Reliability of intrasubject absolute quantification of kidney function measured with 99mTc-DMSA in piglets

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Quantitative uptake of 99mTc DMSA can be used to evaluate and monitor individual kidney function in children in longitudinal studies. Information is scarce concerning intrasubject validation of the tracer under minor physiological altered conditions.

Aim:
to evaluate the reproducibility of quantification measures of kidney function in the same subject under alterations of hydration status and base excess in a limited time span prior to the examination.

Materials and methods:
5 male castrated piglets, aged 10 weeks at the start, were included. Total duration of investigation was 4 weeks. The animals were kept in metabolic cages in order to collect urine and faeces separately. 99mTc-DMSA was injected IV (ear vein) (dose: 4–5.5 hours prior to acquisition at 2 and 3 days alternating interval. All piglets were anaesthetized with a combination of midazolan (0.5mg/kg) and ketamine (dose:10mg/kg) IM. Urine (density, pH) and blood analysis (base excess, pH, pO2, pCO2 and Hct) were performed. Information concerning absolute quantification was obtained from dorsal and ventral planar images with and without a standard.

Experimental setting 1: acquisitions were taken at 4 successive occasions under standardized conditions.
Experimental setting 2: each piglet was then subjected to a scan after: dehydration during 24h, hyper hydration (NaCl added to food: 5g/1kg food) and decreased pH (CaCl2 added to food:).

Quantification method: Geometrical mean was calculated for both kidneys, corrected for background and attenuation.

Results:
No significant intrasubject variability was noted, neither under standardized conditions, nor under altered physiological conditions.

Conclusion:
This study demonstrates that physiological alterations of the hydration and metabolic status does not influence absolute quantification with 99mTc-DMSA.