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Levels of Eosinophils, Platelets, Leukocytes and 17-Hydroxycorticosteroids During Normal Menstrual Cycle.* (25759)

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Ovulation is associated with thermal, chemical, cytologic and histologic changes in the human and affects levels of certain formed elements of blood(1-3). Eosinopenia has been observed during ovulation and menstruation, and it has been suggested that physiological stress at these periods may increase levels of adrenocortical hormones causing eosinopenia(3,4). The present study was concerned with relationship of levels of plasma 17, 21-dehydroxy-20-keto-steroids (17-hydroxycorticosteroids (17-OHCS) with levels of eosinophils, platelets and leukocytes during menstrual cycle.

Materials and methods. Twelve healthy women with normal menstrual cycles and one oophorectomized control subject were investigated. Two women were allergic. Oral temperature records were kept. Eosinophil, platelet, leukocyte and differential counts and plasma 17-OHCS determinations were performed between 12 noon and 1:00 p.m., to avoid diurnal variations. Approximately 11 to 13 counts and steroid determinations were obtained on each woman during mid-cycle and menstruation, as shown for one patient in Fig. 1. Direct platelet counts were done by phase microscopy(5) and eosinophils were counted by the Wintrobe method(6). Estimations of 17-OHCS in plasma were made by micromethod of Riondel *et al.*(7). Since it was desirable to obtain minimal amounts of blood from each woman daily, duplicate steroid determinations were not feasible. However, duplicate steroid determinations were done on 10 other normal women. The standard deviation of differences in values of the 2 determinations was 3.1. On the basis of these results, there is 95% confidence that an individual observation is no further from the true value than 7 μg%.

Results. A total of 183 eosinophil, platelet, total leukocyte and differential counts and 164 determinations of 17-OHCS levels were performed on 13 women with the results shown in Table I.

Eosinophil levels during menstrual cycle. Eosinopenia occurred during menstruation and on one day in mid-cycle in the majority of women. Menstrual eosinopenia occurred in 9 cycles (75%). However, the lowest eosinophil values of the entire cycle were usually in mid-cycle (Fig. 1). When basal

TABLE I. Results of Counts and 17-OHCS Determinations.

	Mean	Stand. error
Eosinophils	162.3	7.9
Platelets	254,955	3,907.–
W. B. C.	8,516	171.–
Polymorphonuclear leukocytes	5,483	267.–
Lymphocytes	2,573	56.–
17-OHCS	12	.71

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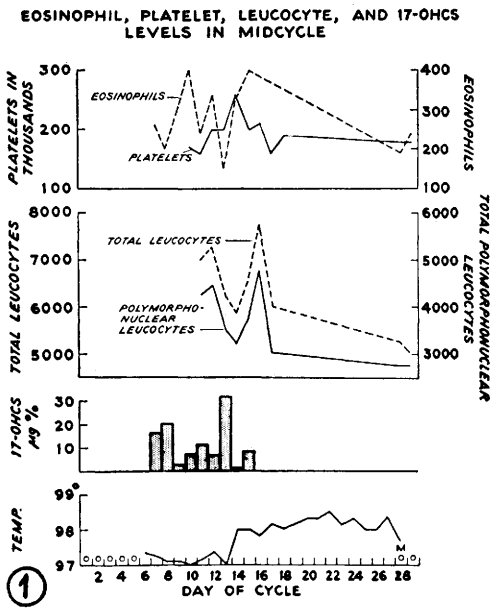

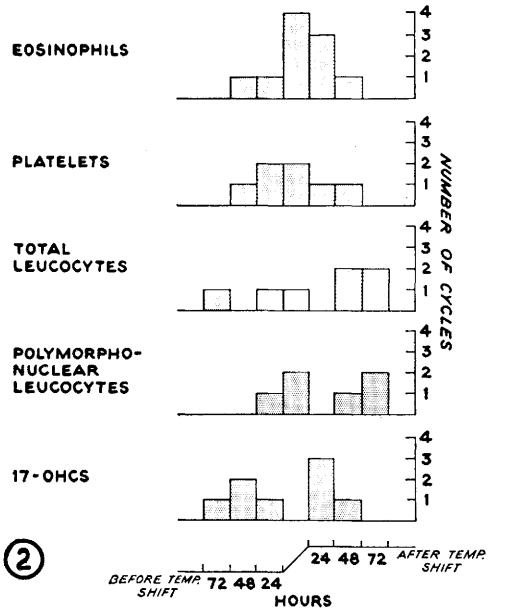

FIG. 1 and 2.

temperature graphs were correlated with eosinophil levels, eosinopenia occurred during ovulatory period in 10 cycles (83.3%) and was absent in 2 cycles (16.7%) (Fig. 2). The 2 allergic women had much more pronounced eosinopenia during mid-cycle than the non-allergic subjects.

