

Uptake of *N*-acetylneuraminic acid-6-¹⁴C (sialic acid) into the brain of neonatal piglets

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Sialic acid, a nine-carbon sugar, is a vital structural and functional component of brain gangliosides and is important in memory function and cell-to-cell communication (1). The specific roles and importance of sialic acid in brain human development are unclear. For obvious reasons experiments based on manipulation and growth of human infants are limited, therefore, appropriate animal models are needed if the importance of sialic acid in neonatal nutrition is to be determined. As part of efforts to evaluate the neonatal pig as a suitable model, the present study assessed sialic acid uptake into the brain of piglets.

Four piglets, three days of age, were removed from sows and two hours later had a catheter inserted into the right jugular vein under general anaesthesia. Two hours after recovery each pig was given a bolus injection of 5 μ Ci ($11\text{--}12 \times 10^6$ counts per min (cpm)) of *N*-acetylneuraminic acid-6-¹⁴C with a specific activity of 55 mCi/mmol. Blood samples (1 mL) were taken over next two hours and plasma harvested. The pigs were then euthanased and the brain removed and weighed. Sub-samples of brain segments (100–200 mg) were digested in Soluene-350 (Packard), scintillation cocktail (Highsafe-3, Wallace) added and the radioactivity measure in cpm using a Wallace scintillation counter. The radioactivity in 0.1 mL plasma samples was also determined.

Brain segment	Activity (cpm/g)	Total activity (cpm)	Fraction of injected activity (%)
Frontal lobe	921 \pm 226	5274 \pm 1109	0.046 \pm 0.007
Left cerebrum	804 \pm 106	7650 \pm 781	0.066 \pm 0.007
Right cerebrum	814 \pm 107	7222 \pm 688	0.063 \pm 0.007
Cerebellum	996 \pm 236	3412 \pm 697	0.030 \pm 0.006
Thalamus	945 \pm 204	3315 \pm 613	0.029 \pm 0.006

mean \pm SEM.

The data indicate that 0.23% of a labelled dose of sialic acid was taken up into the brain of neonatal pigs. The percentage uptake of the total label injected was low but similar to values published for mice and rats (2). It was estimated that 80% of the labelled sialic acid was removed from the circulation by 2 min and this no doubt limited the total uptake. Therefore, uptake of sialic acid into the brain would not be a limiting consideration in using pigs as an animal model for human studies.

1. Von Itzstein M, Thompson RJ. Sialic acids and sialic-recognising proteins: drug discovery targets and potential glyco-pharmaceuticals. *Current Medicinal Chem* 1997; 4: 185–210.
2. Nohle U, Schauer R. Uptake metabolism and excretion of orally and intravenously administered ¹⁴C- and ³H-labeled *n*-acetylneuraminic acid mixture and the mouse and rat. *Hoppe-Seyler's Z Physiol Chem* 1981; 362: 1495–1506.