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EEC WORKSHOP
IDENTIFICATION AND CHARACTERIZATION
OF BIOLOGICAL TISSUES BY NMR

Istituto Superiore di Sanità, Rome, 18 – 20 May 1983

Proceedings by F. Podo (a) and J. S. Orr (b)

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CONTENTS

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List of participants.....	Pag.	1
Foreward – F. Pocchiari.....	»	5
Preface – The Editors	»	6

GENERAL PROBLEMS OF TISSUE CHARACTERIZATION BY NMR

Introduction to the aims of the Workshop – F. Podo	Pag.	7
Present trends of NMR technology in medicine – F. De Luca, B. C. De Simone and B. Maraviglia	»	9
Expression of relaxation properties within the NMR image – J. S. Orr, R. A. Lerski and K. Straughan	»	13
The biophysics of the relaxation properties of water in biological systems – R. Mathur-De Vré	»	19
Heterogeneities in space, time, and clinical condition influencing the NMR response of tissues – K. H. Schmidt	»	25
Discussion – Moderator: F. Podo	»	31

TECHNICAL ASPECTS OF THE MEASUREMENTS OF RELAXATION BEHAVIOUR IN TISSUES

Technical aspects of relaxation measurements and their relationship with tissue properties – C. Casieri, F. De Luca, B. C. De Simone and B. Maraviglia	Pag.	41
Effects of relaxation time constants in NMR imaging – A. L. Luiten	»	43
Technique dependence in NMR imaging measurements – D.G. Taylor and A. Ericsson	»	47
NMR Imaging, T_1 measurements and calibration in relation to so-called T_1 images – J. Reisse, L. Wilputte and D. Zimmermann	»	51
Discussion on the effects of differences between various techniques on measurements – Moderator: B. Maraviglia	»	57
Technical aspects of human metabolic studies by NMR – P. Styles	»	61
Spatial localization of high resolution spectra and relaxation times using a rotating frame imaging technique – A. Haase, C. Malloy and W. Haenicke	»	65
Discussion on the interaction of measurements with localization – Moderator: P. Styles	»	71

PROBLEMS OF CHARACTERIZATION OF TISSUES AND BIOLOGICAL MATERIALS, USING STANDARD TECHNIQUES

Mechanisms of relaxation for protons in biological systems – M. Villa	Pag. 73
Factors influencing the values of the experimentally obtained relaxation rates of tissues – W. M. M. J. Bovée »	77
Can measurements of proton relaxations of tissues tell us about their bioenergetics? – G. K. Radda	» 81
<i>Discussion on biophysical factors determining relaxation behaviour and other NMR properties in tissues – Moderators: J.-M. Lhoste and W. M. M. J. Bovée</i>	<i>» 85</i>
Tissue discrimination <i>in vivo</i> by NMR imaging – M. A. Foster	» 89
The adequacy of the uni-exponential model in characterizing spin-lattice relaxation curves of biological tissues – C. J. Bakker and J. Vriend	» 103
Measurement and meaning of relaxation times: specific and non-specific variations in cancer – J. D. de Certaines	» 107
The NMR proton relaxation in biological fluids: a good way to identify precisely healthy or pathological states – G. J. Béné	» 121
Relaxation measurements in excised and perfused organs – G. Chambron, J. Mauss, D. Fornasiero and D. Grucher	» 127
<i>Discussion on experimental measurements in real tissues – Moderators: J.-M. Lhoste and W. M. M. J. Bovée...</i>	<i>» 137</i>
The problems of characterization of tissues and biological materials – R. Mathur-De Vré	» 143
Influence of age and thermal treatment on the proton NMR response of muscle – M. Villa	» 145
<i>Discussion on protocols for the preparation of biological samples for characterizing tissues – Moderator: J. S. Orr</i>	<i>» 149</i>
<i>Discussion on a possible categorization of measured values – Moderator: F. Podo</i>	<i>» 151</i>

IDENTIFICATION AND ASSESSMENT OF SUITABLE CONTRAST AGENTS

Principles and practical aspects of contrast agents for NMR imaging – J.-M. Lhoste	Pag. 155
<i>Discussion – Moderator: P. Servoz-Gavin</i>	<i>» 161</i>

STANDARDIZATION AND CALIBRATION METHODOLOGY FOR NMR EQUIPMENT

Standard phantoms for NMR imaging equipment – W. Derbyshire	Pag. 163
Synthetic polymers: a possible source of phantoms for NMR imaging – A. L. Segre	» 169
<i>Discussion on specification of relaxation properties required in substances for calibration – Moderator: J. S. Orr</i>	<i>» 173</i>

Practical considerations in the assessment of noise-limited medical images, with special reference to nuclear magnetic resonance imaging – A. R. Cowen	Pag. 175
Preliminary results from phantoms for spatial and contrast resolution, standardisation and calibration, within NMR images – J. S. Orr, R. A. Lerski and K. Straughan	» 191
<i>Discussion on specification of design of phantoms and protocols of use for performance assessment with respect to spatial and contrast discrimination</i> – Moderator: J. S. Orr	» 197
 POSSIBILITY OF DESIGNING A STANDARD INSTRUMENT FOR SAFETY ASSURANCE BY MEASURING ELECTROMAGNETIC EFFECTS	
Design of an instrument for safety assurance in NMR imaging procedures – K. J. Olsen	Pag. 199
<i>Discussion on safety assurance in NMR imaging procedures</i> – Moderator: J. S. Orr	» 203
 CONCLUDING REMARKS – F. Podo	Pag. 205

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Istituto Superiore di Sanità, Rome, Italy, 18-20 May 1983

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FOREWORD

NMR methodologies are demonstrating today their great potentiality in providing soft tissue information not always available by other technical approaches. For these reasons NMR is definitely attracting the interest of the biomedical Community, as also indicated by the conspicuous number of scientific Meetings and Symposia organized in these days in several Countries.

