

TABLE II

Verification of equation (1) for systems (i) and (ii) in the presence of added electrolyte

System (i) Zinc/Ferrous ammonium sulphate-water : $K = 1.8$, $m = 1.00$.

System (ii) Copper/Zinc potassium sulphate-water : $K = 1.0$, $m = 1.00$.

a	No.	System (i)			System (ii)		
		w	$y_{\text{expt.}}$	$y_{\text{theor.}}$	w	$y_{\text{expt.}}$	$y_{\text{theor.}}$
0.666	1	0.467	0.757	0.755	0.318	0.660	0.666
	2	0.503	0.755	0.752	0.383	0.660	0.666
	3	0.529	0.748	0.750	0.423	0.659	0.666
	4	0.547	0.743	0.749	0.473	0.657	0.666
	5	0.588	0.733	0.745	0.539	0.656	0.666
	6	0.615	0.730	0.743	0.578	0.660	0.666
0.333	1	0.402	0.436	0.436	0.360	0.313	0.333
	2	0.433	0.439	0.433	0.450	0.316	0.333
	3	0.474	0.432	0.429	0.536	0.320	0.333
	4	0.498	0.426	0.425	0.566	0.324	0.333
	5	0.523	0.421	0.422	0.596	0.327	0.333
	6	..	..	..	0.660	0.326	0.333
	7	..	..	..	0.699	0.329	0.333

theoretical results (calculated with $K = 2.6$ and $m = 1.0$; $K = 1.0$ and $m = 1.0$ for systems (i) and (ii) respectively) are in good agreement with the experimental values obtained. The effect of added electrolytes is shown in Table II. The value of K had to be changed from 2.6 to 1.8 for system (i) while making theoretical calculations of y in presence of added electrolyte.

It can be seen that there is good agreement between experimental and theoretical values. Further it can also be seen that in the presence of added electrolyte, there is a four-fold increase in the yield of crystals (in terms of w) and the fact that purity of the crystals as denoted by y values, decreases only by 5–10% in the presence of the added electrolyte, can become a significant controlling factor in large industrial separations, where these ternary systems are involved. Thus equation (1) adequately explains the distribution of the salts even in the presence of the added electrolytes, for the two systems studied.

Department of P.G. Studies S. HARIHARAN.
and Research in Chemistry, A. S. A. MURTHY.
Manasa Gangotri, D. S. MAHADEVAPPA.
University of Mysore,
Mysore 570 006, India,
February 6, 1980.

1. Chlopin, V., *Z. Anorg. allgem. chem.*, 1925, 143, 97,

- Doerner, H. A. and Hoskins, W. M., *J. Am. Chem. Soc.*, 1925, p. 47.
- Hill, A. E., Durham, R. S. and Ricci, E., *Ibid.*, 1940, 62, 2723.
- Abu Elamayem, M. A., *J. Inorg. Nucl. Chem.*, 1964, 26, 2159.
- Hariharan, S., Murthy, A. S. A. and Mahadevappa, D. S., *Indian J. Chem.*, 1979, 18A, 551.
- Ananda Murthy, A. S. and Mahadevappa, D. S., *Ind. Eng. Chem. Process Des. Develop. (U.S.A.)*, 1970, 9, 260; 1972, 11, 201.
- Vogel, A. I., *Quantitative Inorganic Analysis*, ELBS—Longmans, 1968, p. 443.
- , *Ibid.*, 1968, p. 352.
- Schwarsenbach, G. and Flaschka, H., *Complexometric Titrations*, Methuen and Co., Ltd., London, 1969, p. 257.
- Ross, S. L., *Differential Equations*, Blaisdel, Ginn and Co., London, 1964, p. 282.

INTRANASAL ADMINISTRATION OF INSULIN REDUCES CIRCULATING LEVELS OF GLUCOSE IN THE RHESUS MONKEY

THE suppression of blood glucose levels following systemic injection of insulin is well known. We report here that insulin is able to bring about a similar pharmacological effect when administered by the intranasal route also,

Four healthy, adult male rhesus monkeys (9-10 kg body weight) were used. Monocomponent insulin (Actrapid; Novo Industry, A/S Copenhagen, Denmark) was administered by intravenous (I.V.) intramuscular (I.M.), subcutaneous (S.C.) injections or intranasal spray (I.N.) (dose 0.1 I.U./kg body weight). The method of intranasal spraying using a precalibrated glass atomizer has been previously described^{1,2}. The animals were crossed over between the four routes of insulin administration and they were also used as controls by administering physiological saline by the four different routes. The animals were starved overnight for about 12 hrs before administering insulin and they were not fed during period of blood sampling. The animals were rested for 1 week between treatments. Glucose levels were measured³ in blood samples taken before and at intervals (Fig. 1) for as long as 180 minutes following the administration of insulin.

