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Persistent Deficiency of Myeloperoxidase and Lactoferrin in Granulopoietic Cells of Patients with Acute Leukemia *

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Searching for prognostic factors which could help in the management of the therapy of human leukemia, we found marked cytochemical abnormalities in granulopoietic cells in plasma clot cultures of bone marrow and also peripheral blood cells of patients with acute leukemia [1]. We plotted the data of CFU-c colony/cluster ratio [2] versus MPO staining (Fig. 1) and found a significant decrease in the percentage of MPO-positive staining colonies. The colony/cluster ratio also showed a slight decrease, although these differences were not significant. CFU-c colony/cluster ratio versus colony number (Fig. 2) showed no significant difference although a slight decrease in colony numbers was suggestive.

Using these data in a logistic regression analysis and plotting the percentual a posteriori probability of membership to a normal group versus the time after establishing the diagnosis, we found marked abnormalities for leukemia patients on and off therapy (Fig. 4). In order to investigate whether the disturbance of maturation observed in vitro was related to the plasma clot technique or whether it reflected an in vivo mechanism, semiquantitative cytochemical

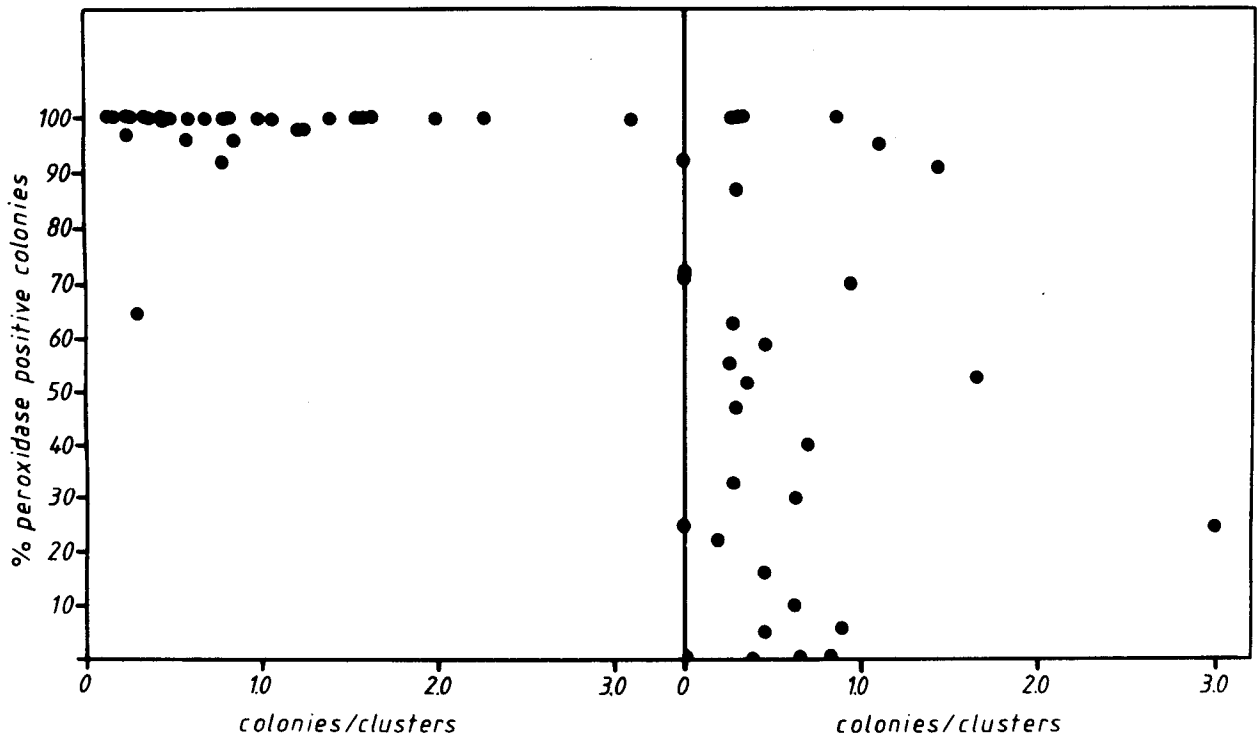

Fig. 1. CFU-c colony/cluster ratio versus MPO staining. *Left,* control; *right,* patient group

