

STABLE BLOOD GLUCOSE TEST STRIPS AND REFLECTANCE METERS

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SYNOPSIS

Reflectance meters provide an accurate method for home blood glucose monitoring. However, the commonly used glucose meters are expensive and bulky in size. We study an alternative method for self-monitoring of blood glucose using the stored "Reflotest" strips method. The strips stored at 4° C in dessicator containers remained stable for up to 4 days. This method provides a potentially convenient and economical method for home blood glucose monitoring.

INTRODUCTION

The importance of home blood glucose monitoring as a means to gauge and improve diabetic control has recently been emphasized (1,2,3,4,5).

The methods available made use of glucose oxidase test strips which can be read visually (semiquantitative) or by means of reflectance instruments (quantitative). Semiquantitative assessment of blood glucose requires visual assessment and is therefore subjected to great observer variation. Reflectance instruments on the other hand allow for more accurate measurements (6,7,8,9,10). This technique requires reading of the strips with the instruments within a precise time interval. Hence, for 24 hour blood sugar profile monitoring, patients will need to have the instruments with them when performing the tests (e.g. at home or at place of work). Recently, an alternative technique of home blood glucose estimation has been introduced whereby such inconvenience is obviated. This entails storing "Reflotest" glucose-oxidase strips (Boehringer Mannheim) in dessicator containers before reading (Fig. 1). These containers are the receptacles in which the "Reflotest" strips are marketed. The strips can then be read subsequently at a suitable time at home or in the outpatient's clinic where the glucose meter, "Reflomat" (Fig. 2) is available.

Our study aims to assess the reliability of this technique under our local conditions.

MATERIALS AND METHOD

Blood glucose estimations using the "Reflotest" strips were performed on 40 venous whole blood samples. After measurement, the strips were stored in the dessicator containers which were then left standing at room temperature (average T° 28°C). The stability of the stored Reflotest strips was determined by reading the blood glucose values daily over the subsequent 5 days using the "Reflomat".

Concurrently, the whole procedure was conducted with the strips stored at 4° C (i.e. temperature of refrigerator).

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Table 1 : The influence of time on blood glucose concentrations at room temperature

		No. of Days					
		0	1	2	3	4	5
Blood Glucose mmol/l	Mean	7.10	*6.81	*6.62	*6.52	*6.34	*6.29
	SEM	0.77	0.71	0.66	0.63	0.61	0.60
(n = 40) at room temperature	(%)**	100	95.9	93.2	91.8	89.3	88.6

*Significantly different (p < 0.05) from Day 0.

**Mean values expressed as a percentage of Day 0.

Table 2 : The influence of time on blood glucose concentrations at 4° C

		No. of Days					
		0	1	2	3	4	5
Blood Glucose mmol/l	Mean	7.07	7.01	6.99	6.91	*6.83	*6.83
	SEM	0.77	0.75	0.76	0.72	0.71	0.71
(n = 40) at 4°	(%)**	100	99.2	98.9	97.8	96.6	96.6

*Significantly different (p < 0.05) from Day 0.

**Mean values expressed as a percentage of Day 0.

RESULTS

(1) Strips stored at room temperature:

The mean blood glucose values of the 40 samples stored at room temperature at day 0 to day 5 are shown in Table 1. There was a significant fall in the mean blood glucose values from day 1 to day 5 when compared to that at day 0 using Student paired t test. The percentage decrement was 4.1% at day 1 and 11.4% by day 5.

(2) Strips stored at 4° C:

The mean blood glucose values of the 40 samples are shown in Table 2. The results at day 1, day 2 and day 3 were not significantly different from day 0. The values show a significant fall only at day 4 and day 5. The percentage fall in blood glucose values was 1.4% at day 1 and 4.2% by day 5.

DISCUSSION

Our results show that the strips remain stable when stored in the dessicator containers at 4° C for 4 days. In other words, blood glucose values do not show a significant fall when the strips are stored at 4° C for up to 4 days. However, when the strips are stored at room temperature, they are less stable, blood glucose values showing an appreciable fall from day 1.

It should be emphasized that this study was carried out in the laboratory. It remains to be established whether comparable results could be attained by patients themselves although we do not expect any great difference. A study by Howe-Davies et al¹¹ showed that sufficiently accurate results were obtained when the method was used by patients at home.

One of the main aims of self-monitoring of blood glucose is to allow the patient to make decision about his or her therapy and diet based on the blood glucose values obtained. This can be achieved with the technique reported here although the blood glucose results may not be immediately available but be delayed for a day or two. The advantages of this technique, on the other hand, are many. They include (i) obviating the inconvenience of having to bring the meter to the place of work. The patient can read the strips later at a suitable time and place where the meter



Fig. 1 : "Reftest" strips in the dessicator container.

