree to one degree Fahrenheit (Fothergill and Murrell). There are also interesting records of race-variations of temperature. One of the most interesting of these occurs in the Goorkhas. Some years ago a writer in the *Indian Medical Gazette* drew attention to the fact that Goorkhas recovering from typhoid fever were not well until the temperature went down to 97° F., and added some further remarks on the "normal Goorkha temperature." Captain Lalor, I.M.S., has recently given an account in the same medical magazine of feeding with sugar six healthy men in a Goorkha regiment. For 11 days before administering sugar the temperature was 97·1° F.; for 11 days during its administration 97·4° were registered; and for 11 days after its administration, 97·2°. The temperature rose in every case while the men were being fed with sugar. Captain Lalor's theory is that the low temperature is due to defective metabolism.

References to temperature in connexion with the subject of menstruation are chiefly to be found in the literature of the so-called "Cyclical Theory of Menstruation," a term that seems to have been used first by the professor of obstetrics in Louisville Medical College, Dr. Goodman.¹⁵ Dr. Goodman makes slight reference to variations in pulse and temperature. His theory is that menstruation is the result of a general condition of the vascular system due to the rhythmic action of nervous centres.

Dr. A. E. Giles's¹⁶ observations were taken upon patients who were admitted to the Chelsea Hospital for Women for "trifling conditions" such as ruptured perineum, stenosis of the os externum, urethral caruncle, cervical erosion, &c. Many had no operation performed, and in the case of the remainder the observations were either made before operation or begun at least a week after operation. Even so they can hardly be considered women in robust health under normal conditions. A brief summary of Dr. Giles's paper is as follows: Temperature observations—50 menstrual periods in 45 patients. Conclusions.—That the temperature is lowest at the middle of the inter-menstrual period, gradually rises to a maximum two days before menstruation, falls suddenly on the day preceding the flow, falls again, but more slightly, at the end of the period, rises slightly for the first week thereafter, and finally falls slightly at the beginning of the inter-menstrual period (Fig. 1). Blood-pressure.—Seven patients, nine menstrual periods, 40 observations. Blood-pressure greatest on the first two days of menstruation and on the day preceding menstruation; it is lower during the remainder of the period, but rises again slightly after its cessation. Pulse tracings taken by Dudgeon's sphygmograph. The author does not entirely agree with the cyclical theory of menstruation, but regards menstruation as the "conclusion of the reproductive phase of an alteration of nutritive and reproductive activity," whereas the cyclical theory regards menstruation as the result of a periodical "variation of metabolic activity" or "nutrition wave" manifested by variations in the temperature, blood-pressure, and amount of urea excreted per diem.

The first record of observations made upon the temperature during menstruation appears to be by Fricke¹⁷ in 1838. He states that the temperature is slightly higher during menstruation.

In 1867 Squire¹⁸ observed that there was a rise in temperature before menstruation and a fall at the time when menstruation occurred.

In 1870, Rabuteau¹⁹ recorded a series of observations which showed that the amount of CO₂ excreted during the menstrual period was considerably less than at other times; also that the amount of urea excreted was less just previously to menstruation, and that it rose again after menstruation. The same writer has recorded further observations on pulse and temperature.

A brief summary of the results recorded by more recent writers may be given. Daily excretion of urea.—Maximum, just before menstruation. Minimum, just after menstruation. Gradual increase from minimum to maximum. Temperature.—A slight rise for about seven days before menstruation is followed by a fall just before the onset. Another

⁷ Boston Medical and Surgical Journal, Feb. 7th, 1901.

⁸ New York Medical Journal, Dec. 15th, 1900.

⁹ THE LANCET, Feb. 23rd, 1901, p. 527.

¹⁰ THE LANCET, August 19th, 1899, p. 519.

¹¹ Journal of the Sanitary Institute, vol. xx., Part 4, January, 1900.

¹² Dr. Robert Maguire: THE LANCET, Dec. 8th, 1900, p. 1633.

¹³ Die Körperwärme des Gesunden Menschen, Studien von Prof. Dr. Theodor Jürgensen, Leipsic, 1893.