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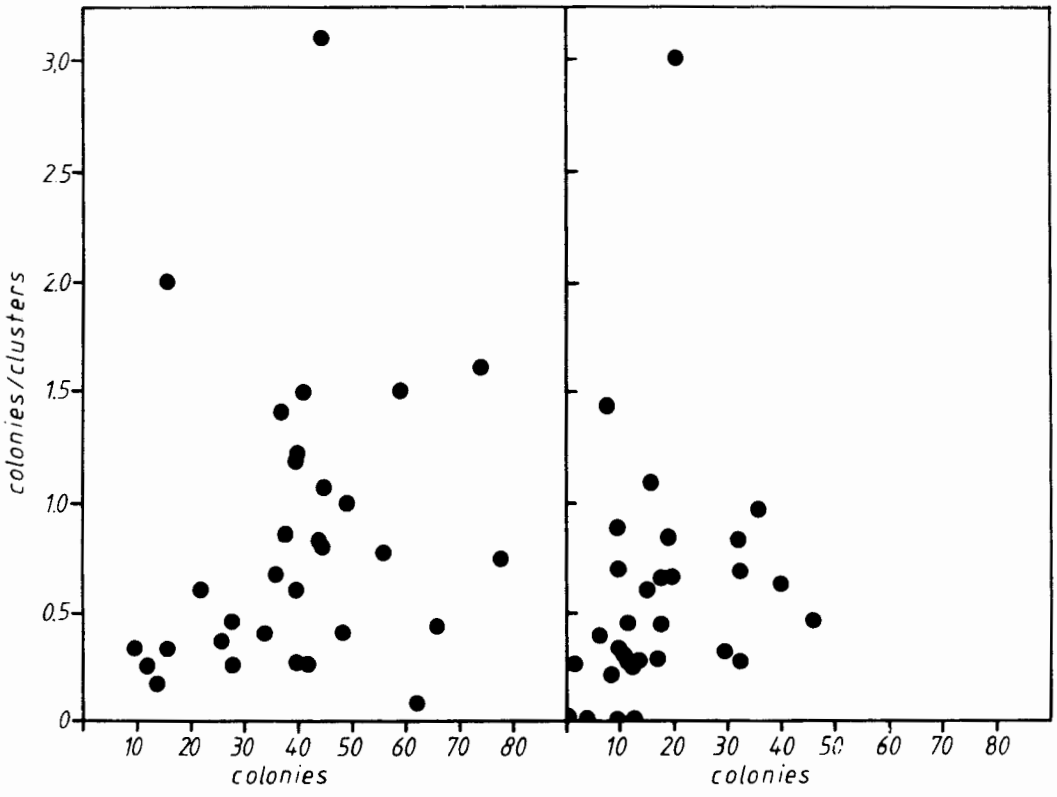

Fig. 2. CFU-c colony/cluster ratio versus colony number. *Left,* control; *right,* patient group

