LETTERS TO THE EDITOR

Acanthamoeba and contact lens disinfection: should chlorine be discontinued?

EDITOR,—Two presentations of *Acanthamoeba* keratitis associated with 'disposable' contact lens wear have been recorded in Glasgow within the last year. *Acanthamoeba* was cultured from the corneas of both patients after biopsy. In addition *Acanthamoeba* was isolated from the contact lens storage cases of both patients. In each instance, the patients had used a chlorine-based system to attempt disinfection of their contact lens.

Others have isolated *Acanthamoeba* from two of nine lens cases exposed to disinfection with chlorine-based lens cleaning systems; *Acanthamoeba* was not isolated from 35 cases disinfected using chlorhexidine and 20 cases using hydrogen peroxide.¹ One of 18 cases disinfected using an unidentified disinfectant contained *Acanthamoeba*, as did three of 19 cases which used 'heat'. This latter study also provided data which reinforce the notion of Lowe and colleagues² that there is a greater relative risk of residual bacterial growth, a prerequisite for nutrition of amoebae, within the lens cases if chlorine rather than hydrogen peroxide is used as the disinfectant.

Although available commercially as Softab (sodium dichloroisocyanurate) and Aerotab (hazalone) there are grounds for doubting the value of chlorine as an anti-*Acanthamoeba* disinfectant. *Acanthamoeba* trophozoites are sensitive to 1.25 mg/l available free chlorine³ but cysts appear more resilient. These can resist a free available chlorine concentration of at least 50 mg/l, derived from a solution of sodium hypochlorite.⁴ Cysts also survived in a concentration of 5 mg/l free available chlorine generated from Aerotab tablets.⁵ No published data are currently available relating to the specific effects of sodium dichloroisocyanurate on *Acanthamoeba* trophozoites or cysts.

The general failure of most commercially available chemical disinfectant systems to guarantee uniform killing of *Acanthamoeba*, within a reasonable time period, could be overcome by replacing the reusable and usually contaminated lens storage case with a sterile disposable one.⁶ Furthermore, the increasing prevalence of microbial keratitis with 14-day wear 'disposable' lenses, and recognition of *Acanthamoeba* infection associated with them, highlights the requirement for a sterile disposable case for the reusable a 'disposable' lens. Lack of compliance with recommended lens disinfection procedures, especially by younger wearers who use contact lenses principally for cosmetic purposes, has been identified as a further factor which enhances the risk of keratitis. Wearers may not perceive the need for good hygiene since a 'disposable' lens is being used. Medical practitioners and optometrists should consider these factors when advising patients on contact lens wear and hygiene.

An alternative approach to reduce contamination and enhance eradication of *Acanthamoeba* cysts and other microbes involves daily washing of the lens case with hot (>70°C) boiled water from the domestic kettle, followed by storage in a dry state.⁷ The micro-

biocidal effect of this process means that the subsequent activity of efficacious chemical disinfectants, such as hydrogen peroxide, is not compromised by contamination, but is dependent only upon contact time with the lens, to which amoebal cysts adhere, and penetration of any associated biofilm. Under such conditions sterility of the contact lens would be assured.

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- 1 Larkin DFP, Kilvington S, Easty DI. Contamination of contact lens storage cases by *Acanthamoeba* and bacteria. *Br J Ophthalmol* 1990; 74: 133-5.
- 2 Lowe R, Vallas V, Biennan NA. Comparative efficacy of contact lens disinfection solutions. *Contact Lens Assoc Ophthalmol J* 1992; 18: 34-40.
- 3 Cursons R, Brown TJ, Keys EA. Effect of disinfectants on pathogenic free-living amoebae in axenic conditions. *Appl Environ Microbiol* 1980; 40: 62-6.
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Corneal diameter in premature infants

EDITOR,—The paper by Al-Umran and Pandolfi¹ contains valuable information, but appears from some material points of view incomplete. It is not altogether surprising that the corneas, like most parts of premature infants, should be smaller than those of full-term ones. In fact, the subject was first studied almost 70 years ago,² and the data for premature cadaver corneas neatly fit into measurements obtained on living eyes.³ Al-Umran and Pandolfi's measurements are also consistent with earlier data.³

What is more recent in the work by Al-Umran and Pandolfi is their attempt to link corneal measurements to the high incidence of congenital glaucoma in Saudi Arabia. It would appear that this has not yet succeeded for at least two reasons.

In the first place, they have not attempted to relate the size of the cornea to other ocular components. It is arguable that a mechanical role played by a (premature) cornea may depend on its curvature, which decreases steeply during the last weeks before full term.³ Again, information on the depth of the anterior chamber, more likely to be affected by corneal curvature than by corneal diameter, could also be relevant. In short, since both the cornea and the eyeball grow log linearly right up to full term, it is hard to see at present what aetiological role corneal size can play.