The Workshop on "Identification and Characterization of Biological Tissues by NMR", held at the Istituto Superiore di Sanità (May 18–20, 1983) on behalf of the EEC Working Group on Biomedical Engineering (SWG–BME) differed from many other Meetings on medical applications of NMR, since its objectives were not restricted to discussing diagnostic potentialities and clinical significance of the various approaches, but were also oriented towards the definition of a sound and realistic basis for a common European cooperation in this field of interest.

The Workshop was organized by Dr. F. Podo for our Institute, who prepared the Programme in collaboration with Prof. J. S. Orr (London), Prof. K. H. Schmidt (Tübingen) and Ir. A. L. Luiten (Eindhoven), and with the advice of Prof. J. P. Morucci (Toulouse) and Prof. A. Ermans (Bruxelles), members of the SWG–BME. The success of this Workshop, due to the wonderful collaborative efforts of all its participants has represented the basis for the subsequent preparation of a proposal for the performance of a Concerted Research Project on "Identification and Characterization of Biological Tissues by NMR", to be carried out under the auspices of the Commission of the European Economic Community. This programme, coordinated by Dr. F. Podo, will start in 1984.

It is a pleasant opportunity to express my best wishes for a fruitful work to the Project Leader, to the Project Management Group and to all the participants in this Concerted Action.

Prof. Francesco Pocchiari
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Istituto Superiore di Sanità

Rome, December 15th, 1983

PREFACE

NMR has recently been revealed as offering a non-invasive *in vivo* approach for assessing physiological and pathological properties of tissues and organs. The technological developments of the last decade have opened new perspectives in the use of NMR methodologies in the field of tissue identification and characterization. This purpose is additional and supplementary to that of anatomical imaging, which is rapidly advancing. Tissue characterization has previously formed a subsidiary aspect of most other medical imaging methods, such as ultrasound reflection, CT X-ray scanning and molecular medicine, but its promise has not been fully realised in these methods.

NMR offers, in the complex proton relaxation properties of biological tissues, a unique and potentially highly powerful tool. A considerable body of evidence has suggested that NMR relaxation properties can be meaningful parameters for detecting and monitoring the existence of pathological conditions in tissues. However the present studies of proton NMR relaxation properties with a view to tissue discrimination have been almost entirely empirical. The difficulties encountered in comparing the results from various laboratories have also made it difficult for the clinical and biomedical potentialities of NMR to be properly expressed in the field of tissue characterization. Although NMR spectroscopy on samples *in vitro* has widely expanded understanding of molecular biochemistry, new approaches are needed for the non-invasive characterization of heterogeneous tissues *in vivo*.

The present issue of this Journal contains the Proceedings of the Workshop on *Identification and Characterization of Biological Tissues by NMR*, held at the Istituto Superiore di Sanità (May 18–20, 1983), on behalf of the Working Group on Biomedical Engineering of the Committee on Medical and Public Health Research, Commission of the European Economic Community.

The structure of the Workshop was inspired by the belief that practical solutions to the problems of tissue characterization by NMR could only be envisaged by joining together, in a collaborative working plan, multidisciplinary efforts and specific expertise in physics, engineering, biophysics, physical chemistry, biochemistry, physiology and medicine.

The Sessions and Working Panels of the Workshop consisted of general and specific contributions, followed by plenary discussions. The scientific papers were prepared in advance by the contributors, and circulated among the participants at the Meeting. The papers were accepted as submitted. The discussion, recorded at the Meeting, were transcribed by Ms. Ruth Dombey and then sent to the participants for revision. The resulting texts were later revised by the Editors, who tried their best to preserve the lively style of the debates and some of the idiomatic style of English used.

The Editors wish to express their deep gratitude to Prof. K. Schmidt and to Ir. A. Luiten for their collaboration in preparing the scientific programme of the Workshop; to Prof. A. Ermans, Prof. J. P. Morucci, Prof. A. Sargentini, members of the EEC BME Group and to Dr. W. Skupinsky of the EEC Commission for their many, precious suggestions; to Prof. F. Pocchiarri, Director General of the Istituto Superiore di Sanità and Prof. G. D'Agnoles, Director of the Laboratory of Cell Biology for their constant encouragement and advice; to Prof. A. Cassone, the Editor-in-Chief of the *Annali dell' Istituto Superiore di Sanità* for having enthusiastically agreed to reserve a special issue of the Journal to the publication of these Proceedings.

The Editors are also pleased to acknowledge the collaboration of Dr. G. Carpinelli and Dr. G. Maddaluno in the editorial revision of some manuscripts; the invaluable and untiring assistance of Ms. Caterina Tripodi in the preparation of the Proceedings; and the skillful and experienced contribution by the staff members of the Editorial Section of the ISS Library to the completion of this publication.

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The Editors