tives, and small peptide hormones. Diabetologia 21: 508 (Abstract)
17. Lauritzen T, Faber OK, Binder C (1979) Variation in ^{125}I-insulin absorption and blood glucose concentration. Diabetologia 17: 291–295
18. Williams G, Clark AJL, Cook E, Bowcock S, Pickup JC, Keen H (1981) Local changes in subcutaneous blood flow around insulin injection sites measured by photoelectric plethysmography. Diabetologia 21: 516 (Abstract)
19. Lauritzen T, Binder C, Faber OK (1980) Importance of insulin absorption, subcutaneous blood flow, and residual beta-cell function in insulin therapy. Acta Paediatr Scand (Suppl) 283: 81–85

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Glycosylated Haemoglobin and Reticulocyte Count in Diabetes

Dear Sir,

It has been suggested that, in poorly controlled diabetes, the increase in the level of glycosylated haemoglobin, because of its greater oxygen affinity, may lead to polycythaemia [1]. This hypothesis is supported by the results of Graham et al. [2], who found a weak but significant correlation between the glycosylated haemoglobin level and red blood cell count in adult diabetic subjects and of Kawahara and Ditzel [3], who found increased haematocrit, haemoglobin and 2,3-DPG concentration in diabetic children.

However, Bodansky et al. [4] and Lev-Ran [5] question whether the hypoxic effect of glycosylated haemoglobin in diabetes is sufficient to induce polycythaemia.

We have measured the red cell counts, haematocrit and reticulocyte, haemoglobin and glycosylated haemoglobin (HbA_1) levels in 80 diabetic outpatients (40 males, 40 females, mean age (± SEM) 36 ± 2.8 years). All the subjects were non-smokers and none suffered from cardiac, pulmonary or haematological disease. HbA_1 levels did not differ significantly according to whether the patients were treated with diet alone, hypoglycaemic drugs or insulin. Their results were compared with those of a control group of 100 subjects (50 males, 50 females, mean age 38 ± 3 years, all non-smokers). The reticulocyte count and HbA_1 levels were significantly higher in the diabetic subjects compared with those of the control subjects (both $p < 0.001$). No significant differences were found in the other parameters.

The reticulocyte count was significantly correlated with the HbA_1 level in the diabetic subjects, independently of sex ($r = 0.68$, $p < 0.001$). Ten diabetic subjects (five males, five females, HbA_1 5.8–16%) were re-studied 1 month later. Their reticulocyte count and HbA_1 level showed parallel variations (basal: $r = 0.68$, $p < 0.05$; 1 month later: $r = 0.91$, $p < 0.001$).

Our results suggest that the increase in glycosylated haemoglobin found in diabetic patients may cause sufficient chronic hypoxia to stimulate erythropoietin production and thus lead to an elevation in the reticulocyte count.

Yours sincerely
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Table 1. HbA_1, reticulocyte count, total haemoglobin, haematocrit and red blood cell count in diabetic and healthy subjects

	Diabetic patients ($n = 80$)	Healthy subjects ($n = 100$)
HbA_1 (%)	9.3 ± 0.4	6.4 ± 0.1[a]
Reticulocyte count (%)	9.34 ± 0.8	6.37 ± 0.3[a]
Total haemoglobin (g/dl)	14.1 ± 0.6	13.9 ± 0.4
Haematocrit (%)	41.3 ± 0.8	39.1 ± 0.9
Red blood cell × 10^{12}/l	4.5 ± 0.2	4.42 ± 0.3

Results are expressed as mean ± SEM
[a] $p < 0.001$ diabetic versus healthy subjects

References

1. Bunn HF, Briehl RW (1970) The interaction of 2,3-diphosphoglycerate with various human hemoglobins. J Clin Invest 49: 1088–1095
2. Graham JJ, Ryall RG, Wise PH (1980) Glycosylated haemoglobin and relative polycythaemia in diabetes mellitus. Diabetologia 18: 205–207
3. Kawahara R, Ditzel J (1980) Haematocrit, glycosylated haemoglobin and diabetic microangiopathy. Diabetologia 19: 486 (Letter)
4. Bodansky HJ, Cudworth AG, Swindlehurst C, Welch SG (1980) Haematocrit, glycosylated haemoglobin and diabetic microangiopathy. Diabetologia 19: 163–164
5. Lev-Ran A (1980) Glycosylated haemoglobin and red blood cells in diabetes. Diabetologia 19: 487 (Letter)

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