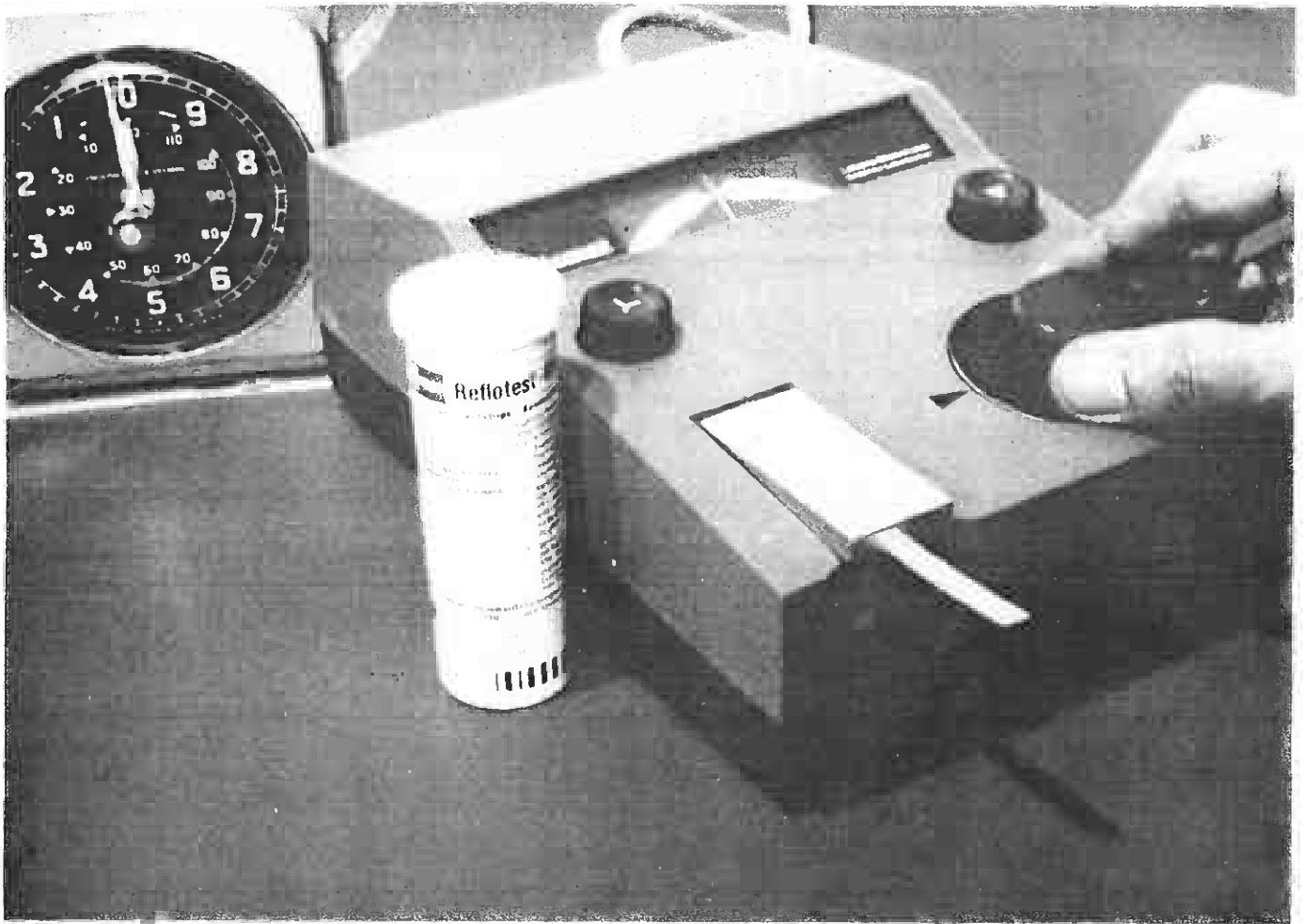


Fig. 2 : "Reflotest" strips and the reflectance meter, "Reflomat".

is available (e.g. at home or at a diabetic outpatient's clinic); (ii) eliminating the initial capital cost (10) of buying the meter by the patient. This would be so if the meters are available in hospitals' outpatient clinics or maintained at diabetic health centres. Furthermore, groups of patients may pool resources to purchase a meter for joint use, and thereby reduce expenditure.

It is worthy of note that other comparable convenient techniques for self-monitoring of blood sugar which do not require the patient to own the meters exist. These are the vacuum collector bottle (11), and the filter-paper methods (12,13). However, these procedures require the back-up of a laboratory including trained personnel for the blood glucose estimations.

The stored 'Reflotest' strips method therefore provide a simple, convenient, reliable yet economical method for home blood glucose monitoring.

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