at the same time. The red blood cells may be counted from the same preparation in the usual manner.

Derivation of the figure representing the total white blood cells per cu. mm. of blood depends upon calculating the number of eosinophiles in one cu. mm. diluting fluid ($\times$ 10/9) then correcting for the dilution ($\times$ 200) and finally multiplying this result by the fraction $\frac{100}{\text{percentage of eosinophiles}}$.

Since for any particular total cell count these values are all constants with the exception of the percentage of eosinophiles, it is possible to calculate a single factor for use with each percent of eosinophiles. This simplifies the above calculations to one step, namely, the multiplication of the number of eosinophiles counted in 0.9 cu. mm. diluted blood by the factor corresponding to the percentage of eosinophiles found in the differential count. Table I contains 100 factors each corresponding to a particular percentage of eosinophiles.

Two examples will clarify this explanation:

Example 1. *Without Use of Table:*

Number of cells counted in entire ruled area (0.9 cu. mm.) 26
Percentage of eosinophiles in differential count 60
Total white cells $26 \times 10/9 \times 200 \times 100/60 = 9{,}627$

Example 2. *With Use of Table:*

Number of cells counted in entire ruled area (0.9 cu. mm.) 26
Percentage of eosinophiles in differential count 60
Total white blood cells $26 \times 370.3 = 9{,}627$

It is believed that both technical and mathematical errors will be reduced in observations on avian blood by the adoption of the procedures outlined in this presentation.

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Preliminary Observations on Human Blood in Early Syphilis by the Supravital Method.

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Cells in the circulating blood frequently reflect the pathological process which is occurring in the tissues. Reports of cellular changes

in tissues of syphilitic rabbits have appeared recently.[1, 2] Preliminary blood studies in selected patients at the University Clinic showing early syphilitic lesions revealed such definite deviations from the normal differential blood count that it seemed worth while to make repeated observations on such cases. Seventeen young adults of both sexes with uncomplicated early syphilis were selected. Observations were made at weekly intervals for 3 weeks to 4 months. Standardized pipettes were used and the supravital technique utilizing Janus green and neutral red in physiological concentrations was used for differentiating the white blood cells.

The physiological range for the white blood cells in the normal adult human during any 24 hours represents a fluctuation of 100% in the total cells, with corresponding numerical changes in the individual cell strains. This normal qualitative and quantitative range must be recognized and only those deviations outside this range may be interpreted as related to specific tissue reactions.

In all but 3 cases, the total white cell count remained within normal limits, i. e., 5,000 to 10,000, throughout the period of observation. That the total number of white cells remains so consistently within normal limits may account for the lack of significance which has been attributed in the past to cytological studies of the peripheral blood in syphilis. It is only when careful differential studies of the cells of the blood are made that certain significant changes are noted.

At the time these observations were being made, Pearce and Rosahn[2] published findings from a supravital study of early primary and secondary syphilitic lesions in rabbits. A transient increase in monocytes in the peripheral blood was found associated with a monocyte proliferation at the site of the lesions.

In our human cases 75% of the patients showing early lesions presented a monocyte rise greater than the physiological range.* For example, a white male, aged 21, with a chancre of 7 weeks' duration and a generalized maculo-papulo-pustular rash covering the entire body of 5 days' duration, showed monocytes approaching their peak. Within the following week, 18% of the 10,000 white blood cells in the peripheral circulation were monocytes (1800 per cu. mm.). Under antiluetic treatment there was a rapid fall in the monocytes during the following 12 days, to 200 cells. The total

[1] Morgan, Hugh J., *Trans. Assn. of Am. Phys.*, 1930, **45**, 67.

[2] Pearce, L., and Rosahn, P. D., PROC. SOC. EXP. BIOL. AND MED., 1931, **28**, 654.

* Shilling gives 6% monocytes as the normal average for the human adult, which in absolute numbers would represent from 300 to 600 cells.

polymorphonuclear neutrophils and lymphocytes remained within the limits of normal during this time, though both showed a definite "shift to the left," in younger types within their respective cell strains. A definite monocyte rise of greater or lesser magnitude has been found in the majority of the cases thus far studied in the primary and secondary stages of the disease. There have been no qualitative changes noted similar to those described in tuberculosis.

Seventy-five per cent of the cases have shown a definite increase in eosinophilic leucocytes, one patient having had as many as 2500 eosinophils in a total count of 9,000 white cells. An occasional patient has shown a marked eosinophilia without a monocyte increase in the blood, though the rule has been to find both of these cell types increased. The average early case has shown from 2 to 12% eosinophils, the total number seldom going above 1,000 per cu. mm. Basophils were present in 11 cases, but in increased relative and absolute numbers in only 2 patients.

The neutrophilic leucocytes were affected less than any of the blood cells in both number and quality, though an occasional patient showed a "shift to the left" in the nuclear formula.

Only a rare clasmatocyte has been seen in the blood of the cases thus far studied.

The lymphocytic fluctuations varied from patient to patient. The majority of the cases showed the total lymphocytes to be well within the established limits of normal. Qualitative studies revealed some tendency to an increase in the younger cell types. Four of the cases showed a very definite lymphocytosis associated with young cell types.

All cases are being followed to determine if possible the significance of the variation in cellular response during the initial stages of the disease, and the effect of various types of treatment on the cellular picture and clinical course of the disease in individual patients.