¹⁴ Die Temperatur des Gesunden Menschen, Zeitschrift für Biologie, 1898.

¹⁵ The Cyclical Theory of Menstruation, American Journal of Obstetrics, vol. xi., p. 673.

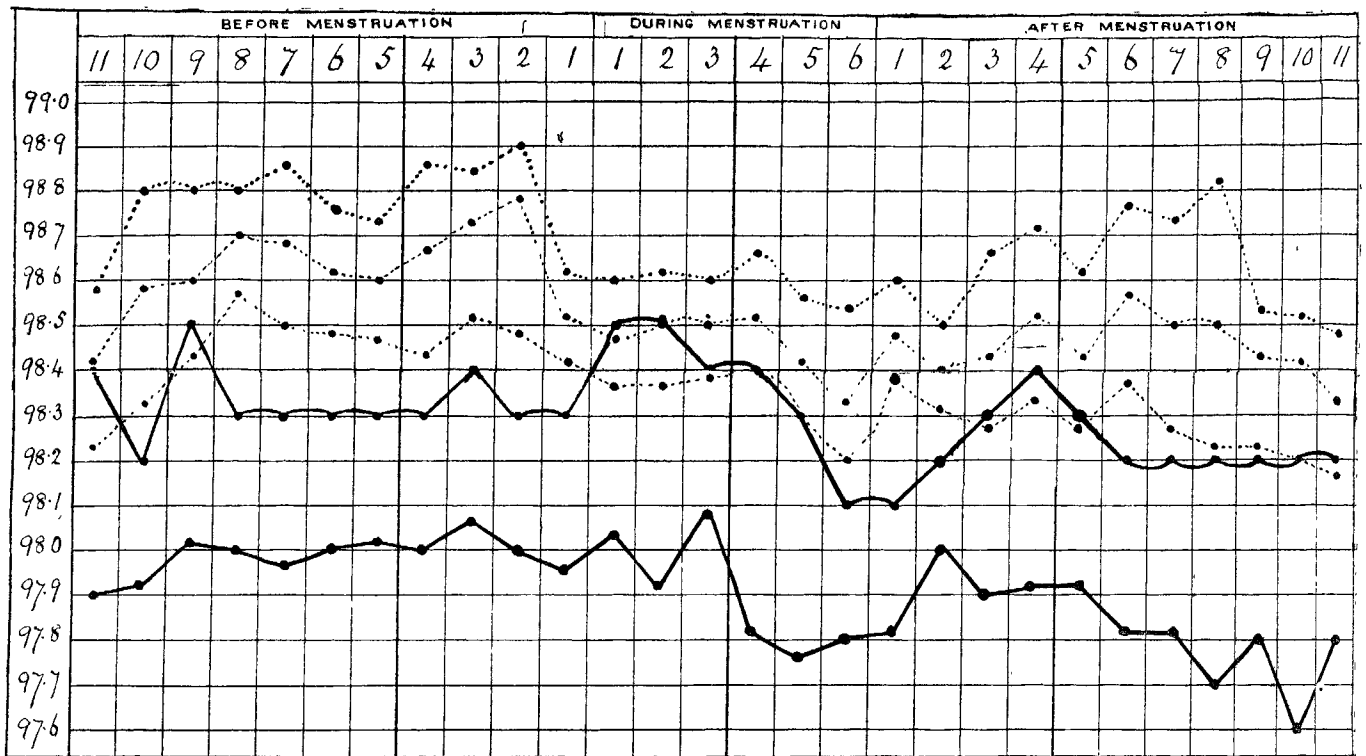
¹⁶ The Cyclical or Wave Theory of Menstruation, Transactions of the Obstetrical Society of London, 1897, vol. xxxix., p. 115.

¹⁷ Recherches sur la Température du Vagin et de la Matrice avant, pendant, et après les Règles, Journal de Fritsch et Oppenheim. Gazette Médicale, 1838, p. 818.

