

stung region. In the case of stone fish poisoning, however, it is best that the concentrated necrotising venom is allowed to diffuse freely away from the region. Deaths due to the systemic effects of the venom are extremely rare, with only a couple recorded in published work.

Infection often occurs with this type of injury. It should be remembered that marine bacteria comprise a wide range of organisms, and many are resistant to common antibiotics and also may require saline media for culture. It follows that debridement should be assisted by washing the wound well with fresh or preferably sterile water. The drug of first choice is trimethoprim-sulphamethazole. Tetanus prophylaxis should also receive attention.

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- 1 Wilmhurst P. Stone fish bite. *Br Med J* 1990;300:436. (17 February.)
- 2 Gordon DJ, Millar R. Stone fish bite. *Br Med J* 1990;300:464. (17 February.)
- 3 Llewellyn T, Fraser-Moodie A. Stone fish bite. *Br Med J* 1990;300:134. (13 January.)
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- 5 Sutherland SK, Coulter AR, Harris RD. The rationalisation of first aid measures for elapid snakebite. *Lancet* 1979;i:183-6.

Analysis of serial measurements in medical research

SIR,—Dr J N S Matthews and colleagues have made a spirited case for the use of the summary measures approach to the analysis of repeated measures.¹ Though this is undoubtedly one of the best methods, their claims for it are extravagant.

Two of their objections to an analysis at each time point also apply to summary measures. If univariate analyses are performed on maximum values and on areas under the curves for subjects in a clinical trial the facts that these measurements come from the same subjects and are not independent are also ignored. Many of the summary measures that are commonly used together are correlated even when the measurements on which they are based are not. The summary measures approach is more reasonably recommended on the grounds that it may be a sensible way to reduce data; it is not more valid than an analysis at each time point, the validity of which was noted by Yates in the paper cited by Dr Matthews and colleagues.²

The authors are also uncritical in their recommendation of the measures used in clinical pharmacology. Many of these are not good measures, and their common use is as much a matter of illogical habit as is the analysis at each time point performed in other subjects. The widespread use of the poor "time to event" measures betrays an ignorance of the way in which causality is determined in experiments. For example, in a single dose placebo controlled trial of a bronchodilator a "return to baseline" of forced expiratory volume in one second (FEV₁) in the bronchodilator group may be observed some hours before the mean FEV₁ in the bronchodilator group equals the mean in the placebo group simply because the whole experiment is affected by a strong downward trend (the patients may have been imperfectly "washed out," they may become tired with the FEV₁ manoeuvre, etc). Under such circumstances a comparison between groups at each time point to determine the duration of action of the bronchodilator, although not without difficulties, is better than defining duration in terms of the conceptually false "time to return to baseline."

Despite these criticisms it is pleasing to see space given to an article on this topic. If the authors'

general advice on thinking carefully about measurements and ways of combining them when planning experiments is followed current practice will improve considerably.

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- 1 Matthews JNS, Altman DG, Campbell MJ, Royston P. Analysis of serial measurements in medical research. *Br Med J* 1990;300:230-5. (27 January.)
- 2 Yates F. Regression models for repeated measurements. *Biometrics* 1982;38:850-3.

AUTHORS' REPLY,—We are grateful to Dr Stephen Senn for his comments and for this opportunity to emphasise and clarify some of the points in our paper.

We agree with Dr Senn that the principal advantage of summary measures is that they are chosen to address specific questions and to have a meaningful interpretation. The success of the method rests entirely on the appropriate choice of the summary measures. This should depend on a careful consideration of the aims of the study and perhaps an inspection of the data rather than on any of the illogical habits mentioned by Dr Senn.

The dependence between successive values of the original variable is likely to be high, and this will make it impossible to correctly interpret, for example, levels of significance calculated at successive time points. Two summary measures may well be dependent, but this position is different in at least three ways: firstly, each summary is intended to answer a separate question, and dependence with other measures does not invalidate the analysis; secondly, choosing summary measures of different aspects of the response may lead to measures that are not as highly correlated as the original variables; and, thirdly, the nature of the dependence between summary measures may be of interest in itself (something unlikely to be true of the original values) and can be investigated by standard statistical methods.

The analysis of serial measurements is not straightforward, and inevitably we had to exclude many topics from consideration in our paper. Among these was the difficult topic of interpreting and analysing data when interest may legitimately be focused on whether and when a patient has returned to a pretreatment level or to an equilibrium state. The time to an event may be a very valuable summary measure, but if the event is difficult to define sensibly or precisely then its value may be wholly undermined. At this stage we would simply remark that inspection of the shapes of the responses would be important. Once again we must emphasise that appropriate summary measures can be sensibly chosen only on the basis of a thorough understanding of the measured variable and the purpose of the study.

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Superglue inadvertently used as eyedrops

SIR,—The problems associated with dropper bottles of similar appearance were emphasised by Mr Christopher Lyons and colleagues in their report of nail adhesives being administered instead of eye drops.¹

As previous attempts at limiting the appearance of non-medical plastic bottles have not been taken up the authors suggest that a distinctive shape should be adopted for ophthalmic dropper bottles. This confusion with glue and nail fixer bottles is not, however, the only danger of multiple dose ophthalmic dropper bottles. They also allow cross infection and the risk of irritation from the preservatives used in multiple dose formulations.

Perhaps it would be better to overcome all such dangers and abolish multiple dose containers for ophthalmic use and change to sterile, plastic, single dose units for all therapeutic eye drops and ointments. Labelling can be inscribed on the flange attached to the single dose unit in Braille as well as clear text, and each unit can be taken off, used, and discarded for each dose application.

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- 1 Lyons C, Stevens J, Bloom J. Superglue inadvertently used as eyedrops. *Br Med J* 1990;300:328. (3 February.)

Training in accident and emergency

SIR,—We would like to add our comments to those of Mr Francis Morris and colleagues.¹ We have run an induction course at our hospital on the first two weekends of February and August since 1985, enabling accident and emergency departments to send half of their new senior house officers on one weekend and half on the other.

An analysis of 1431 assessment forms returned during 1985 to 1989 (20 courses) showed that 1412 participants found the course useful. Of 22 topics, the most useful were head injuries; gynaecological emergencies; limb injuries; major injuries; minor injuries; spinal problems; radiological pitfalls; and eye, ear, nose, and throat, and dental emergencies. This probably reflects the delegates' lack of experience with these types of problems. As a result of feedback we have added psychiatric emergencies and common orthopaedic mistakes to the course programme.

Our attempts to test skills objectively have included a comparison of the performance of the senior house officers at the hospital during the first week of August 1987. Among the tutored doctors one incorrect and 46 correct assessments of radiographs were made compared with 16 incorrect and 98 correct assessments made by untutored doctors (0.02 < p < 0.05).

Many consultants in accident and emergency medicine support the course, and we think that all senior house officers in this subject would benefit from such a period of intensive training.

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- 1 Morris F, Cope A, Hawes S. Training in accident and emergency: views of senior house officers. *Br Med J* 1990;300:165-6. (20 January.)

SIR,—We were most surprised that Mr Francis Morris and colleagues did not mention orthopaedic surgery in their study of senior house officer training in accident and emergency.¹ At least a quarter of patients seen by general practitioners' and over a third seen in the accident and emergency