

BLOOD BASOPENIA AS AN INDICATOR OF OVULATION

P. RAJAN, G. SUNDAR RAO AND S. WALTER*

Department of Physiology,
Christian Medical College,
Vellore- 632 002

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Abstract : Direct basophil counts were done on capillary blood samples in thirteen normal young women, during the different phases of their menstrual cycles. Mean basophil counts during the follicular and progesterational phases were 36.6/cumm and 39.3/cumm respectively. A significant midcycle fall in counts of 36% and a premenstrual fall of 22% were observed. These changes are probably due to migration of the cells from the peripheral blood into the rupturing follicle of the ovary and into the ischemic premenstrual endometrium.

Key words : basophils ovulation basopenia menstrual cycle

INTRODUCTION

The physiological importance of blood basophils has been recognized over the past few decades. Several important functions have been attributed to these cells. Thonnard-Newmann in 1954 (1), Boseila in 1959 (2) and Mettler and Shirwani in 1974 (3), observed a relationship between the female sex cycle and the basophils, showing significant changes in their counts during the cycle, especially associated with ovulation both in humans and in animals. However, their reports are conflicting with regard to the direction of these changes. The present study was undertaken to re-examine this phenomenon.

METHODS

Thirteen normal female medical students formed the subjects of this study. Their age, height and weight were 17.9 ± 0.86 yrs, 158.7 ± 7.02 cms, and 49.9 ± 5.32 kg, respectively. They had normal regular menstrual cycles and no history of any respiratory or other allergy. The date of the last menstrual period and the date of the menstrual period following the study were recorded. Each student was provided with a thermometer and asked to record her basal body temperature (BBT) every morning. The menstrual cycle was divided into five phases, designated

backwards from the onset of the next menstrual period, since it is known that the length of the progesterational phase is more constant than the length of the follicular phase (4).

- Premenstrual — 1st to 3rd day prior to the onset of next menstruation
- Progesterational — 4th to 9th day prior to the onset of next menstruation
- Ovulation — any day, 10 to 15 days prior to the onset of next menstruation
- Follicular — 16th day prior to the onset of next menstruation to the 5th day of the cycle.
- Menstrual — 1st to 4th day of menstruation

Blood samples were collected daily throughout one complete menstrual cycle. This was done at the same time of the day to avoid possible diurnal variations. Five micro litre samples of capillary blood were obtained by finger prick, in micropipettes dried with EDTA. Thick smears were made on glass slides, which had a circle of 1.5 cm diameter etched on them. Smears were stained with toluidine blue using the technique of Mendanha and Walter (5) were studied for basophil counts.

*Corresponding Author

RESULTS

The Table shows the mean basophil counts during different phases of the menstrual cycle. Basophil counts during the follicular and progestational phases were 36.6/cu. mm \pm 3.74 (SE) and 39.3/cu. mm \pm 5.42 (SE) respectively. A statistically significant fall to 23.4/cu. mm ($P < .001$) during midcycle and to 30.8/cu. mm ($P < .05$) during the premenstrual phase was observed.

TABLE I : Basophil counts during the menstrual cycle.

| | Menstrual phase | Follicular phase | Ovulation | Progestational phase | Premenstrual phase |
|-----------------|-----------------|------------------|-----------|----------------------|--------------------|
| Mean Cells/cumm | 36.3 | 36.6 | 23.4*** | 39.3 | 30.8* |
| SE | 4.17 | 3.74 | 2.19 | 5.42 | 4.43 |

* $P < .05$ *** $P < .001$

Menstrual — 2nd day of cycle

Follicular — 7th day of cycle

Ovulation — lowest of the counts obtained from the 10th to the 15th day prior to next cycle.

Progestational — 6th day prior to next cycle.

Premenstrual — 2nd day prior to next cycle.

An analysis of the BBT showed that of the 13 subjects, only 8 showed midcycle changes. These 8 subjects showed a fall in temperature lasting for 1 to 3 days, followed by a sudden rise in four subjects, and a slower stepwise rise in the other four. The mean magnitude of the fall was 0.5°C and the subsequent rise 1.1°C.

DISCUSSION

The basophil counts obtained in this study are similar to values reported for women by Boseila, (2) and are comparable to values obtained by the authors in an earlier study on male nonsmokers (6).

The present findings show significant variations occurring in the blood basophil counts during the

normal menstrual cycle. A midcycle fall of 36% and a premenstrual fall of 22% was observed. A fall in the count could occur, either due to degranulation and loss of identify of the cells in the blood, or due to migration of the cells to an area of need. It is difficult to envisage a degranulation of this magnitude with its consequent mediator release occurring in the peripheral blood without producing systemic effects. It is, therefore, more likely that the fall in basophil counts is due to their migration to the rupturing follicle and to the ischemic endometrium prior to menstruation. It is known that histamine plays an important role in the mediation of ovulation (7, 8). The basophils are the chief reservoir of histamine in the blood (9). Chemical factors released at the site of the maturing ovum could elicit basophil chemotaxis and cause basophil migration and subsequent histamine release locally. Sex hormones themselves do not seem to have a direct effect on basophil degranulation (10). However, the ubiquitous and powerful local hormones, prostaglandins, could well play an intermediary role. PGF₂ α and PGE₂ in the ovary and endometrium show cyclic variation during the menstrual cycle (11). Since PGE₂ is a well known modulator of basophil degranulation (12), it is possible that this hormone plays a role in the basopenia during ovulation and prior to menstruation.

The present observations also suggest that the fall in basophil count may be a more reliable indicator of midcycle events, than the changes in BBT. A simultaneous investigation of the hormonal status of the subjects would have provided additional valuable information, but this could not be done in the present study.

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