¹⁸ Puerperal Temperatures, Transactions of the Obstetrical Society of London, 1867, vol. ix., page 130.

¹⁹ Gazette Médicale de Paris, 1870, p. 616.

FIG. 1.



Lower dotted line shows morning temperature. Middle dotted line shows mean temperature. Upper dotted line shows evening temperature. [Dr. A. E. Giles: "A Composite Chart of the Temperature in Relation to Menstruation, based on 50 Observations."] The upper black line shows the evening temperature and the lower black line the morning temperature; present observation of 20 charts, 1901.

rise of temperature is observed during the period. Blood-pressure.—This is below the average during the period, after the period it gradually rises, and there is a distinct decrease in blood-pressure either shortly before or at the time of the onset of menstruation.

Ott²⁰ of St. Petersburg, who gives a record of observations upon blood-pressure in 14 cases in which he used Basch's apparatus, finds that in 13 of these cases the blood-pressure fell considerably with the onset of menstruation, remained under the average during the period, and rose again after the flow ceased. The author concludes that the vasomotor system is the chief agent in preparation for reproductive activity and that this is proven by the variations of pulse and temperature, and by nervous symptoms as well as by changes in the uterus and ovaries.

A valuable contribution to the study of this subject was made in 1886 by the professor of materia medica in the Women's Medical College at New York City, Dr. Mary P. Jacobi.²¹ In that year the Boylston Medical Committee appointed by the President and Fellows of Harvard University offered a prize of \$200 for the best essay on the following question: "Do Women require Mental and Bodily Rest during Menstruation, and to what extent?" The prize was awarded to Dr. Jacobi and her dissertation, a volume of more than 200 pages, thus became the Boylston Prize Essay of Harvard University for 1886. It is a careful and elaborate discussion of the subject. Dr. Jacobi collected many statistics and found, in the majority of cases, the following results. Excretion of urea.—Maximum a few days before menstruation and minimum immediately after; the amount decreases during menstruation. Pulse.—No uniform rate of variation. Temperature.—Rises just before menstruation, falls during menstruation. Arterial tension.—Maximum just before menstruation and minimum just after; rapid decrease during the menstrual flow.

The results of Dr. W. Stephenson,²² professor of midwifery in the University of Aberdeen, are based upon four cases (the dates of all observations mentioned being June and July); a summary of his statement is here given in his own words:—

1. That menstrual life is associated with a well-marked wave of vital energy which manifests itself in the temperature of the body, in the

daily amount of the excretion of urea, and to a slighter extent in the pulse-rate. 2. That the cycle of changes takes a true wave-form divisible as to time into two nearly equal parts, the one below the other above the average for the whole period. 3. That the length of this wave varies in different individuals and may also vary in the same person. The urea wave and the temperature wave are equal in length in the same case. 4. That menstruation does not correspond with the apex or climax of the waves, but occurs five or six days after the decline has begun. It is probable that normally it occurs when the temperature curve reaches the mean; this was the case in nine out of 10 menstruations. The flow or evacuation cannot be regarded as the cause of the decline. 5. That the temperature wave is the most uniform and gradual in its rise and fall. In the urea curve the transition to elevation takes place more quickly, even suddenly. 6. That the temperature wave and the urea wave are independent of each other. 7. That whilst the pulse wave is not so marked in character it also shows a decided influence; it is depressed after menstruation and manifests a distinct rise some days before the next period. 8. In all the waves there are evidences of secondary waves.

The observations of Reinl²³ were based upon statistics obtained from 18 "relatively healthy" women, as far as possible alike in nourishment. The record includes 29 menstruations. These "relatively healthy" patients were suffering from chlorosis, version of the uterus, weakening of ligaments and walls of the vagina, &c. Only one was a virgin and their ages ranged from 24 to 41 years. Dr. Reinl finds a pre-menstrual rise of temperature, a menstrual fall, and a still lower post-menstrual temperature (Fig. 2).

