

THE LEUCOCYTE COUNT IN CHILDREN WITH MONGOLISM

By

URSULA MITTWOCH, Ph.D.

Galton Laboratory, University College, London

A PREVIOUS communication (Mittwoch, 1957) contained evidence that the leucocyte count in children with mongolism showed certain abnormalities. Although the total count was not affected, the lymphocyte count was lower and the neutrophil count seemed somewhat higher than in a comparable control group. It will be shown in the present paper that these differences between mongol and non-mongol children are dependent on age, and that the gradual drop with age of the lymphocyte count, which is found in normal children (Kato, 1935), does not occur in children with mongolism.

PATIENTS INVESTIGATED

The investigation was performed on 50 children with mongolism and on 50 non-mongol, mentally defective children, who were all patients of the Fountain Hospital. The range of ages was between 3 and 14 years, except for one patient of 20 years in both groups. The mean age of all children with mongolism was 7·16 years, that of the controls 6·91 years. In both groups males and females were present in equal numbers, and, in order to keep conditions as comparable as possible, each time specimens of blood were taken from mongols, specimens were also taken from the same number of controls of the same sex and similar age.

METHODS

Specimens of capillary blood were obtained from pricks on the finger. All specimens were taken during the middle morning hours. For the counting of total leucocytes, 0·025 c.c. of blood were taken and diluted 20 times. Four counts of 1 sq. mm. on the haemocytometer were performed.

For the differential count, blood films were made on cover-slips, stained with Giemsa and mounted. Two hundred cells were classified for each count.

RESULTS

The mean numbers of the different types of leucocytes found in mongols and controls are shown in Table I. The last column of the Table gives the probability with which the differences between the mongols and controls would occur on a random hypothesis.

It will be seen that the figures for total granulocytes are very similar to those for neutrophils, so that it makes no difference which count is chosen. In the last row of the Table the difference between granulocytes and lymphocytes is given for each group. Although it is not implied that this difference between the granulocyte and lymphocyte counts has any physiological basis,

TABLE I
Mean Leucocyte Counts Per c.mm. of Blood in 50 Mongols and 50 Controls

Type of Cell	Mongols	Controls	Mongols- Controls	'98	Probability
Total leucocytes	8,254	7,965	289	0.53	0.6
Total granulocytes	5,492	4,402	1,089	2.69	0.01*
Neutrophils	5,184	4,048	1,136	2.84	0.01*
Eosinophils	282	339	-57	1.00	0.4
Basophils	26	15	11	$\chi^2=5.80\dagger$	0.02*
Lymphocytes	2,102	2,888	-786	3.36	0.01*
Monocytes	660	674	-16	0.25	0.8
Granulocytes-lymphocytes ..	3,390	1,514	1,876	4.44	0.001*

* Difference judged to be significant.

† Owing to the small number of basophils, the distribution is discontinuous, and the χ^2 method had therefore to be used.

it was used because in practice it provided the biggest difference between the mongols and controls.

The total number of leucocytes found was very similar in the mongols and controls, and the small excess in the mongols is not statistically significant. Again, no significant differences between the two groups were observed in the numbers of eosinophils and in the monocytes.

The mongols differed in the number of neutrophils and of lymphocytes, as well as in the number of basophils; but the basophil count was so low (0.3 per cent. and 0.19 per cent. in mongols and controls respectively), that the numbers are difficult to interpret.

In the mongols there were more neutrophils and fewer lymphocytes than in the controls. These differences were particularly marked in the younger age groups as will be seen from Tables II and III. For the purpose of these tables both groups were divided into two according to age; the mean ages for the younger and older mongols were 4.47 and 9.85 years respectively, and those for the younger and older control groups 4.33 and 9.65 years respectively.

TABLE II
Comparison Between Leucocyte Counts in 25 Mongols (Average Age 4.47 Years) and 25 Controls (Average Age 4.33 Years)

Type of Cell	Mongols	Controls	Mongols- Controls	'48	P
Total leucocytes	8,768	8,416	352	0.44	0.7
Neutrophils ..	5,789	4,235	1,554	2.66	0.02
Lymphocytes ..	2,040	3,271	-1,231	3.45	0.01

TABLE III
Comparison Between Leucocyte Counts in 25 Mongols (Average Age 9.85 Years) and 25 Controls (Average Age 9.65 Years)

Type of Cell	Mongols	Controls	Mongols- Controls	'48	P
Total leucocytes	7,740	7,514	226	0.32	0.8
Neutrophils ..	4,578	3,860	718	1.35	0.2
Lymphocytes ..	2,164	2,505	-341	1.18	0.3

It will be seen, from Table II, that in the younger mongols there was an excess in the number of neutrophils of about 1,500, while the lymphocyte count showed a relatively even more marked shortage of about 1,200 cells. In the older age group (Table III) there was still an excess of neutrophils and a shortage of lymphocytes in the mongols, but the differences are no longer significant.

In both age groups the differences of the total white cell counts are quite insignificant. A comparison of the leucocyte counts between the younger and older group of mongols is given in Table IV, while a similar comparison for the controls is given in Table V. The most important point emerging from these tables is that while, in the controls, the lymphocyte count fell with age, this effect was not observed in the mongols.

