

## Seasonal variation in megaloblastic anaemia

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1. Four hundred and fifty patients who were treated for megaloblastic anaemias in northern Finland were grouped according to the month of diagnosis.
2. Only slight seasonal variation was detectable in the occurrence of megaloblastic anaemia.
3. During the first half of the twentieth century the seasonal variation in occurrence of megaloblastic anaemia was pronounced. The decrease in the variation is most likely related to the more even distribution throughout the year of the supply of foods containing folate and vitamin B<sub>12</sub>.

Most textbooks of haematology do not mention the seasonal variation in the manifestation of megaloblastic anaemias. Chanarin (1969), in his monograph on megaloblastic anaemias, reviewed the earlier literature, in which seasonal variation has been reported in the occurrence of pernicious anaemia (e.g. Lindström, 1929; Grönberg, 1946) and fish tapeworm anaemia (Lindström, 1929). In addition, similar variation has been observed in the concentrations of vitamin B<sub>12</sub> in the serum of carriers of fish tapeworm (Palva, 1962). It has been suggested that this variation was related to the variations in the vitamin content of food. The extent of such variation has probably changed over the decades along with the changing eating habits of the people. This paper reports our observations on the decreasing seasonal variation in the manifestation of megaloblastic anaemias in Finland during recent years.

### EXPERIMENTAL

The subjects included all 260 patients treated for megaloblastic anaemias in the Department of Medicine, University of Oulu, during the period 1961–70 and, in addition, 190 patients with megaloblastic anaemias treated in other hospitals in northern Finland during the period 1967–70; it is customary for all such anaemias to be referred to hospital, so the data are likely to represent a complete picture for northern Finland. The exceptional patients with megaloblastic anaemia of aetiology other than pernicious anaemia or fish tapeworm anaemia were excluded. The subjects were grouped each month according to the diagnosis of megaloblastosis.

### RESULTS

The monthly distribution of the occurrence of megaloblastosis in the 450 patients is presented in Table 1. On average, 8.9% of the total number of cases occurred in each of the months January to August; during the months September to December the monthly number of cases was slightly lower—on average, 7.2% of the total. Of the

Table 1. *Distribution, according to month of diagnosis, of 450 cases of megaloblastic anaemia*

Month	...	Jan.	Feb.	Mar.	Apr.	May	June
No. of cases		44	36	42	40	36	45
% of total		9.8	8.0	9.3	8.9	8.0	10.0
Month	...	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. of cases		38	40	32	29	34	34
% of total		8.4	8.9	7.1	6.5	7.5	7.5

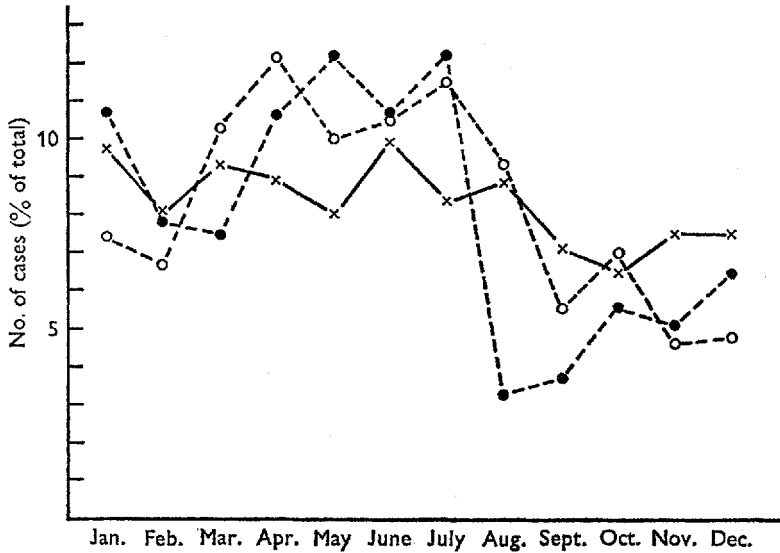


Fig. 1. Seasonal variation in the occurrence of megaloblastic anaemia in three series of patients: ○ --- ○, Lindström (1929), 744 cases; ● --- ●, Grönberg (1946), 152 cases; × — ×, present series, 450 cases.

total number of cases, 71.3% occurred during the months January to August and 28.7% during September to December. The occurrence of cases during the latter period was just significantly lower ( $P < 0.05$ ) than the hypothetical even distribution of the cases throughout the year. The highest number of cases diagnosed (45) was in June, the lowest (29) in October, but the difference was not significant.

#### DISCUSSION

In the present series of patients, the incidence of megaloblastic anaemia was just significantly lower during the autumn months than during the rest of the year. A notable change had thus occurred in Finland during the decades since Lindström's (1929) report. In his patients from the period 1898–1928, 64.0% of the 744 cases occurred during the months March to August and 36.0% during September to February. These values deviated highly significantly ( $P < 0.001$ ) from the hypothetical even distribution throughout the year. The seasonal variation in the occurrence of megaloblastic anaemia during those years was similar in other centres

(Lindström, 1929; Chanarin, 1969), and it was even more pronounced in a Swedish series of patients between 1931 and 1945 (Grönberg, 1946). To illustrate the decrease in the seasonal variation in the occurrence of megaloblastic anaemia, the monthly distributions in two earlier investigations (Lindström, 1929; Grönberg, 1946), and in the present one are shown together in Fig. 1.

No reliable figures of the total incidence of megaloblastic anaemias in Finland are available. Hence, possible changes in the total incidence are unknown. Although substantially all anaemic patients in Finland are seen by the hospitals, the areas of service of the hospitals have changed over the years so much that calculations of total incidence based on their journals are too unreliable. For these reasons, only such hospitals were included in the present series, which did not have major alterations during the period of the study, and which maintained the same diagnostic criteria.

The tendency towards a decrease in the seasonal variation in the manifestation of megaloblastic anaemia is most likely to be due to a change in eating habits. Green vegetables have not been, and are not even nowadays, so popular in Finland that they could have provided folic acid sufficient to maintain normal haemopoiesis during the autumn and so lead to a greater manifestation of vitamin B<sub>12</sub> deficiency to the spring and summer months. Although we do not have direct information on the possible seasonal variations in the dietary intake of folates and vitamin B<sub>12</sub> in Finland, it is likely, in our opinion, that regulation of the meat supply is a major, perhaps the most important, factor in reducing seasonal variation in the manifestation of megaloblastosis. In the past, cattle and pigs were slaughtered in Finland almost exclusively during autumn and early winter, and the supply of folic acid and vitamin B<sub>12</sub> from liver and fresh meat must thus have been highest during that period. Nowadays the slaughtering of cattle has become more evenly distributed throughout the year and modern deep-freeze storage techniques have further equalized the supply of folates and vitamin B<sub>12</sub> throughout the year. It is possible that this tendency is still continuing and that the seasonal variation in the manifestation of megaloblastosis may disappear entirely.

#### REFERENCES

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