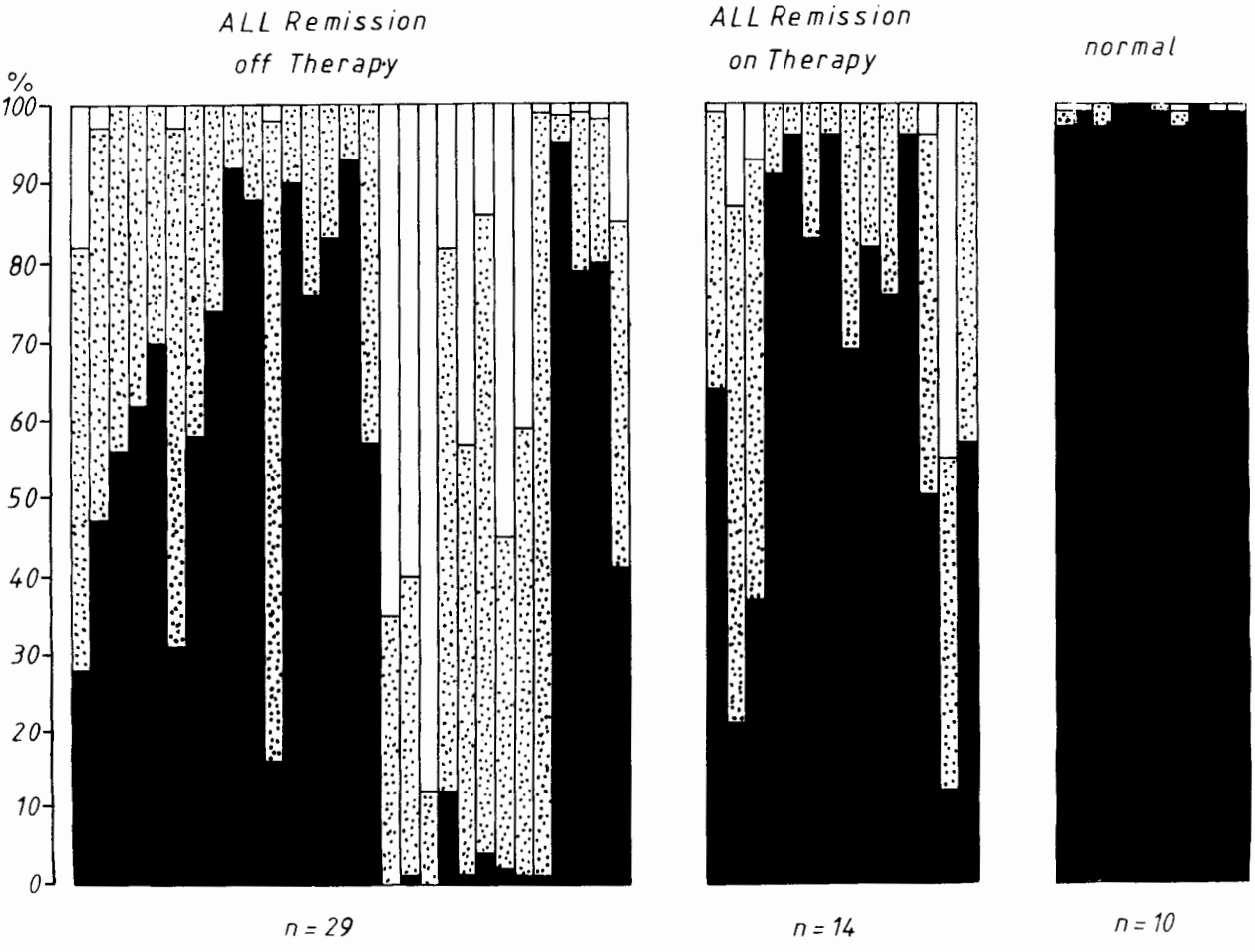

Fig. 3. Results of MPO staining for PmN in children with ALL in complete remission off chemotherapy and on maintenance treatment, and for comparison the juvenile control group. ■, + + cells; ⊡, ± cells; □, – cells

