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The isolation of *Escherichia coli* from a poultry packing station and an abattoir

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SUMMARY

The distribution and serotype of strains of *Escherichia coli* from a poultry packing station and an abattoir are described. The results indicated that animal faecal strains contaminated the environment and the animal carcasses.

Using 150 O antisera, a high proportion of the *E. coli* strains were non-typable. This suggests that the serotype distribution of *E. coli* in animals is different from that in man.

Strains with single antigenic differences were isolated, and the possibility of genetic transfer of these antigenic structures is suggested.

INTRODUCTION

We have previously briefly described the isolation of *Escherichia coli* from a poultry packing station and an abattoir (Shooter, Cooke, Rousseau & Breaden, 1970). We now report the distribution and serotypes of *E. coli* from these sources and provide further evidence about the spread of *E. coli* in these environments.

MATERIALS AND METHODS

The poultry packing station and the abattoir have been described (Shooter *et al.* 1970). Both were well maintained and the standards of hygiene were good.

Swabs were taken from the interior and exterior of the chicken carcasses; cloacal swabs were taken after killing but before processing. Giblets were cut up and suspended in $\frac{1}{4}$ strength Ringer's solution for examination. Swabs were taken from the environment of the poultry packing station and the water in the de-feathering and cooling tanks was also sampled.

In the abattoir swabs were taken from the skin and flesh of the animals. Rectal swabs were taken after the animals were killed but before evisceration. Swabs were also taken from the environment of the abattoir.

The O and H antigens of strains of *E. coli* were identified using 150 O antisera and 50 H antisera. The methods used were based on those described by Bettelheim & Taylor (1969).

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Table 1. Escherichia coli *types found in a poultry packing station and an abattoir*

	No. of strains		
	Poultry	Pigs	Beef
O typable	149	24	116
O non-typable	135	46	183
Rough	65	22	58
H typable	271	68	344
H non-typable	15	11	4
Non-motile	63	13	9
Total	349	92	357

RESULTS

Poultry packing station

Two surveys of the poultry packing station were carried out, in which 349 strains of *E. coli* were isolated. These were from the defeathering and cooling tanks and from the carcasses at all stages of processing. The O and H typing characteristics of these strains are shown in Table 1.

Many O groups were found to be associated with a number of H antigens and to have different antibiotic sensitivity patterns; for example, O69.H38 and O69.H48 resistant to tetracycline and streptomycin were isolated and O69.H38 resistant to tetracycline. In the second survey similar results were obtained except that different serotypes were isolated.

Abattoir

The contamination of the environment was much less than that of the poultry packing station. A total of 357 strains of *E. coli* were isolated during studies when cattle were being slaughtered and 92 when pigs were being slaughtered. The number of these which were typable is shown in Table 1.

The serotypes commonly isolated from cattle were O17.H18, O58.H40, O91.H7, O113.H4, O132.H28, O146.H21 and O non-typable with H antigens 2, 7, 8, 10, 19, 21 and 31 and rough strains with H antigens 19 and 42. Many of these were also recovered from the environment or from the carcasses.

From the pigs also there was a wide scatter of serotypes. Those of which more than one was isolated were O68.H12, O97.H16, O103.H43 and O non-typable with H antigens 8 and 10 and rough strains with H antigens 16 and 30.

DISCUSSION

Strains of *E. coli* are frequently isolated from food and there is evidence to suggest that these strains subsequently form part of the human faecal population of *E. coli* (Shooter *et al.* 1970). The present study is an attempt to determine the sources of *E. coli* on meat and we have studied the isolation of *E. coli* during the procedures followed at a chicken packing station and an abattoir.

One of the most interesting results to come out of this investigation was that even though a nearly complete set of *E. coli* O antisera was used only 289 out of

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798 strains could be serotyped. During a study on human faeces carried out at the same time (Bettelheim, Faiers & Shooter, 1972) only two out of 1580 strains could not be identified with 150 O sera. This seems to indicate that strains of animal origin may comprise O groups which are not commonly encountered in human faeces and have therefore not been given O numbers. It is unlikely that only a few such O groups occur because in the present study 13 different H antigens were associated with these unknown *E. coli* O serotypes.

In the present study it could be shown that a strain of *E. coli* O69.H38 which was resistant to both streptomycin and tetracycline and which was first isolated from the rectal swab of a chicken could be isolated throughout the process and it was present in the final prepared carcasses. The presence of 4 markers on this strain marked it out very easily from all other strains. It was nevertheless interesting to note that a number of strains were present in the process carrying only some of these markers. These included strains of *E. coli* O69.H38 which were resistant only to tetracycline, and strains resistant to both antibiotics but with single differences in antigenic structures; O69.H48; O51.H38; and O N.T.H38. Whether these antigenic determinants can be transferred in the same way as the resistance to antibiotics is not known although this appears to be a possibility. Antigenic variation has also been observed among the *E. coli* isolated from chronic urinary tract infections (Bettelheim & Taylor, 1969).

A sensitive strain of *E. coli* O25.H45 which was first isolated from the feather softening bath could also be isolated from most of the subsequent stages to the prepared carcasses. It is interesting to note that the sensitive strain that was found was probably present in the water, while an antibiotic-resistant strain of the same serotype was first observed in the rectal swab of a chicken.

The results in both the abattoir and the poultry packing station indicate that there is transfer of strains from the faeces of the animals to the environment and that the strains of *E. coli* found on the carcasses of poultry, cattle and beef will originate from the faeces of the animal and from the environment and will reflect the history of the carcass.

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