The original single charts were arranged for recording observations every two hours for one week and then twice daily for four weeks. Fourteen two-hour charts and 20 records taken twice daily were received. It was specially requested that the same thermometer should always be used. Three of the 20 records being taken by nurses on night duty were not used in finding the average, but they presented the same features as the others. The chart shows a rise of temperature in the pre-menstrual period, a rise of temperature during the menstrual period, a fall of temperature just before menstruation, a fall of temperature at the end of menstruation, and a minimum temperature during the inter-menstrual period.

It remains to consider the large percentage of affirmative answers received to the questions. There is no doubt that the percentage, though large, is lower than it should be, for reasons already referred to. Several of those who kindly sent papers remarked afterwards that if they had the papers again they could put down more affirmative answers; when

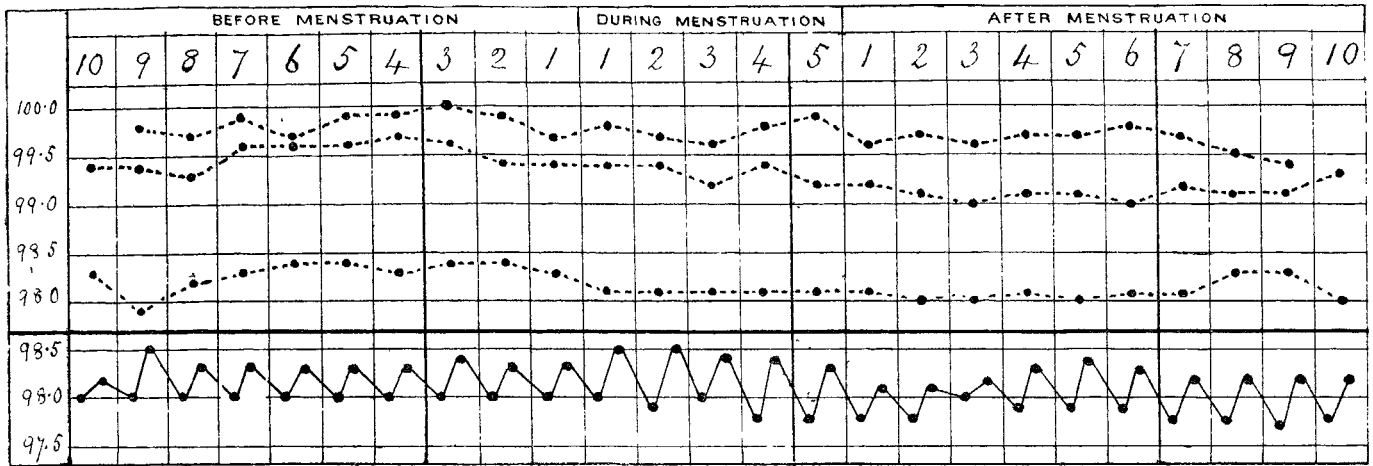
²⁰ Loi de Périodicité de la Fonction Physiologique dans l'Organisme Féminin, Nouvelles Archives d'Obstétrique, vol. v., September, 1890, p. 502.

²¹ The Question of Rest for Women during Menstruation, New York, 1886.

²² On the Menstrual Wave, American Journal of Obstetrics, vol. xv., p. 287.

²³ Die Wellenbewegung der Lebensprocesse des Weibes, Volkmann's Sammlung, No. 243.

FIG. 2.



Lower dotted line shows axillary temperature: Dr. Jacobi. Middle dotted line shows rectal temperature: Dr. Jacobi. Upper dotted line shows rectal temperature: Dr. Reinl. Black line shows morning and evening temperatures (taken in the mouth), based on 20 observations, 1901.

their attention was drawn to the subject they observed what had previously passed unnoticed.

One can hardly consider the results of this inquiry without asking what these phenomena mean. If we could interpret them perhaps we should be more able to explain the true significance of menstruation. Nos. 1 to 9, and to a greater or less extent Nos. 14, 15, and 18, of the replies seem to originate from some condition of the nervous system. Nos.