Figure 1 illustrates the geometric mean values and the 95% confidence limits of blood glucose levels in all the 4 monkeys following different routes of insulin administration as compared with the pretreatment levels. In the controls there was a very slight decrease in blood glucose levels during the sampling period and this is not surprising as the animals were not fed during this period of blood sampling. Following I.V. administration of insulin there was a sharp decline (ca. 40%) in blood glucose levels as early as 30 mins of the injection after which blood glucose levels showed a rise; the rise in blood glucose levels at 90 mins following insulin administration showed a marked increase (ca. 20%) above the pretreatment values. This characteristic rebound in blood glucose levels is known to occur following the I.V. injection of insulin. When insulin was sprayed intranasally blood glucose levels dropped gradually and showed a maximum reduction (ca. 50%) at 60 mins after I.N. spraying; thereafter glucose levels remained reduced throughout the sampling period. Blood glucose levels after S.C. injection declined gradually and reached a minimum (ca. 45% of the pretreatment values) at 60 mins after the injection; thereafter the levels continued to rise gradually to reach the pretreatment level by about 180 mins post-treatment. Deep intramuscular injection of insulin caused a marked reduction in blood glucose levels and reached a minimum (ca. 70% of pretreatment levels) at 60 mins after injection and blood glucose levels were markedly reduced throughout the sampling period.

The present studies clearly indicate that comparable pharmacological effects, in terms of reducing circulating blood glucose levels, are achieved by administering similar doses of insulin by different systemic as well as by the intranasal routes.

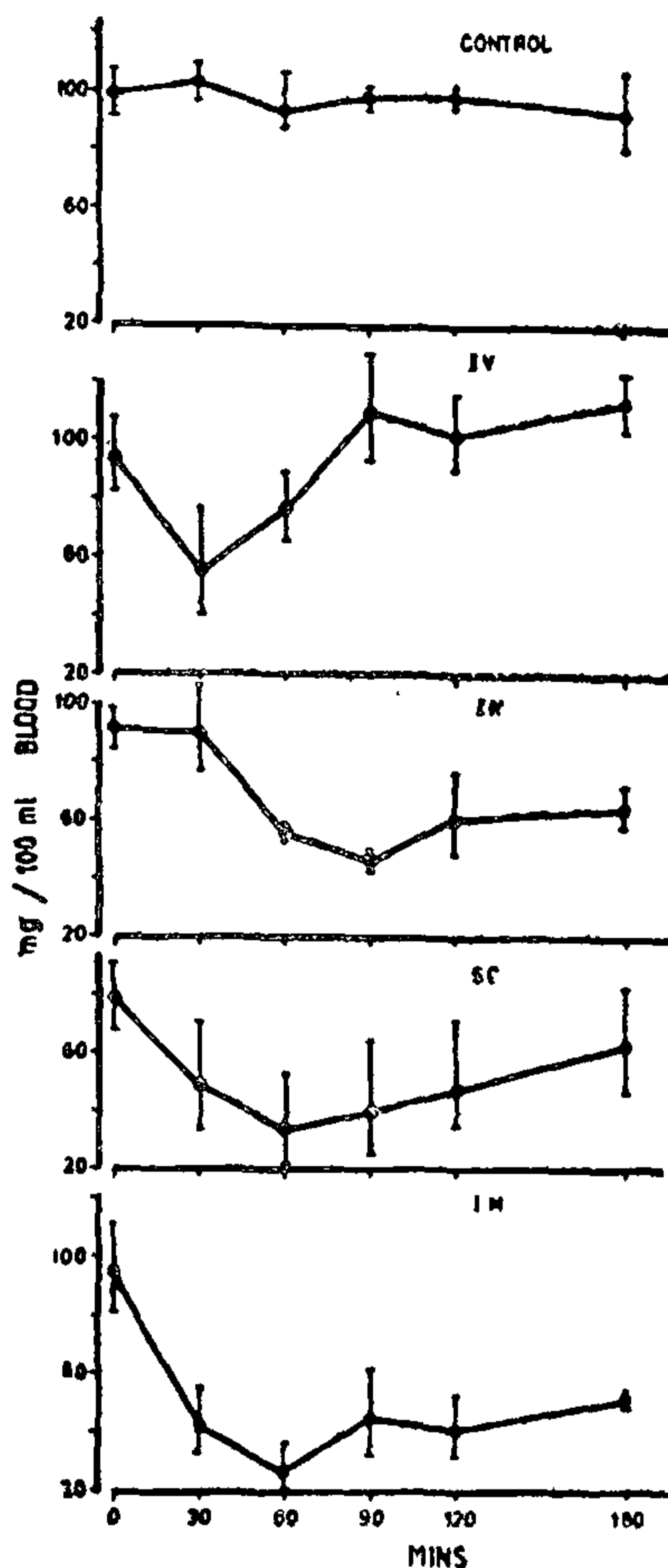


FIG. 1. Blood glucose levels in adult male rhesus monkeys ($n = 4$) crossed over between different routes of insulin (dose: 0.1 I.U./kg body weight) administration. Each point represents the geometric mean values and the bars indicate the 95% confidence limits at various time intervals. Controls were treated with physiological saline. The values for the control group include all the data obtained following the administration of physiological saline by the different routes as there was no difference between controls treated by different routes. Routes of administration: intravenous injection (I.V.); intranasal spray (I.N.); subcutaneous injection (S.C.); intramuscular injection (I.M.).

