nature and severity of the chemical hazard has not been determined is the supplied gas respirator with full face shield of Level A (an encapsulating suit and self-contained breathing apparatus) or Level B (a non-encapsulating suit with self-contained breathing apparatus or a full face respirator on a gas line).[3,4]

Confronted with a hazardous materials emergency, potentially involving very toxic chemicals, emergency department staff need to have complete confidence in their own protection. This is only possi-

response. The interdisciplinary issues mentioned by Bradt were mentioned in our article, but not in detail because of space limitations.

Our personal protective equipment (PPE) conforms to Australian standards[1-3] and the three decontamination lines are in keeping with other institutions. We are not aware of any simple decontamination system which, evidence-based, is superior.

The choice of PPE in the ideal situation would be one that would provide

Trusting numbers: uncertainty and the pathology laboratory

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TO THE EDITOR: White emphasised problems that can arise if medical decisions are overly reliant on the results of laboratory tests.[1] He relates the case of a

patient who, because of a peculiarity of her immunology, consistently produced a false-positive test result. In probabilistic language, the issue is are there risks of both random errors and patient-specific errors? It is important to distinguish between them. Suppose a test has a false-positive rate of 10%. If this is truly random error, the probability of two false-positive results in the same person is 1%, and the probability of three false-positive results is tiny. But if it is due to there being 10% of healthy people for whom the test is invalid and who consistently give a positive result, the probability of two false-positive results in the same person is 10%, and the probability of three false-positive results is 10%!

Major textbooks of medicine have excellent chapters on decision-making. These warn about limitations of sensitivity and specificity (eg, that data from the general population may not apply to people who have tested positive in screening). But, other than this, little is said about reasons for errors in testing, and the consequences for how sensitivity and specificity should be used. In most cases, the impression given is that errors occur completely randomly. However, it appears that White's example, in which repeated testing led to repeated errors, is not unique.

Lee[2] writes as follows: "Suppose a low-risk patient has an abnormal lung ventilation–perfusion scan. Obtaining that same test result over and over will not truly raise that patient's probability of coronary disease further and further."

Perhaps Goldman[3] had something similar in mind when writing, "It may be quite difficult to distinguish random laboratory errors from test results that might be falsely positive or negative because of coexistence of a process that can affect the test".

Lists of possible reasons[4,5] for errors include both short-acting (eg, distracting external noise, and biochemical effects of foods recently eaten) and long-term (eg, physical handicaps, and demographic factors) influences.

I wonder if information about tests should routinely include separate random and patient-specific components of sensitivity and specificity. For example, it might be stated that a false-positive rate of 15% arises from 10% random errors and 5% patient-specific factors, or that a false-negative rate of 10% arises from 3% random errors and 7% patient-specific factors. This is the conclusion I have been led to by White's article.

1. White GH. Trusting numbers: uncertainty and the pathology laboratory. *Med J Aust* 2002; 177: 153-155.
2. Lee TH. Interpretation of data for clinical decisions. In: Cecil textbook of medicine. 21st ed. Philadelphia: Saunders, 2000; 79-84.
3. Goldman L. Quantitative aspects of clinical reasoning. In: Harrison's Principles of Internal Medicine. 14th ed. New York: McGraw-Hill, 1998; 9-14.
4. Mitrushina MN, Boone KB, D'Elia LF. Handbook of normative data for neuropsychological assessment. New York: Oxford University Press, 1999; 16.
5. Young DS, Bermes EW. Specimen collection and processing: sources of biological variation. In: Tietz textbook of clinical chemistry. 3rd ed. Philadelphia: Saunders, 1999; 42-72. ❑

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IN REPLY: Many factors potentially contribute to error in generating a diagnostic test result, and include random pre-analytical errors arising from patient preparation and specimen collection, random errors associated with the act of measurement, and systematic errors caused by, for example, drug interference. Tested individuals may also harbour an interfering substance, such as a drug or immunoglobulin. The theoretical and practical description of these components of test error is generally well understood and documented by laboratories, and the basics of test error and diagnostic sensitivity and specificity are taught in medical schools. However, I think trying to apply probability data to a test result for a specific patient is of limited value to the treating doctor.

The commoditisation and automation of much of pathology testing contributes to a perception that tests are 100% reliable, and there is also a perhaps related decline in communication between requester and provider. Most tests have limitations, many inconsequential, some important and patient-specific. Although Hutchinson draws a valid conclusion, I hope readers also concluded that communication with diagnostic laboratories remains important for safe patient care, and that test results still need to be interpreted in the context of other clinical information about a patient, and not accepted without question. ❑

Correction

Re the article "Water and the environment: a natural resource or a limited luxury?", by Karin Leder, Martha I Sinclair and John J McNeil in the 2/16 December issue of the Journal (*Med J Aust* 2002; 177: 609-613). Due to a software error, the affiliation of the authors was incorrectly given as the National Centre for Epidemiology and Population Health, Australian National University, Acton, ACT. The correct affiliation and contact details are:

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eTG complete

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TO THE EDITOR: In reviewing the CD-ROM containing an integrated set of *Therapeutic guidelines* (*eTG complete*),[1] Mann noted that, although utility was improved, the cost was high ($220 for a first user, and $110 for each subsequent user, compared with $264 for a set of the printed volumes which could be shared within a practice).[2]

Unfortunately, the cost of distilling evidence-based knowledge is also high, especially for publications that require regular review and update. In addition, there are extra costs involved in electronic conversion (text to HTML), reformatting material to fit computer screens, creating expandable and col-