10, 11, 12, and 19 seem to belong to metabolic processes. No. 13 may be explained by the high blood-pressure, and it may be that the increase of urea and the decrease of CO_2 are connected. Nos. 20 and 21 are connected with the activity of the uterine glands and Nos. 16 and 17 would seem to indicate a lessened power of resistance, or a greater liability to infection.

Toronto.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

A CASE OF LARGE PERI-NEPHRITIC ABSCESS WITH UNUSUAL SEQUEL.

BY HENRY MALLINS, M.B., M.CH. DUB.

A BOY, aged 14 years, was admitted into the Watton Cottage Hospital on July 22nd suffering from a painful swelling of the left side of the abdomen. On examination it was found that this region was dull on percussion from the ribs to the iliac crest, the line of dullness extending from the flank to within an inch of the median line. The lumbar region was distinctly bulged and was the seat of the chief pain. Pressure could be borne over the swelling in front. As he had been suffering from bladder trouble for several years the diagnosis of peri-nephritic abscess was made. The boy was so emaciated and the pulse was so feeble that any operative interference was deemed inadvisable. After a week's interval the swelling of the side commenced to disappear, as did also the dullness, and for a week before his death on August 16th all trace of it had gone. The emaciation was of the most marked description. At the post-mortem examination, which was made the next day, general peritonitis was observed. Distinct traces of a huge abscess extending from the stomach above to the sheath of the left psoas muscle below were found, the pelvis being full of large pieces of purulent lymph and the muscle sheath distended with thin yellow pus. The left kidney, enlarged to the size of that of a bullock, was practically converted into a bag of pus, which had evidently given way at a point on its convex surface, thus forming the starting point of the abscess, to which nature seems to have tried to put a limit by the formation of a wall of lymph, so poorly organised that it in the end gave way, permitting the contents to diffuse into the peritoneal cavity and thus explaining the disappearance of the swelling. The right kidney was also enlarged and was the seat of several deposits of caseous pus.

There was, unfortunately, no time to examine the bladder, as the examination, which was made under considerable difficulties, had to be abruptly terminated owing to the

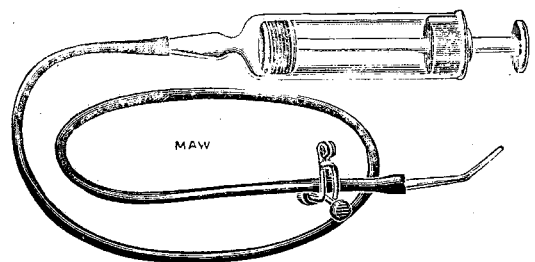
interference of a relative. As the mother had suffered from hip-joint disease since childhood I have but little doubt that a tuberculous ulcer of the bladder slowly infected the kidneys and led to the phenomena above recorded.

Watton, Norfolk.

SUBMAMMARY INJECTION OF SALINE SOLUTION IN THE TREATMENT OF COLLAPSE DURING AND AFTER POST-PARTUM HÆMORRHAGE.

BY FRANCIS FOULDS, M.R.C.S. ENG., L.R.C.P. LOND.

IN a recent case of collapse from post-partum hæmorrhage I injected 25 ounces of warm saline solution into the sub-mammary cellular tissue by means of the simple apparatus (of which an illustration is here given) brought to my notice by Dr. Drummond Robinson and made by Messrs. Maw, Son, and Thompson. Before the injection the patient



was almost pulseless (having no radial pulse) and was ghastly pale. She had sighing respirations, with a large, flabby, uncontracted uterus from which the placenta had to be peeled, and the hæmorrhage could only be controlled by bimanual compression. Within five minutes of the introduction of the saline fluid the pulse could be discerned at the wrist. The facial appearance and the character of the respirations improved and the patient regained consciousness—although her condition remained critical for several hours. She made a slow but uneventful recovery and is now in good health. In his "Handbook of Midwifery," Dr. Dakin states that "Münchmeyer injected saline fluid into the connective tissue and muscles of the back, &c.," and then goes on to say that the process is slow, and if the woman is in a dangerous state, too slow to be of any use. In this case the whole of the fluid was absorbed in