QUANTITATION OF UPTAKE OF LATEX MICROSPHERES FROM RAT GASTRO-INTESTINAL TRACT

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The neonatal mammalian small intestine has a capacity to ingest macromolecules by a process of endocytosis involving the Peyer's patches in the gut, which comprise membranous epithelial (M) cells overlying lymphoid follicles, whose number changes with age but is maximal at puberty. Viral and bacterial particles can penetrate the mucosal barrier by way of the Peyer's patches which endocytose and transport macromolecules and microorganisms into the associated lymphoid tissues. Le Fevre et al (1978;1989) have observed the uptake and translocation of polystyrene latices, and recently we (Jani et al., 1989) have obtained histological evidence of the absorption of intact polystyrene latex particles in the 50nm to 1um size range, and report here the quantitative aspects of uptake. Particles (Polysciences, U.K) were fed orally (0.1ml of 2.5% latex) for 10 days to rats (Sprague-Dawley) and tissues and organs extracted after killing the animals, freeze-dried and the polystyrene extracted with chloroform. Recovery from spiked samples of tissues was 74%, analysed by gel permeation chromatography; results were calculated to give the uptake of the particles as a percentage of the total dose administered. The Table reveals a size-dependent uptake.

Table: Uptake (%) of 50nm and 100nm polystyrene latex particles

*Organ**	*50nm (SD)*	*100nm (SD)*
Stomach	1.1(0.19)	0.65(0.15)
Small intestine	12 (0.47)	3.4 (0.21)
Colon	14 (1.45)	16 (1.61)
Liver	3.3(0.96)	3.8 (0.72)
Spleen	0.9(0.22)	0.69(0.07)
Blood	2.2(0.39)	1.25(0.44)
Bone marrow	n.e.	0.1 (0.01)

n.e = not examined. * n = 3.

Particles were not detected in the heart or lungs. Total recovery of polystyrene was about 35% for the 50nm particles and 24% for the 100nm particles, the majority in the gut being detectected in the Peyer's patches and the mesentery network. These results confirm our histological data (Jani et al 1989) and suggest the need to re-examine the possibilities of particulate carriers for oral drug delivery, as well as the potential toxicity of ingested particles, and oral colloidal adjuvants for immunization (Mestecky and McGhee 1989). The results are lower than those reported by Alpar et al (1989) who used larger volumes of latex suspensions which may have distended the stomach and intestine and resulted in abnormally high transport. We have no evidence of histological damage in any part of the GI tract; the fact that the particles are largely to be seen in (mainly lymph) vessels in the tissues concerned confirms the physiological nature of the uptake and translocation.

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