Published in:
Society of Magnetic Resonance in Medicine
Abstracts of the Second Annual Meeting
San Francisco, California, 27-28 March 1993.

Magnetic Resonance in Medicine (Magn Reson Med);
Volume 1, number 2 (June 1984), page 237.



171. *NMR Ventilation Imaging of the Lungs Using Perfluorinated Gases.* PETER A. RINCK,* S. B. PETERSEN,* E. HEIDELBERGER,* V. ACUFF,* J. REINDERS,* M. L. BERNARDO,* L. K. HEDGES,* AND P. C. LAUTERBUR,*† Departments of *Chemistry and †Radiology, State University of New York, Stony Brook, New York 11794.

NMR zeugmatographic imaging in the gas phase with perfluorinated gases was used to visualize the distribution and exchange of gases within the lungs.

We present the first *in vivo* fluorine-19 pulmonary ventilation images of a dog. Transverse, sagittal, and coronal two-dimensional summation images obtained at 3.76 MHz are shown. Imaging time per picture was 25 min, estimated spatial resolution is better than 1.5 cm. Simultaneously but independently a three-dimensional hydrogen-1 image of the thoracic region has been obtained immediately after the fluorine study and from these two images difference and superposition images have been prepared.

Both xenon ventilation scans and X-ray images of the dog lungs have been obtained and compared with the NMR images. Imaging time, spatial resolution, and signal-to-noise ratio of the NMR method are similar to those in the radioisotope examination. As shown in phantom experiments, three-dimensional imaging is possible (*1*). A significant improvement of contrast can be obtained by subtracting a fluorine NMR image from a proton NMR image in either liquid (*2*) or gas phase.

Calculations and preliminary results presented here indicate that fluorine-19 pulmonary ventilation imaging may achieve a better resolution than presently obtained by xenon ventilation scans, and real time ventilation imaging may be possible at higher field strengths.

For medical assessment of pulmonary diseases, both ventilation and perfusion studies are necessary. Perfusion studies using perfluorinated compounds have already been performed and *in vivo* studies are under way.

REFERENCES

1. E. HEIDELBERGER AND P. C. LAUTERBUR, Society of Magnetic Resonance in Medicine, First Annual Meeting, pp. 70–71, 1982.
2. S. B. PETERSEN, M. BOLMSJØ, P. A. RINCK, R. N. MULLER, J. REINDERS, K. HEDGES, AND M. BERNARDO, *in* Proceedings, FNMS, Brussels, 1983.

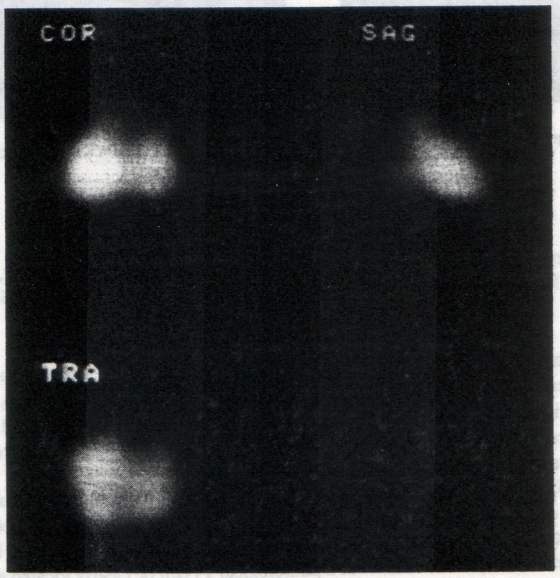


FIG. 1. Coronal, sagittal, and transverse summation images (shadows) by tetrafluoromethane as a NMR pulmonary ventilation agent.