TABLE IV
Comparison Between Leucocyte Counts in 25 Mongols of Average Age 4·47 Years and 25 Mongols of Average Age 9·85 Years

Type of Cell	Younger Mongols	Older Mongols	Younger Mongols—Older Mongols	48	P
Total leucocytes	8,768	7,740	1,028	1·03	0·3
Neutrophils ..	5,789	4,578	1,211	1·92	0·1
Lymphocytes ..	2,040	2,164	-124	0·37	0·8

TABLE V
Comparison Between Leucocyte Counts of 25 Controls of Average Age 4·33 Years and 25 Controls of Average Age 9·65 Years

Type of Cell	Younger Controls	Older Controls	Younger Controls—Older Controls	48	P
Total leucocytes	8,416	7,514	902	1·32	0·2
Neutrophils	4,235	3,860	375	0·80	0·5
Lymphocytes ..	3,271	2,505	766	2·25	0·05

DISCUSSION

It is sometimes asserted that, owing to the increased susceptibility of mongols to infections of various kinds, leucocytosis may be a prevalent condition. The present findings do not support this view. A few rather high counts were observed, but their number was not large. Thus three of the mongols had total white cell counts of over 14,000 per c.mm., as compared with two cases in the controls. None of the counts was over 15,500, and the average number of, roughly, 8,000 leucocytes per c.mm. in both the mongols and the controls is well within the range of that reported by other investigators for similar age groups (cf. Sturgis and Bethell, 1943). These findings therefore agree with those of Benda (1947) that leucocytosis is not a common factor associated with mongolism.

The most striking difference between the mongols and controls in the present series is the low lymphocyte count in the mongols belonging to the younger age group, i.e. between 3 and 6 years. This low lymphocyte count was associated with a rather high neutrophil count. Normally infants have a high lymphocyte count, which gradually falls with age. At the age of 4 years lymphocytes and neutrophils should be present in about equal numbers of, roughly, 4,000 per c.mm. (Whitby and Britton, 1953; Kato, 1935; Sturgis and Bethell, 1943). Thereafter the lymphocyte count continues to fall throughout childhood. As can be seen from Table II, the average numbers of neutrophils and lymphocytes in the younger group of control children (mean age 4·33 years) are 4,235 and 3,271 respectively, while the corresponding figures for mongols (mean age 4·47 years) are 5,789 and 2,040 respectively. The ratio of neutrophils to lymphocytes in the control group is therefore 1·3, while

that in the mongols is 2·8. It is thus evident that the neutrophil and lymphocyte counts in mentally defective, non-mongol children between 3 and 6 years is much closer to the normal than to the counts in mongols.

In the older age group the differences between the mongols and controls have become smaller. This is largely due to the fact that the fall of the lymphocyte count with age, which is found in normal children and which was observed in the mentally defective controls, did not occur in the mongols whose lymphocyte count was low throughout the whole age group investigated. Although mongols may be more retarded with respect to certain aspects of their chemical physiology than other mentally defective children (Stern and Lewis, 1957), a comparison of the leucocyte counts in mongols and controls does not suggest that the changes observed merely reflect a displacement of the changes in the leucocyte count with age. It seems more likely that a qualitative difference is involved. Since mongolism predisposes to leukaemia (Stewart, 1957; Krivit and Good, 1956; Merrit and Harris, 1956), it is felt that the cause of the abnormal leucocyte counts in children with mongolism is worth investigating.

The common occurrence of lymphopenia in children with mongolism was already described by Benda (1947). The data of Shapiro (1949) show no evidence that the percentage lymphocyte count of adult mongols is lower than that of controls. Both findings fit in with the present data, which indicate that the relative lymphopenia of mongol children compared with controls decreases with increasing age during childhood; it might therefore have disappeared altogether by the time adulthood is reached.

SUMMARY

Total and differential leucocyte counts were obtained for 50 children with mongolism between the ages of 3 and 14 years and for 50 non-mongol mentally defective children in the same age group.

The total leucocyte count showed no significant difference between mongols and controls. The mean value for mongols was 8,254, that for controls 7,965.

The neutrophil count of the mongols was significantly higher than that of the controls. The mean count for mongols was 5,184, that for controls 4,048.

The lymphocyte count of the mongols was significantly lower than that of the controls. The mean count for mongols was 2,102, and that for controls 2,888. The lymphocyte count in the controls fell with increasing age, while that of the mongols remained stationary.

The basophil count was low in both mongols and controls, but it was higher in the mongols.

The eosinophil and monocyte counts showed no differences between mongols and controls.

ACKNOWLEDGMENTS

I am very much indebted to Dr. L. T. Hilliard, Dr. B. H. Kirman and Dr. J. Stern of the Fountain Hospital for their co-operation and interest in this work, and to Dr. H. Lehmann of St. Bartholomew's Hospital for helpful suggestions.

REFERENCES

- BENDA, C. E., *Mongolism and Cretinism*, 1947. London: Heinemann.
 KATO, K., "Leucocytes in infancy and childhood", *J. Pediat.*, 1935, 7, 7.
 KRIVIT, W., and GOOD, R. A., "The simultaneous occurrence of leukemia and mongolism", *Amer. J. Dis. Child.*, 1956, 91, 218.
 MERRIT, D. H., and HARRIS, V. S., "Mongolism and acute leukaemia", *Amer. J. Dis. Child.*, 1956, 92, 41.
 MITTWOCH, U., "Some observations on the leucocytes in mongolism", *J. Ment. Def. Res.*, 1957, 1.
 SHAPIRO, A., "The differential leucocyte count in mongols", *J. Ment. Sci.*, 1949, 95, 689.
 STERN, J., and LEWIS, W. H. P., "Serum proteins in mongolism", *J. Ment. Sci.*, 1957, 103, 222.
 STEWART, A., "A current survey of malignant diseases in children", *Proc. Roy. Soc. Med.*, 1957, 50, 251.
 STURGIS, C. C., and BETHELL, F. H., "Quantitative and qualitative variation in normal leucocytes", *Physiol. Rev.*, 1943, 23, 279.
 WHITBY, L. E. H., and BRITTON, C. J. C., *Disorders of the Blood*, 1953. London: Churchill.