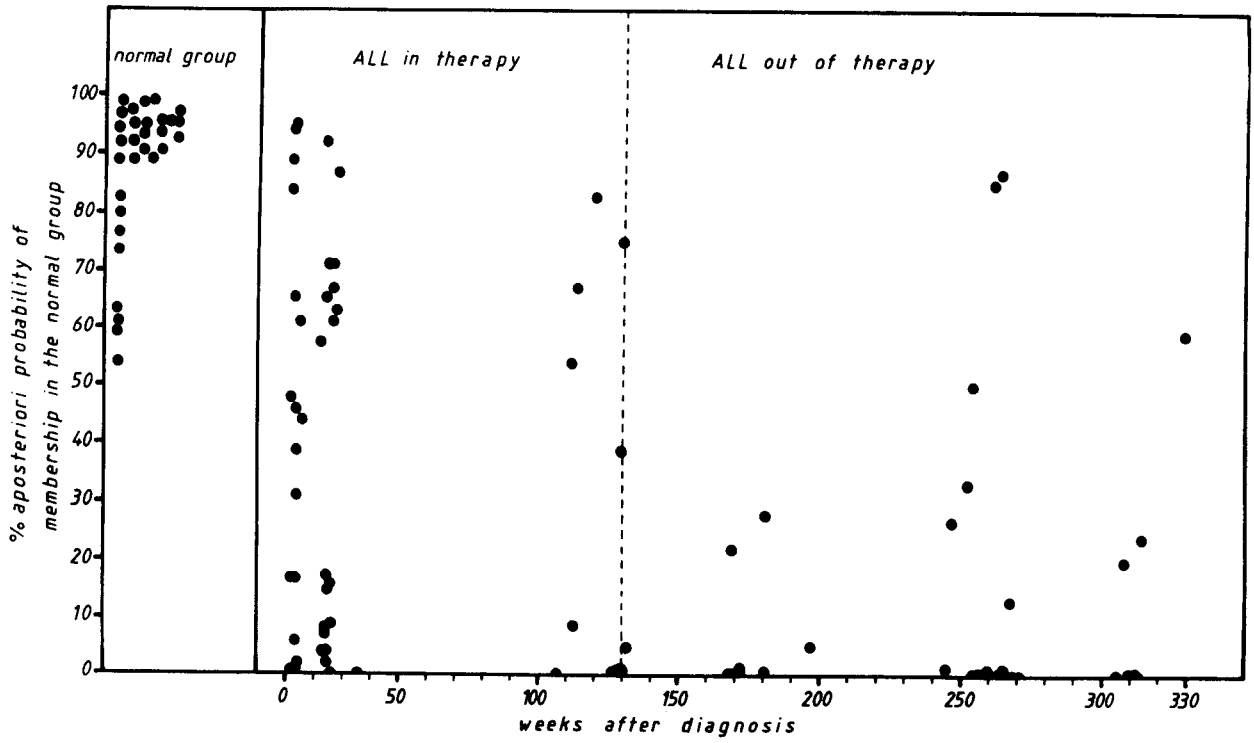

Fig. 4. Regression analysis of a posteriori probability of membership in the normal group versus weeks after diagnosis