The second reason is the lack of any clinical follow up. What is needed now is information on the incidence of congenital glaucoma amongst the cases examined by Al-Umran and Pandolfi and a comparison of this with results obtained for the incidence in (a) full-term babies, and (b) babies born with normal corneal

diameters. These two pieces of information would complete a very important study.

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- 1 Al-Umran KU, Pandolfi MF. Corneal diameter in premature infants. *Br J Ophthalmol* 1992; 76: 292-3.
- 2 Scammon RE, Armstrong EL. On the growth of the human eyeball and optic nerve. *J Comp Neurol* 1925; 38: 165-219.
- 3 Weale RA. *A biography of the eye - development, growth, age*. London: Lewis, 1982: 97-101.

Reply

EDITOR,—We were intrigued to learn from Dr Weale that the corneal diameter in premature cadavers was being measured as early as 1925. It would be interesting to know whether before measurement these eyes were cannulated and perfused at physiological pressure since post-mortem hypotony is likely to alter the geometry of the globe. Anyway Dr Weale makes a useful reminder—that is, it pays to examine the old literature.

The aim of our investigation was purely to provide a set of 'normal' values useful to answer the question: is the corneal diameter of a given premature infant too large and consequently shall one suspect a congenital glaucoma in this child? We did not attempt to correlate the corneal diameter with the high incidence of primary infantile glaucoma in Saudi Arabia. The children examined were healthy and none has subsequently developed glaucoma.

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BOOK REVIEWS

Recent Advances in Ophthalmology Eight. Eds S I Davidson, B Jay. Pp 224. £62.95. Churchill Livingstone: Edinburgh, 1992.

It is always a pleasure to read concise, up to date information written by people who know what they are talking about. Sidney Davidson and Barrie Jay have succeeded admirably in drawing together a collection of mini reviews covering areas in ophthalmology which are developing particularly rapidly at present.

Chapters cover aspects of oculoplastic surgery, contact lenses, corneal transplant, intraocular lens complications, therapy of open angle glaucoma, automated perimetry, uveitis, retinopathy of prematurity, pneumatic retinopathy, proton beam irradiation of choroidal melanomas, and molecular genetics. Each chapter has been written by one or more well known figures from the United Kingdom or the United States. The results of laboratory research have been blended with clinical

experience leading to fresh information of direct relevance to clinical practice. Editorial control has been effective, with a consistently readable style throughout and excellent referencing of each chapter. Many of the references are to specialist journals and provide an accessible starting point for further in depth study.

This book will be read avidly by all who aspire to provide 'state of the art' clinical care. It will also provide a final pre-examination boost to those fellowship candidates who wish to demonstrate their familiarity with some of the major recent developments in ophthalmology.

B W FLECK

Fetal and infant origins of adult disease. Edited by D J P Barker. Pp 344. £24.95. BMJ Books: London, 1992.

This book is a compilation of 31 publications by Professor Barker and his colleagues from the MRC Environmental Epidemiology Research Unit of Southampton University. It puts together the main body of work which has investigated the role of prenatal, neonatal, and postnatal risk factors for adult disease, in particular ischaemic heart disease, hypertension, stroke, maturity onset diabetes, and chronic bronchitis. The substantial introduction by Professor Robinson, Emeritus Professor of Paediatrics at Guy's and St Thomas's hospitals, serves as an excellent guide and independent critique to the collected papers which follow. The introduction, together with minor modifications to the text of the published papers, binds the various research approaches into a cohesive whole which makes fascinating reading.

The research as a whole investigates the 'programming' hypothesis of the physiological development of body systems with particular regard to the use of nutrients, haemodynamic, and rheological factors which are determinants of hypertension and respiratory factors which later determine resistance to infection. The concept of the 'sensitive period' in development when exposures or events can determine the later function of an organ or body system is not a strange one to ophthalmologists.

The development of the theoretical argument from retrospective studies on the geographical correlations of maternal and infant mortality with later adult mortality, through case control studies on individuals, to longitudinal studies on individuals' life exposures, is exemplary. It illustrates the formulation of a research idea which is then investigated from a number of different standpoints using the whole gamut of epidemiological research methodology.

One of the most remarkable aspects of this research is that it was possible at all. The detective work required to identify reliable but ancient records of maternal and child health must have been exhaustive. And then to be able to follow up survivors and the death certificates of those individuals who had died half a century later is quite an amazing achievement. Robinson elegantly describes this in his introduction as epidemiological archaeology. But none of this would have been possible were it not for the British obsession for the collection of health statistics. The pivotal data for this research are death certification by cause but other data routinely collected by health visitors on maternal and child health and feeding behaviour were crucial. Record linkage was also a vital tool. Robinson correctly points out that

research like this more than justifies the collection and storage of such data. We, as ophthalmologists, should take note, with only the blind and partial sight register (with its well known limitations) to fall back on.