The findings reported here suggest, for the first time, the possibility of using a novel, and convenient method

of insulin therapy in the management of diabetes mellitus by an acceptable, non-invasive and painless route.

Experimental Biology Unit,
Department of Anatomy
and

T. C. ANAND KUMAR.
ATAM SEHGAL.
J. S. BAJAJ*.

*Department of Medicine,
All-India Institute of Medical
Sciences, New Delhi 110 029,
March 14, 1980.

1. Anand Kumar, T. C., David, G. F. X. and Puri, V., In *Recent Advances in Reproduction and Regulation of Fertility* (ed. G. P. Talwar), Elsevier/North-Holland Biomedical Press, 1979, p. 49,
2. Gopinath, P. G., Gopinath, G. and Anand Kumar, T. C., *Curr. Therap. Res.*, 1978, 23, 596.
3. Sharma, N. C. and Sur, B. K., *J. Clin. Pathol.*, 1966, 19, 630.

AN ALKALINE PROVINCE IN ANDHRA PRADESH

THE discovery of an alkaline complex near Elchuru¹ prompted the author to undertake reconnaissance field trips in search of alkaline rocks in parts of Prakasam and Guntur districts of Andhra Pradesh. During these trips it was noticed that undersaturated, saturated and oversaturated alkaline rocks occur at several scattered localities near to and far away from the Elchuru complex². Some of the observed occurrences are arcuate, elliptical or oval in shape, and the nepheline-rich, nepheline-poor and nepheline-free alkaline rocks consist of varied mineral assemblages and have different rock associations. The alkaline rocks examined are dominantly leucocratic, subordinately mesocratic and rarely melanocratic. A wide variety of the rock types are identified in different rock groups; for example, in the syenitic rock group, following the classification proposed by the IUGS Subcommission on the Systematics of Igneous Rocks,^{3,4} one can distinguish such types as nepheline syenites, nepheline-bearing alkali-feldspar syenites, nepheline-bearing syenites, syenites, alkali-feldspar syenites, alkali syenites, quartz syenites, alkali-feldspar quartz syenites and alkali quartz syenites. These names are based on the relative amounts of alkali-feldspar, plagioclase and quartz (or nepheline)³, and on the presence of alkali-pyroxenes and/or alkali-amphiboles⁴. Further, alkaline mafic (lamprophyric) dykes and rare carbonatites are also encountered.

The majority of the alkaline complexes are confined to a long narrow belt which extends to about 110 km in a NE-SW direction, parallel to the regional structure, starting from Kotappa Konda⁵ near Narasaraopet

town in the north and ending at Kanigiri town⁶ in the south. This linear belt is approximately, but often less than, 10 km wide in the northern half, but splay out considerably in the southern half. Gabbroic rocks, far in excess of the areal distribution of the alkaline rocks, were observed in this belt and they are rarely associated with anorthosites⁷. All these rock types conform to the typical members of other alkali provinces studied in different parts of the world⁸⁻¹⁰. As the alkaline belt is a well defined linear unit parallel with major fracture systems, it is likely that the former is spatially related to a major structural feature; of course, this major structural feature and the alkaline igneous activity are both expressions of a more fundamental process¹¹. The exact relationship between the alkali province and available data on tectonic features of the region is under investigation and will be published in detail at a later date. The primary purpose of this note is to introduce and advocate, for the first time, the concept of an alkaline province for this belt.

It is well known that "alkaline rocks are formed from magmas generated in the deep crust or upper mantle or from derivatives of such magmas" and that they are "characterized by special geological environments".⁴ It is also widely recognized that the "provinces of alkaline rocks often show a long duration of the alkaline igneous activity" and that there "is generally a close connection between alkaline igneous activity and major tectonic structures, first of all fault zones".⁴ It is in this context, that the recognition of the existence of an alkaline province in the Prakasam district, lying east of the eastern margin of the Cuddapah basin, is not only of paramount petrological importance but also of profound structural significance.

Department of Geology,
Osmania University,
Hyderabad 500 007,
November 26, 1979.

C. LEELANANDAM.

1. Leelanandam, C., Narasinga Rao, K., Mallikharjuna Rao, J. and Madhavan, V., *Curr. Sci.*, 1972, 41, 39.
2. Madhavan, V. and Leelanandam, C., *Jour. Geol. Soc., India*, 1978, 19, 523.
3. Streckeisen, A. L., *Geotimes*, 1973, 18, 26.
4. Sorensen, H., *The Alkaline Rocks*, John Wiley and Sons, 1974.
5. Narasinga Rao, K. and Leelanandam, C., *Jour. Ind. Acad. Geo. Science*, 1974, 17, 53.
6. Ramachar, T. M., Krishnamoorthy, B. and Jayaram, K. M. V., *Curr. Sci.*, 1979, 48, 860.
7. Prasad Rao, A. D., Rao, K. N. and Murthy, Y. G. K., *Abstract Archaean Geochemistry*, 1977, p. 95.