A Cool Storage Pot for Insulin in Rural Africa

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INTRODUCTION

Patients with insulin – dependent diabetes mellitus (IDDM) who live in the rural areas of developing countries have to contend with a number of problems which interfere with the control of their disease. In particular, these include infection, large distances to reach hospitals or dispensaries, loss or damage to insulin syringes and needles, and lack of refrigerators to store insulin with consequent loss of potency of insulin caused by high midday temperatures.[1]

The last often results in a need for patients to increase the amount of insulin suspension injected toward the end of a 3 month prescription period to maintain control of their disease. This problem cannot be readily overcome by shorter prescribing intervals since travelling to the hospital can take several days in each direction.

A study was undertaken to test the efficiency of water-filled porous clay storage pots in reducing the loss of insulin potency caused by high ambient temperatures.

PATIENTS, METHODS AND RESULTS

Seventeen insulin – dependent diabetics (10 male, 7 female) living in the northern province of Zambia consented to take part in the study. All were considered to be stable as the dose of insulin prescribed had not required alteration for 3 consecutive outpatient visits prior to entry into the study. The mean age was 37 years (range 16 to 59); mean duration of IDDM 8 years (range 2 to 23) and mean daily dose of insulin zinc suspension lente 43 units (range 24 to 76). Upon entry to the study none had focal infection, intestinal parasites, anaemia or malaria.

The patients were instructed to keep a daily record of insulin dose, morning urine sugar concentration (Ames clinistix) and symptoms of excessive thirst, polyuria and nocturia. Each was initially prescribed sufficient insulin for 16 weeks treatment at his usual dose and instructed to store the insulin in his accustomed fashion, which was usually on a thatched mudbrick hut. Insulin was injected with either a glass insulin syringe or a plastic disposable syringe which was washed, stored dry and reused.[2] After 12 weeks the patients were reviewed and prescribed a further 16 weeks supply of insulin to be stored in aluminium screwcap canisters placed in a near spherical porous clay pot of 7 to 10 litres capacity filled with water and kept in a shaded, well ventilated, position. The pot and its contents lose heat by evaporation of water from the outer surface. It was found that the water in such pots maintains a temperature of 15 to 17°C throughout the day despite rises in the ambient temperature of up to 41°C. At the end of the second 12 week period the patients were reviewed again.

One patient developed lobar pneumonia and was excluded from the study. Of the remaining 16 the mean daily dose in the last 2 weeks of the first 3 month period, compared with the mean in the first 2 weeks, had needed to be increased in 12; the increase for the group being significant (P 0.002, Wilcoxon's matched pairs signed ranks test). However, when the insulin was stored in the clay pot, only 4 patients had needed to increase the insulin dose (see table).

Furthermore, the patients recorded less morning glycosuria (219 compared with 392 occasions of 1 percent or more glycosuria in the group as a whole) when using the storage pot, and fewer episodes of nocturia (433 compared with 712). All were satisfied that the storage pot improved the control of their diabetes, and all found it easy to manage.

COMMENT

It was shown that storing insulin in water-filled clay pots reduced the need to increase the amount of insulin suspension injected, and improved the control of the diabetes in these patients; their feeling of well being was also increased. As the storage pot was the only obvious variable it seems likely that the improvements were due to the prevention of thermal damage to the insulin. The skill to make such clay pots is found in most villages in the rural areas of Zambia, and the cost to the patient is negligible. Since completion of the study 5 of the patients have stored insulin for 5 months without needing to progressively increase their daily dose. It was concluded that waterfilled porous clay insulin storage pots can make a significant contribution to the management of patients with IDDM living in the rural areas of developing countries when refridgerators are not available.

REFERENCES

1. *Stephen N.R., Romans R.G. Thermal stability*

TABLE

Patient No.	A	B	C
1.	36	43	41
2.	32	41	32
3.	60	60	60
4.	24	24	24
5.	30	36	30
6.	60	69	60
7.	28	33	33
8.	50	46	50
9.	36	45	43
10.	60	62	66
11.	76	76	76
12.	30	35	30
13.	36	43	36
14.	48	56	48
15.	50	50	50
16.	44	51	44
Mean	43.7	48.1	44.5

Insulin doses at the beginning of each prescription period (A), the mean dose in the last two weeks of the first 3 month period (B), and when using the storage pot (C).

of insulin made from zinc insulin crystals. J. Pharm Pharmacol 1960; 12:372–3.

2. *Oli J.M., Guguani H.C., Ojiegbe G.C. Multiple use of ordinary disposible syringes for insulin injections. Br. Med. J. 1982: 284:236.*