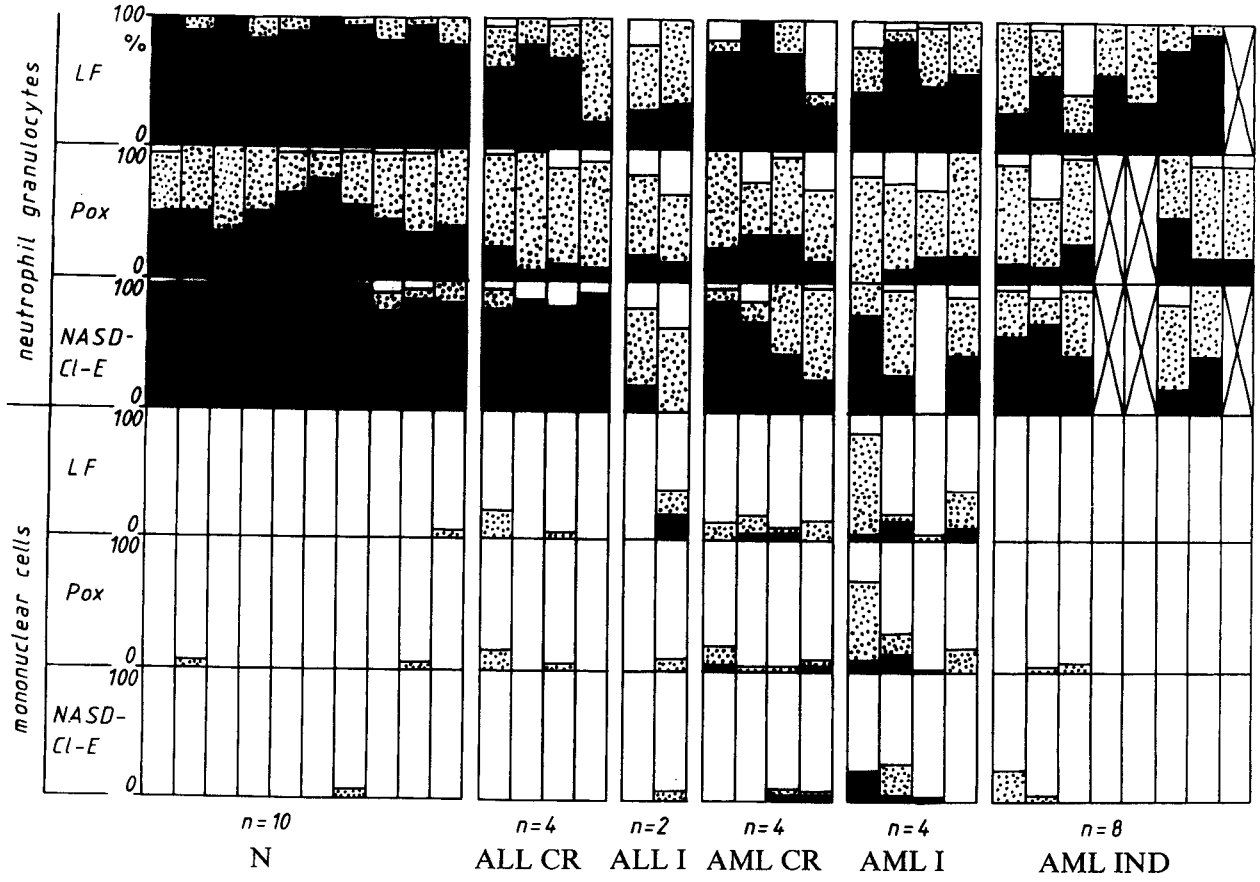

Fig. 5. Peroxidase, NASD-chloroacetate esterase, and lactoferrin staining of peripheral blood neutrophilic granulocytes and mononuclear cells in adult patients with ALL and AML during complete remission at diagnosis and during induction treatment and in adult control. *N,* normal controls; *ALL CR,* ALL in complete remission; *ALL I,* ALL at diagnosis; *AML CR,* AML in complete remission; *AML I,* AML at diagnosis; *AML IND,* AML induction chemotherapy; *LF,* lactoferrin; *Pox,* Peroxidase; *NASD-Cl-E,* NASD-chloroacetate esterase; ■, + + cells; ⊡, + – cells; □, – cells

analysis of peripheral blood cells was carried out. Figure 3 shows the results of MPO staining for PMN in children with ALL in complete remission off chemotherapy and on maintenance treatment, and for comparison the juvenile control group. In our search also for a more sensitive marker for granulopoietic differentiation and proliferation we looked for intracellular lactoferrin in PMN as well as MPO and myeloesterases (Fig. 5).

The observations in adult patients yielded very similar results to those seen in children, demonstrating deficient enzyme activities and lactoferrin staining in acute leukemia on and off therapy. Cytochemical stains for myeloid NASD-chloroacetate esterase yielded similar results to those obtained by MPO staining as well as immunofluorescence and immunoperoxidase staining for lactoferrin.

The results of these studies support the hypothesis that bone marrow function of patients with acute leukemia does not become completely normal even in clinical long-term complete remission.

References

1. Moore MAS (1976) Prediction of relapse and remission in AML by marrow culture criteria. Blood Cells 2: 109
2. Burk E, Chennaoui-Antonio L, Beiersdorf H, Winkler K, Heinisch B, Küstermann G, Krause U, Neth R (1981) Cytological and cytochemical analysis of plasma clot cultures related to long-term survival in childhood ALL. In: Neth R, Gallo RC, Graf T, Mannweiler K, Winkler K (eds) Modern trends in human leukemia IV Springer-Verlag, Berlin, Heidelberg, New York