DEPOSITION AND CLEARANCE OF INHALATION AEROSOLS IN DOGS AND RABBITS USING A GAMMA CAMERA

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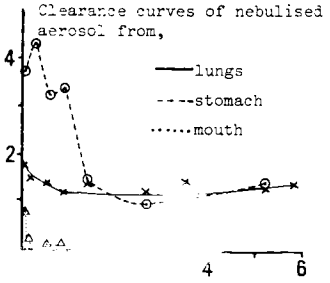
Administration of metered-dose aerosols to animals is complicated by the need to actuate the aerosol at the beginning of inspiration to obtain optimum lung deposition (Newman et al 1980) and by the pharmacological effects of anaesthetics used for intratracheal administration (Patrick & Sterling 1977) needed to by-pass the filtering effect of the nasal passages.
Administration devices previously described in the literature (Poynter & Spurling 1971; Halpern & Schlesinger 1980) have been modified to administer nebulised and metered-dose aerosols to conscious rabbits and beagle dogs. After dosing with ^{99m}Tc-labelled preparations, the animals were imaged using a gamma camera for the assessment of initial aerosol deposition patterns and clearance rates. Aerosols for administration were generated either from a shielded De-Vilbiss type nebuliser, or from metered-dose inhalers.
Eight experiments were conducted using trained rabbits and dogs by administering a nebulised solution of salbutamol and sodium pertechnetate in aqueous ethanol. The differences in initial aerosol deposition are shown in the table below:

	% of total body dose deposited		
	lungs	stomach	mouth
rabbits (n=4)	15±12	52± 8	25±15
dogs (n=4)	55± 9	25±14	8± 3

The mass median diameter of the droplets was 6.5±0.5μm.
The increased lung deposition in dogs may be explained by:
(i) the administration device acts as a drying chamber, thereby reducing the mean aerosol droplet size.
(ii) the delivery tubing is wider, thus reducing wall losses, and the end of the tube is shaped to seal the trachea, so reducing the amount of aerosol deposited in the mouth or swallowed.

The Figure shows a typical result from an experiment conducted in a rabbit. The relative quantities and rates of clearance vary with species and with aerosol formulation. The graph shows that the activity cleared from the lungs and mouth within the first hour goes into the stomach, from which it is subsequently cleared.



The initial deposition patterns are influenced by differences in breathing rate and tidal volume for example, so that careful monitoring is required.

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