

Validation of acoustic rhinometry in laboratory animals

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ABSTRACT

The PhD-project was conducted at the Department of Environmental and Occupational Health, Institute of Public Health, the University of Aarhus, and Environmental Health Sciences Research Center, the University of Iowa, USA.

Acoustic rhinometry (AR) is a method that can determine the geometry of the nasal cavity by acoustic reflections. AR has been used in laboratory animals to develop drugs acting on the nasal mucosa as well as in exposure studies. The validity of AR in laboratory animals is not known and assumptions about this have previously been based on studies in humans. There is a range of theoretical problems doing that and the PhD-study aimed at validating AR in laboratory animals, i.e. guinea pigs, rats, cats and dogs.

Validation was done post mortem by comparison of nasal geometry obtained by AR, MRI, nasal casts and fluid-displacement. In vivo, AR was validated in guinea pigs by comparison with inflammatory markers after inhalation of dust. The results showed a general tendency of AR to underestimate nasal volume by 20% independent of the species measured. AR was very reproducible and is suitable for measuring relative changes in upper airway geometry. This is useful in development of new drugs exerting effects in the nose and in toxicology studies of nasal effects. Future fields of development are optimized algorithms and dimensioning of the equipment.