In conclusion, it is suggested that because of the changes of disintegrant effect over the pressure range, full compressional studies are necessary for disintegrant evaluation.

The authors thank Mr. E. Salole for his assistance.

REFERENCES

KHAN, K. A. & RHODES, C. T. (1972). *Pharm. Acta. Helv.*, **47**, 594–607.
KHAN, K. A. & RHODES, C. T. (1974). *Ibid.*, in the press.
SMITH, H. L., BAKER, C. A. & WOOD, J. H. (1971). *J. Pharm. Pharmac.*, **23**, 536–538.

The effects of binding agents on granule strength and tablet strength

E. SHOTTON* AND N. J. EDWARDS†

**The School of Pharmacy, University of London, Brunswick Square, London, W.C.1. †Lilly Research Centre Ltd., Erl Wood Manor, Windlesham, Surrey, U.K.*

The binding agent employed in the wet granulation of tablets imparts strength to the granules and to the subsequent tablets. This report presents results showing a correspondence between granule strength and tablet strength.

The ratio of radial or die-wall pressure to the axial pressure applied during the tableting of sulphadiazine granules, made with various binding agents, was found to be related to the strength of the individual granules.

Granules prepared from sulphadiazine and alginic acid (8%, as disintegrating agent), containing one of four binding agents, namely, PVP, acacia, starch and methylcellulose, at a concentration of 4% were tested individually for their resistance to deformation as a result of the application of a range of small loads up to 330 mg in a Micro-tensile testing machine (Marsh, 1961), modified to test the granules in compression. Despite the wide scatter of results straight line relation between strain and load applied to the granule were obtained and a ranking order of the binding agents could be drawn up on this basis. The cross-sectional area and therefore the stress could not be measured. Granules made with methylcellulose showed a greater resistance to deformation than PVP granules.

The forces involved in tableting on a single punch tablet machine were measured with strain gauge instrumented top and bottom punches and the pressure exerted on the die-wall was measured with a piezo-electric transducer. The ratio of radial pressure to axial pressure for granules prepared with methylcellulose as binding agent was less than that for granules made with PVP. This difference was manifested by lower values of tablet crushing strength for methylcellulose than for PVP-containing tablets. A low ratio of radial to axial pressure implies a low shearing action which would tend to give weaker tablets. The methylcellulose granules also gave tablets of higher porosity than the PVP granules and with an increased tendency to cap.

A simple method for measuring granule friability was employed (Baba & Sugimoto, 1965) which gave a similar ranking order for the binding agents as the measurement of individual granule strength. Thus, granules made with methylcellulose proved to be more resistant to the abrasive forces involved in the friability test than granules made with PVP. For the range of binding agents studied, this test could be used in a limited way as a screening method for the granules before compression to give some indication of the likely behaviour of the granules under compression.

The viscosity of aqueous solutions of the various binding agents appeared to be an important factor in the strength of the individual granules, the more viscous solutions giving stronger granules.

REFERENCES

BABA, M. & SUGIMOTO, K. (1965). *Ann. Rept. Shionogi Res. Lab.*, No. 15, 227–231.
MARSH, D. M. (1961). *J. scient. Instrum.*, **38**, 229–234.