

TABLE 1

Doctor's view of the usefulness of the guidelines in the Grey Book*. Figures in percentages.

	House Officers	Senior House Officers	Registrars	Consultants
Numbers in cohort	(12)	(23)	(36)	(45)
Very Useful	20	9	6	3
Useful	55	35	28	29
Not Useful	18	26	11	4
Not Applicable	7	30	55	65

*The question asked was 'Please indicate for each topic how useful you have found it as an aid to the clinical management of patients'.

mounted to increase awareness and to provide a contact address (the Clinical Pharmacology Unit Office) where Guidelines could be collected increased distribution to all hospital staff. Posters were displayed in strategic places through the main hospital and medical school, and were the most likely explanation for the subsequent increase in number of those who received copies. However other factors may have contributed. Staff may have been keener to obtain copies following an increasing awareness of the value of guidelines coupled with wide-spread encouragement of their use. Finally, clinical activity at the hospital has often been audited against the Guidelines and this will have made them familiar to a widening audience. The increase in the number of recipients was particularly great for consultant staff, from 58 per cent to 93 per cent. Presumably before the poster campaign the consultant's copy was thrown away, and with it the copies for their juniors. The value of a poster campaign has been referred to by others¹ but not studied systematically.

If as shown a poster campaign is needed to help the distribution of an established set of guidelines (published for nearly 13 years), it is almost certain that an equivalent campaign will be needed when launching a new guide. We do not know whether the improved distribution has increased the utilisation of the Guidelines and this is now being investigated, though we have shown that 80 per cent of recipients keep copies and view their provision as beneficial.

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²Grol R, Development of Guidelines for General Practice Care. *Br J Gen Pract* 1993; **43**: 146.

AN EGG-RELATED SALMONELLOSIS OUTBREAK IN SAUDI ARABIA

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The incidence of foodborne bacterial diseases is increasing world-wide with various types of *Salmonellae* identified as the leading aetiologic agent.^{1,2} *Salmonellae* have been isolated from almost all animal species, but poultry and poultry products are emerging as the most important source of human infection.²⁻⁴ The latter, including eggs, may now be responsible for more than 50 per cent of common epidemics of foodborne salmonellosis.^{5,6}

We describe below the first large scale common vehicle poultry product related outbreak of salmonellosis reported from Saudi Arabia.

MATERIALS AND METHODS

In March 1993, an outbreak of gastroenteritis occurred in a company's complex. All members of the campus were interviewed regarding the food and beverages consumed and their illness if any. Clinical and epidemiological data were recorded on a specially designed form. A case of salmonellosis was defined as a person with diarrhoeal illness starting within 48 hours of consumption of food prepared in the common serving kitchen who also had *Salmonella* isolated from a stool sample or a rectal swab. Symptomatic individuals with a negative culture were labelled as probable cases. Patients with severe symptoms were admitted to hospital.

Samples of cooked and uncooked food items supplied by the common serving kitchen were cultured. All the patients and cooks had either a rectal swab, stool culture or both taken, the material was cultured using standard methods for isolation and serotyping.

Standard frequencies were calculated and Fisher's exact test and chi square test were used where appropriate to calculate significances.

RESULTS

The on site common kitchen had different serving areas for the two communities living in the complex. A total of 290 persons regularly ate from this kitchen; 110 from serving area A and 180 from serving area B. The dishes served to the two different areas were cooked separately. Out of 110 persons eating in area A, 85 ate rice with scrambled eggs and 70 developed symptoms of acute gastroenteritis; only one of the other 25 who had chosen an alternative dish developed the illness. Three of 180 persons eating in area B, developed the illness, one of whom had shared his friend's scrambled eggs. As shown in Table 1 the food specific attack rates were highly significant for scrambled eggs ($p < 0.00010$).

Forty-four of the affected individuals, all male, required hospitalization for

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TABLE 1
The relationship between food type consumed and the development of illness

Food type	Number of consumers	No. sick (%)	Number of non-consumers	No. sick (%)
Rice	190	72(37.90)	100	2(2)
Chicken	200	30(15)	90	44(48.89)
Bread	140	2(1.42)	150	72(48)
Vegetables	104	2(1.92)	186	72(38.71)
Scrambled eggs	86	71(82.56)	204	3*(1.47)

* $p > 0.001$

further management. Twenty-three (52.3 per cent) presented with vomiting immediately followed by cramps and diarrhoea; 20 (45.4 per cent) had cramps and diarrhoea and 1 (2.3 per cent) had diarrhoea alone.

The median interval between the intake of scrambled eggs and development of symptoms was 6.3 hours (± 2.8 hrs, range 2–12 hrs). The frequency of diarrhoea decreased over subsequent days and only 6 patients had 3–12 motions/day on the 4th day.

Salmonella enteritidis was isolated from rectal swabs of 40/44 (90.9 per cent) patients and the stool culture of 37/44 (84.1 per cent) patients. All 44 patients had at least one positive culture. The outbreak consisted of these 44 confirmed and 30 other probable cases of salmonellosis. Both pooled raw as well as scrambled eggs from the kitchen yielded *Salmonella enteritidis*. Other than one cook who was affected after consuming scrambled eggs, all other cooks were asymptomatic and their stool cultures did not grow *Salmonella*.

This outbreak of foodborne salmonellosis is consistent with the increasing incidence of *Salmonella enteritidis* epidemics related to egg consumption which has been noticed both in Europe and the USA.²⁻⁹ In this country, although eggs are commonly consumed, Kabsa, a traditional combination of fried rice served with meat or chicken, is the commonest cause of food poisoning episodes.¹⁰

The epidemiological investigation, as shown in Table 1 identified scrambled eggs as the source of this outbreak. The 3 affected persons, who did not consume scrambled eggs could have been cross-infected.^{11,12} *Salmonella enteritidis* was isolated from both the scrambled and raw shell eggs but from no other foods. Eggs get contaminated with cloacal *Salmonella* which penetrate pores or cracks in eggshells during laying^{13,14} and various serotypes have been found in bulk raw eggs at egg pasteurization plants, presumably because cracked or damaged eggs are inadvertently processed in such plants.⁶

DISCUSSION

There are directives preventing marketing of cracked eggs in Saudi Arabia. The eggs in this outbreak were broken just before cooking but the intact nature of the shells was not confirmed. Hence this mode of spread cannot be ruled out. *Salmonella enteritidis* may also be isolated from intact raw eggs contaminated by other means. *Salmonella pullorum*, a serotype which has host adapted to poultry, may selectively colonize ovaries, without intestinal carriage, infecting the egg yolk prior to shell deposition.¹⁵ Other than *S. pullorum*, *S. enteritidis* and *S. typhimurium* have also been isolated from ovaries of layer hens. It is possible that

even the latter two serotypes may cause outbreaks of foodborne illness through this route.^{16,17} Certain cooking practices including frying and boiling for less than 4 minutes may not kill *Salmonellae* in eggs;¹³ scrambled eggs have caused outbreaks of *S. enteritidis* infection in the past.⁴

Outbreaks of salmonellosis, such as we report here, cause suffering and loss of income.^{1,18} They may be prevented by the proper preparation of eggs; eggs which are cracked or soiled should not be used and serving of raw or lightly cooked eggs should be avoided. If transovarian spread of *S. enteritidis* has occurred even these routine measures may not prevent human infection from eggs contaminated prior to shell deposition. It may be necessary to extend the study of the ecology of this organism in poultry flocks.

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