Essential Oil Analysis by Capillary Gas Chromatography and Carbon-13 NMR Spectroscopy

V. FORMACEK and K.-H. KUBECKA
*John Wiley, Chichester, 1982, pp. 373, £3.50*

In recent years the examination of mixtures of naturally occurring compounds has been revolutionized by advances in instrumentation supported by sophisticated data handling and interpretation. Nowhere has this trend been more noticeable than in the examination of essential oils. As Masada and others have shown, when gas chromatography is coupled with mass spectrometry the combination can be a powerful method for characterization and identification.

The present volume by Formacek and Kubeczka proposes an alternative approach in which the high resolution of \(^{13}\text{C}\) n.m.r. spectroscopy is used to separate the signals from the different components of essential oils without the need for physical separation. Potentially this method should shorten the time to carry out an analysis and therefore should have advantages for routine use.

The book contains a short introduction followed by the results obtained for 50 samples, representing 35 essential oils, from angelica seed oil to thyme oil. Each report consists of a short description of the oil and its uses, a capillary g.l.c. trace determined with a wall-coated WG 11 column, and the \(^{13}\text{C}\) n.m.r. spectrum from 232 to –8 p.p.m. measured at 20.1 or 62.89 MHz. Selected sections of the spectra are expanded and the computer-calculated shifts are tabulated. A composition table is provided, based on the g.l.c. trace, and the n.m.r. peaks identified as characteristic of particular compounds are marked. These identifications were made by comparisons with reference spectra which are given in an Appendix together with a listing of the peaks in order of chemical shift. These Appendices would be useful also to workers in other fields, as they include many non-terpene compounds, but unfortunately the signals are not assigned to the respective carbon atoms. The reproduction of the g.l.c. and n.m.r. traces is clear and well laid out.

However, although \(^{13}\text{C}\) n.m.r. spectroscopy appears to be an elegant and simple technique, close examination of the entries reveals its limitations. In the g.l.c. trace of lemon oil 22 components are identified, but only five compounds were identified in the n.m.r. spectrum. Similar differences are present with most of the samples, components present at less than 1% apparently being difficult to identify. An advantage of the n.m.r. method is its reproducibility, but recent work by the Analytical Methods Committee of the Royal Society of Chemistry has shown how simple precautions can give highly reproducible g.l.c. traces. Unlike g.l.c.—m.s., it is difficult to identify unknown components, because it is hard to assign individual n.m.r. peaks to a particular compound. So far few standard spectra are available, particularly of sesquiterpene hydrocarbons, whose similarities can be expected to produce ambiguities similar to those found for their mass spectra.

The \(^{13}\text{C}\)-n.m.r. approach is an interesting concept, but although spectral measurement is rapid, interpretation of an unknown sample would be complicated and the capital equipment cost is high. It seems counterproductive to go from a 22-peak g.l.c. trace to a 200+-peak spectrum, which must then be unravelled before identification can take place, although there might be potential for computer-aided analysis.

As a new method the book could have been improved by more explanation of the scope and application of the method. Overall the book rather exaggerates the benefits of the n.m.r. method, and at over £50 cannot be considered as anything other than a library reference text for those institutions and companies deeply involved with the examination of essential oils.

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Clinical Cellular Immunology: Molecular and Therapeutic Reviews

A. E. LUDERER and H. H. WEETALL (Editors)
*Humana Press, Clifton, NJ, 1982, pp. 391, £36.75*

This volume purports to be the first of its kind to deal with both fundamental cellular immunology and its role in clinical medicine. The fact that it achieves this almost impossible aim is a tribute to its contributors and editors.

Each chapter deals with a single aspect of cellular immunology, but these have been edited in a manner which allows the book to give a wide overview of the field. In the first two chapters, current concepts of T-lymphocyte function and immune-response genes are discussed by leading workers in the field, and these provide a sound basis for the more clinically orientated chapters to follow. As the initial chapters deal almost entirely with experimental evidence derived from mouse systems, the non-specialist immunologist may be initially reluctant to explore the finer points of theories of T-cell recognition and function. However, the clarity of the text renders the exercise worthwhile for anyone interested in pursuing detailed studies of cellular immune function in man. It is perhaps the only major omission from the book that recent experimental work on human T-cell regulation is not discussed in any detail.

The chapters on immunosuppressive agents are an important contribution to understanding the effects of chemotherapy and radiotherapy on the lymphoid system and are an attempt to detail these more precisely than is normally found. Although these are also based on animal studies, they should be required reading for all those dealing with immunosuppressive therapy.

Similarly the chapters on lymphoma and autoimmune disease are a refreshingly scientific approach to these disorders, with a well-balanced mixture of experimental and clinical information. In each, the authors succeed in providing a concise immunobiological overview of complex conditions and indicate how sound experimental work can contribute to understanding human disease. The chapter on tumour immunity carefully avoids the trap of projecting an immunological 'cure' for malignant disease, and may not satisfy clinicians for this reason. However, this is a good review of the subject which describes the immunological mechanisms that may be involved in cancer, and is a useful reminder of the complexity of the problems. The final chapters are up-to-date discussions of more practical aspects of cellular immunology, dealing with lymphocyte hybridization techniques and methods of assessing cell mediated immunity in patients. Although many of the techniques discussed will not be available in many laboratories at present, the authors show clearly the direction in which immunology should develop, and their comments will provide much interest for workers in the field.

Although aimed at a wider audience, this book will principally be of interest to immunologists working in clinical immunology or in related fields of animal research, and will be an excellent source of reference for them. There is also much of use for clinicians and others in related disciplines, and in general the book fills a large gap in the literature and is a welcome addition to the field.

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