Morning Changes in Number of Circulating Eosinophils in Infants.* (19750)

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Human infants exhibit cycles in bodily activity of about 3, rather than of 24-hour duration(1,2). The daily temperature curve shows only slight deviations from a straight line during the neonatal period(3,4). The 24-hour rhythm in the glycogen content of the liver of rats is absent during the first 2 weeks of life—a period roughly corresponding for man to that covered by the last months of intrauterine life and the first 2 months after birth(5). These observations suggest that several 24-hour periodicities which are features of the physiology of mammals from adolescence throughout senescence are absent during the neonatal period. Accordingly, an inquiry into the time of appearance of the 24-hour rhythm in number of eosinophils, which has been established for mature mice(6) and man(7), appeared to be of possible interest. This was carried out by means of endogenous eosinopenia tests(8) on infants of 2 age groups.

Materials and methods. The subjects of this investigation were patients of the pediatric service at the University of Minnesota Hospitals convalescing from non-endocrine disease. Infants of both sexes constituted the 2 age groups listed in Table I. Nursing of Group I infants was carried out unchanged on the morning of testing at 4-hour intervals starting daily at 01:30, according to the routine of this hospital. The infants constituting Group II had breakfast at 07:30. Stimulation other than daily routine was avoided for all the subjects of this investigation. The time of day of blood sampling was kept identical with the schedule suggested for endogenous-eosinopenia tests in adults(8). Samples of capillary blood were obtained at 06:30 and at 09:30 of the same morning for eosinophil counts by the direct chamber method. Certified diluting pipettes, Randolph's diluting fluid(9), and certified 0.2 MM deep Levy counting chambers with Fuchs-Rosenthal double ruling were employed.

TABLE I. Summary of Morning Changes in Number of Eosinophils per mm^3 in 2 Age Groups of Children.

Group No.	Chronological age	No. of tests	Mean* ± S.E.	t	P_t
1	1 day to 7 mo	16	+54±24	2.21	.043
2	Over 15 mo	17	−39±12	3.32	.005

* Mean % change from the 06:30 to the 09:30 count (with the value obtained at 06:30 equal to 100%).

Results. The results are expressed as per cent change from the 06:30 to the 09:30 count, with the value obtained at 06:30 equal to 100%. A considerable scatter in the morning change in eosinophils in the infants composing the 2 groups studied is readily apparent from Fig. 1. However, most of the infants older than 15 months (Group II subjects) show a decrease in number of circulating eosinophils, a phenomenon established by earlier work for mature man(7). It can be seen from Table I that the endogenous eosinopenia of Group II subjects is significant below the 1% level ($P = .005$). By contrast, only 4 out of a total of 16 tests on Group I infants show a decrease in number of eosinophils. These infants show on the average an increase (+ 54%; $P = .043$). The difference in mean per cent change in number of eosinophils from 06:30 to 09:30 for the 2 groups investigated is 93 ± 27 ($P = .001$). It appears fair to infer that we deal with 2 different populations of infants, from the point of view of their variations in number of eosinophils.

Discussion. The absence of endogenous eosinopenia from 06:30 to 09:30 in Group I subjects could possibly indicate that eosinophil variations during early infancy lack the 24-hour spacing noted later in life. The data indicate that tests for endogenous eosinopenia which employ the 06:30 to 09:30 sampling schedule can be carried out from the age of

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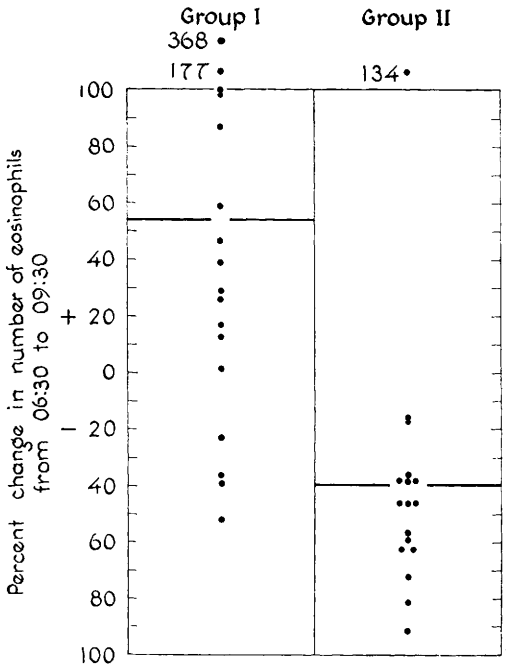

FIG. 1. Morning changes in number of circulating eosinophils in 2 groups of infants (Group 1: younger than 7 months; Group 2: older than 15 months).

15 months onward with the same results as in adults. Tests during the first 7 months of life yield predominantly positive results, *i.e.*, an increase rather than a decrease in number of eosinophils.

It has been shown that endogenous eosinopenia in mature man is synchronized with initiation of daily activities(10). It is conceivable that the several alternations of the activity (and/or feeding) cycle within 24-hour periods, in infants, are associated with eosinophil variations which likewise occur over shorter periods. The marked endogenous eosinopenia in Group II infants is in keeping with the assumption of a developed 24-hour rhythm in number of eosinophils in infants older than 15 months. In view of the parallelisms between the activity and eosinophil rhythms it is of further interest that the activity rhythm of a baby, studied during the first 15 months of its life by Mullin, showed a steady rise in the day to night ratio for bodily activity up to the 7th month(11). It may be also of interest that marked 24-hour periodicity in body temperature of infants first appears during the second year of life, although an approach to a temperature rhythm can be discerned during the first year in that 24-hour variations gradually increase in amplitude (12). Finally, it is noted that the 24-hour rhythm in the glycogen content of the liver in rats develops during the 3rd week of life—a period roughly corresponding to that covered by about the 3rd to the 9th month of human postnatal life(5).

Summary. Morning changes in number of eosinophils were studied in 2 age groups of infants, in the absence of stimulation other than daily routine. Endogenous morning eosopenia, which is one of several physiological periodicities exhibiting 24-hour spacing in maturity, is not revealed in early infancy by tests employing the 06:30-09:30 sampling. By contrast, most infants older than 15 months show a marked decrease in number of eosinophils from 06:30 to 09:30 of the same morning. The significance of these findings is discussed.

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