

EFFECT OF INCREASED VISCOSITY WITH XANTHAN GUM  
ON RATE OF STOMACH EMPTYING IN THE RAT

A.M. MALIK, P.A. DRYDEN, G.P. JONES and R.S.D. READ

The addition of gel-forming gums to carbohydrate foods is known to reduce post-prandial blood glucose and insulin (Jenkins et al. 1978). The mechanism by which this occurs is not clear but may involve several effects, including a reduced rate of stomach emptying (Leeds et al. 1979), reduced rate of transit in the small intestine, reduced intra-luminal mixing, an effective increase in the thickness of the unstirred layer adjacent to the gut wall, direct effects on transport proteins in the brush border or effects on gut hormones.

As part of a series of experiments to determine the relative importance of these possible mechanisms, the effect of the addition of a gel-forming gum on rate of stomach emptying in the rat was investigated. A food-grade xanthan gum (Keltrol F<sup>(R)</sup>) was used to increase the viscosity of an iso-osmolar glucose solution to 60, 240 and 960 centistokes (cSt). The solutions were administered to rats (275 - 325 g) as a 2 mL load by gavage. Rats were killed by a blow to the head and recovery of the non-absorbable dye, phenol sulphonphthalein, was used to determine the rate of stomach emptying.

Effect of increasing viscosity of gavage feed solution on amount remaining in the stomach at 20 min

---

Viscosity (cSt)	1	60	240	960
n =	8	6	6	8
% load remaining at 20 min	24.4	32.4	42.6*	47.8*
SEM	2.9	5.5	5.8	5.8

---

\* Significantly different from 1 cSt value;  $P < 0.01$ .

There was a trend towards progressively slower emptying with increasing viscosity, but emptying rates varied markedly with different animals and only the solutions with viscosities of 240 cSt or greater showed a rate of emptying significantly slower than that observed with the control (1 cSt) solution.

When a shorter time interval (10 min) was used it was possible to demonstrate that the amount of a 60 cSt solution left in the stomach 61%, SEM 2.8, n=5) was significantly greater than in the case of the control solution (47%, SEM 4.8, n=6,  $P < 0.05$ ). These results support the view that an increased viscosity of the liquid phase of an ingested meal could, by slowing stomach emptying, contribute to a lowering of the post-prandial blood glucose level.

JENKINS, D.J.A., WOLEVER, T.M.S., LEEDS, A.R. GASSUL, M.A., WAINSMAN, P., DILAWARI, J., GOFF, D.V., METZ, G.C. and ALBERTI, K.G.M.M. (1978).  
*Brit. med. J.* 1:1392.

LEEDS, A.R., BOLSTER, N.R., ANDREWS, R. and TRUSWELL, A.S. (1979).  
*Proc. Nutr. Soc.* 38:44A.

---