The findings of this research are clearly important and are on the whole convincing. Much of what cannot be explained by adult nutritional and lifestyle exposures in the well documented inequalities in health across our nation is accounted for by these results. The most difficult issue that the authors have to contend with is the potential confounding effect of poor prenatal and postnatal conditions with poor conditions continuing throughout the life of an individual. It is in this area that most of the criticism of this research has been directed. Two studies tackle this issue quite elegantly, the tale of three cities (Nelson, Colne, and Burnley) and the emigrant studies where individuals were followed from their origin, with adverse early exposures, to a more affluent adulthood carrying with them their increased mortality risk.

The authors are careful to point out that these findings do not negate established adult risk factors but coexist with them in the multifactorial spectrum of risks which contribute to every individual's mortality experience.

At the end of his introduction, Robinson makes a point of great relevance to ophthalmologists, that of the unity of medicine. The findings of these studies may be indeed relevant to ophthalmic epidemiology. Though we lack reliable statistics there is some evidence from blind registration data that there are regional differences in eye health in England. To what extent can the great excess of cataract morbidity seen in Asia and Africa be explained by early adverse exposures? What might be the role of these exposures in the risk of aging maculopathy? We cannot answer these questions yet but any reader of this book with an interest in determinants of eye health will surely feel inspired to follow them up.

RICHARD WORMALD

Manual of Oculotoxicity Testing of Drugs. Eds O Hockwin, K Green, and L F Rubin. Pp 436. DM 232. Gustav Fischer: Stuttgart, Germany, 1992.

This manual sets out to present models and methods which represent the state of the art concerning the evaluation of possible secondary effects of drugs and chemicals upon the eye. A panel of 26 authors has been assembled to contribute to this book which covers a wider remit than simply methods of testing the toxicity of drugs.

A general introduction concerning comparative anatomy, physiology, and biochemistry of the eye is provided. This is followed by a review of techniques of clinical examination and investigation of ophthalmic structure and function in animals. Methods of assessing drug toxicity, both in animal models and employing cell and lens culture methods, are then described.

Most of the 20 chapters are written to a high standard in clear, readable English. However the chapter on 'Ocular pharmacokinetics' provides only a rudimentary coverage of the subject and is poorly referenced. This chapter also mentions a number of key references but fails to list them – a potentially frustrating omission which, hopefully, the editors and publishers will address. Another omission is

that the chapter concerning methods and models for testing retinal toxicity reviews a wide range of techniques but it is not referenced despite providing two and a half pages of references at the end!

This review provides a useful reference text for research workers planning to investigate ophthalmic disease or ocular toxicity by establishing animal models or cell culture methods and it will no doubt have a useful place in many laboratories and libraries.

GORDON N DUTTON

All titles reviewed here are available from the BMJ Bookshop, PO Box 295, London WC1H 9TE. Prices include postage in the UK and for members of the British Forces Overseas, but overseas customers should add 15% to the value of the order for postage and packing. Payment can be made by cheque in sterling drawn on a UK bank, or by credit card (Mastercard, Visa, or American Express), stating card number, expiry date, and full name.

NOTICES

Systemic lupus erythematosus

An awareness campaign is being conducted by Lupus UK, under the title of Lupus Awareness Week 1993, on 10–17 April 1993. Further information: Yvette Self, Information/Education Advisor, Lupus UK, Queens Court, 9–17 Eastern Road, Romford, Essex RM1 3NG, UK. (Tel: 0708 731251; Fax: 0708 731252.)

Singapore National Eye Centre

The Singapore National Eye Centre will hold its 1st international meeting on 16–18 April 1993 at the Shangri-la Hotel, Singapore. The theme of the meeting is 'Controversies in ophthalmology'. Further details: The Administrator, Singapore National Eye Centre, 11 Third Hospital Avenue, Singapore 0316. (Tel: (65) 227 7255; Fax: (65) 227 7290.)

Retinal and vitreous surgery

The Tübingen Detachment Course on retinal and vitreous surgery will take place on 22–23 April 1993 at the University Eye Clinic, Lecture Room, Schleichstrasse 12, 7400 Tübingen, Germany. For further details: Secretary, K Lütjens; Organiser, Prof Dr I Kreissig, Univ-Augenklinik Abt III, Schleichstrasse 12, D-7400 Tübingen, Germany. (Tel: 07071–294758; Fax: 07071–293730.)

Duke University Uveitis Course

The Duke University uveitis course will be held on 23–24 April 1993 at the Washington Duke Inn and Gold Club, Durham, North Carolina, USA. Further details: George Andrews, Duke University Eye Center, Box 3802, Durham, NC 27710, USA. (Tel: (919) 684–6611; Fax: (919) 684–2230.)