THE PERIOD OF HUMAN OVULATION
AND A CONSIDERATION OF THE FERTILE AND INFERTILE PERIODS

By

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The present report deals with the identification of the day of ovulation as indicated by 162 conceptions following therapeutic (donor) insemination of 128 women. The results throw light upon the duration of the fertile and infertile periods. In consideration of the fertile and infertile periods a series of 364 cases are also considered.

MATERIAL AND METHODS

The rat ovary hyperemia test was employed for determining the day of ovulation and insemination. The insemination was performed on this day. In the majority of instances, the semen possessed 50 or more million moving sperm per cc, or approximately 200 million in the average ejaculate (Farris – '50).

The technique of the rat ovary hyperemia test (Farris – '46, '55) is as follows: Two cubic centimeters of urine, which the patient passes on arising in the morning, are injected subcutaneously into 2 immature, female, white rats of the Wistar strain. Each animal is killed with illuminating gas at the end of two hours. The abdomen is opened. The two ovaries are drawn, one at a time, into the wound and the color of each is compared with the graded shades of red of the Munsell color system. In the presence of normal ovulation, the patient's urine induces hyperemia in the ovaries of the rat. The test consists of injecting urine samples collected on 10 consecutive days. In the case of a normal ovulation reaction rats injected and sacrificed daily respond with

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ovarian hyperemia for 4 or 5 consecutive days. The last day of the hyperemia (Farris, '55) is the day selected for insemination.

The first month is a control month. The control month tells whether ovulation occurs, and if so, when it takes place in the cycle, and also whether the reaction is normal or abnormal.

The insemination is performed on the last day of the reaction in the following month, if the reaction is normal. Previous studies (Farris, '50 a, '54, '54 a) indicate that conception occurs close to the presumed time of ovulation, and within a matter of hours of ovulation.

RESULTS

The days of the 162 successful inseminations ranged from day 10 to 20 inclusive of menstrual cycles, which varied from 20 to 38 days in average length (Figure 1). The great majority of the conceptions took place on cycle days 11 through 14. Forty-two of the 162 conceptions occurred on cycle day 12, in cycles which averaged from 23 to 32 days in length. Thirty-four conceptions took place on cycle day 13. These cycles ranged from 26 to 33 days in length. Twenty-eight conceptions took place on cycle day 14 in cycles which ranged from 25 to 35 days in length. Twenty-three conceptions took place on cycle day 11. In these cases the cycles ranged from 20 to 31 days in average length. Seventy-eight and seven-tenths per cent of the conceptions occurred on cycle days 11 to 14, inclusive, with 26 per cent occurring on cycle day 12.

Table 1 lists the days of the successful inseminations, and the lengths of the postovulatory interval periods, which varied from 9 to 21 days.

The Average Length of the Menstrual Cycle

The average length of 12 consecutive cycles was computed for each of 50 patients. The average length of the cycles was computed for 3, 6 and 9 months. Each average was expressed in whole days.

The average length of any 3 consecutive cycles was found to be about the same as the cumulative average of that person for 6, 9 or 12 cycles. The maximum variations in the average lengths of the cycles of 3, 6, 9 or 12 months was not over 2 days in most cases. The average length of any 3 consecutive cycles (expressed to the nearest whole day) varies so slightly from the average of more than 3 cycles, that only 3 consecutive cycles need to be utilized to obtain a practical average.

Day for Successful Insemination

Table 1 gives the days of the inseminations which resulted in the 162 conceptions. The greatest number of the latter occurred when insemination was
The Days of 162 Conceptions by Donor Inseminations in Relation to the Menstrual Cycle (Day for Insemination Selected by the Rat Hyperemia Test)

**Fig. 1.**

Conception took place on cycle days 10 to 20 in menstrual cycles which ranged from 23 to 38 days in average cycle length. About 79 per cent of the conceptions occurred on cycle day 11 to 14. The time of ovulation was determined by the rat hyperemia test. Each individual was inseminated only once during a menstrual cycle.

Performed 2 days prior to the midcycle day. For example, in Table 1, in the case of the 26 day cycle, 6 of the 16 conceptions occurred when insemination
Table 1.
The Day of 162 Conceptions by Donor Inseminations in Relation to the Menstrual Cycle.

<table>
<thead>
<tr>
<th>Average Length of Menstrual Cycle</th>
<th>No. of Conceptions</th>
<th>Post-Ovulatory Interval Range</th>
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<tr>
<td>Total</td>
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<td>10</td>
</tr>
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</table>

Range 20–38 Range 10–20 Range 9–21

The table lists the successful days of insemination and the postovulatory ranges. All conceptions occurred within an 8 day range, which may be considered the fertile period.
took place on day 11, which was 2 days before the midcycle day. The next largest number, or 5 conceptions, took place when insemination was practiced one day before the midcycle day. The data in the table indicate that successful insemination took place most frequently 1 or 2 days prior to the midcycle day. In fact, 28 per cent of the conceptions, in this series, took place when insemination was performed 2 days before the midcycle, and about 27 per cent of the conceptions occurred one day before the midcycle. All of the 162 conceptions occurred when insemination was performed as early as 2 days before the predicted day of ovulation, which day is 2 days before the midcycle (Farris, '52), and as late as 5 days after the predicted day of ovulation.

**THE FERTILE AND INFERTILE PERIODS**

For 364 Conceptions and the Fertile Period Calculated by Formula.*

![Diagram showing fertile and infertile periods](image)

**Fig. 11**

illustrates the fertile and infertile periods in relation to the average length of cycles. Note that only 6 or 1.6 per cent out of the 364 conceptions occurred during the infertile period.
The Fertile Period

On the basis of this and other studies (Farris, '52, '55) ovulation seems to occur about 2 days before the midcycle day. The fertile period includes 2 days prior to this day and 5 days after, or a total of 8 days.

The Safe Period

Figure II illustrates graphically the fertile and infertile periods in relation to the average length of cycles ranging from 20 through 40 days. It also illustrates another series of 364 timed conceptions (which included two unusually long menstrual cycle lengths of 49 and 62 days). Only 6 conceptions took place either before or after the 8 days required for contraceptive purposes. In other words, only 1.6 per cent of the 364 cases conceived outside of the fertile period or during the infertile period.

Comparison of the data from the 364 cases with the rhythm method of other workers (Ogino-Knaus) disclose that failure would have occurred in 22 per cent of the women rather than the 1.6 per cent found by the method described.

SUMMARY

Based upon observations which resulted in 162 conceptions by donor insemination, a method for establishing the fertile period is described. Conceptions occurred on cycle days 10 to 20 in menstrual cycles which varied in averages from 20 to 38 days in length. Seventy-eight and seven-tenths per cent of these conceptions occurred on cycle days 11 to 14 inclusive with 26 per cent of these occurring on cycle day 12.

Each subject was inseminated only once during a menstrual cycle, the rat hyperemia test was employed to determine the day of insemination.

The fertile period is determined by using 3 consecutive menstrual cycles to secure an adequate average of the cycle length. The ovulation day is predicted at about 2 days before the midcycle. The fertile period may extend for 2 days before to 5 days following the estimated day of ovulation for a total dose of 8 days.

REFERENCES