Platelet levels during menstrual cycle. The platelets showed wave-like fluctuations during menstrual cycle with elevations in mid-cycle and depressions during menstruation in most cycles (Fig. 1). During menstruation, thrombocytopenia occurred in 8 cycles (66.6%). When basal temperature shifts were correlated with platelet levels, thrombocytosis developed during ovulatory period in 7 cycles (58.3%). In 5 cycles (41.7%) platelet elevations in mid-cycle were absent (Fig. 2).

Leukocyte levels during menstrual cycle. Leukocytosis occurred in mid-cycle in 7 cycles (58.3%). Polymorphonuclear leukocytes had mid-cycle elevations in 6 cycles (50%) (Fig. 1, 2). Levels of lymphocytes showed no significant variations during menstrual cycle. During menstruation, total leukocytes and neutrophilic leukocytes remained at normal levels in the majority of women.

17-OHCS levels during menstrual cycle. In each of 12 menstrual cycles, a peak value of 17-OHCS lasting 24 hours was noted in mid-cycle (Fig. 1). This represented highest steroid level in all but 3 cycles where highest values occurred during first and second day of menstruation. When 17-OHCS levels were correlated with temperature graphs, in 8 cycles (66.6%) the highest steroid levels occurred within 72 hours before temperature shift or within 48 hours after it (Fig. 2).

When steroid levels were correlated with the corresponding eosinophil values, in 6 cycles (50%) 17-OHCS were at peak values when eosinophils were at lowest levels. In 3 cycles (25%) the highest 17-OHCS levels occurred 24 hours before or after eosinopenia, in 2 cycles (16.7%) 48 hours before it, and in 1 cycle (8.3%) steroid peak occurred 72 hours before eosinopenia. Thus in all but one menstrual cycle steroid peaks occurred during or shortly before day of eosinopenia. During menstruation, 17-OHCS levels showed an inverse relationship to eosinophil levels in 6 out of 9 cycles (66.6%) in which steroid levels were determined. In the oophorectomized woman, a fairly close inverse relationship between steroid and eosinophil levels was established, but no significant variations in

eosinophil, platelet or leukocyte levels were found.

Comment. Since Pfeiffer and Hoff(8) first reported fluctuations of platelet levels during menstrual cycle, others have demonstrated thrombocytopenia during menstruation and thrombocytosis during the mid-cycle(2,9). When basal temperature graphs were correlated with platelet levels in the present study, it was again demonstrated that platelet elevations in mid-cycle occurred during the ovulatory period in the majority of women. It seems unlikely that thrombocytosis occurring in mid-cycle is related to increased 17-OHCS levels, since surgical stress is associated with thrombocytopenia(10).

Leukocytosis and increase of polymorphonuclear leukocytes in mid-cycle occurred in a majority of women. These may be attributed to a temporary increase of steroid levels, since other forms of stress produce leukocytosis (11).

Eosinopenia during the ovulatory period and during menstruation has been described, but explanations of the cause of this phenomenon have varied(3,4,12). The present study demonstrated eosinopenia in mid-cycle in 83% of women, even though eosinopenia and 17-OHCS peaks occurred on the same day in only 50% of women.

A diurnal inverse relationship between levels of eosinophils and 17-OHCS has been demonstrated previously in normal individuals(13). Although non-adrenal influences may affect the level of circulating eosinophils (14), it seems likely from our study that eosinopenia which occurred during ovulatory period in the majority of women resulted from increased 17-OHCS levels. In addition, menstrual eosinopenia found in a majority of women studied occurred in association with higher steroid levels. These data suggest that eosinopenia and increased 17-OHCS levels may result from stressful situations occurring during menstrual cycle.

Conclusions. Eosinopenia, thrombocytosis, leukocytosis, and increased 17-OHCS levels were demonstrated during ovulatory period. During menstruation, eosinopenia, thrombocytopenia and higher 17-OHCS levels occurred in the majority of women studied. It is suggested that stressful situations during ovulatory periods and menstruation may cause increased 17-OHCS levels with resulting eosinopenia.

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