# NOTES

## COLICINE-SUSCEPTIBILITY PATTERNS OF ENTEROPATHOGENIC *ESCHERICHIA COLI*[1]

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Reciprocal antibiotic action may occur in *Enterobacteriaceae* from contact of "producer" antagonistic substance (colicine) on susceptible strains. Different colicines are recognized. A given strain may produce one, several, or none and strains may be susceptible to one, several, or none. Colicine action is specific. Rarely a strain will lose its colicine-producing capacity and the colony status—rough, smooth, or mucoid—is an important factor (Ikari, Robbins, and Parr, Proc. Soc. Exptl. Biol. Med., **98**, 142, 1958) in colicine activity.

TABLE 1

*Colicine-sensitivity patterns of enteropathogenic strains of Escherichia coli and of representative nonpathogenic strains*

| Pathogens | Colicines | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 534 | G | H | $S_4$ | C | J | E | $S_8$ | $C_{77}$ | $CF_1$ |
| Group:[a] | | | | | | | | | | |
| 1 (27.6%)[b] | + | − | − | − | ± | − | − | − | − | + |
| 2a (30.6%) | + | + | − | − | ± | − | − | − | − | + |
| 2b (11.2%) | + | + | + | − | ± | − | − | − | − | + |
| 2c (3.0%) | + | + | − | + | ± | − | − | − | − | + |
| 3 (27.6%) | − | ± | − | − | + | − | − | − | − | − |
| Control (psi) | + | + | + | + | + | + | + | + | + | + |
| Nonpathogens[c] | | | | | | | | | | |
| 44 | − | − | + | − | + | + | + | + | + | − |
| 112 | + | − | − | + | − | + | − | − | − | + |
| 71 | − | − | − | − | − | + | − | + | − | + |
| 120 | − | − | − | − | − | − | − | − | − | − |

[a] All strains in a given group had identical patterns.

[b] Percentage of the 98 strains in group 1.

[c] Five of the 39 nonpathogenic strains completely insusceptible. Of 34 susceptible strains, no two had the same sensitivity pattern.

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Datlow (*unpublished data*) studied 48 strains of enteropathogenic *Escherichia coli* and fewer

TABLE 2

*Distribution of serotypes among the colicine-sensitivity groups of enteropathogenic Escherichia coli*

| Serotype | Colicine Sensitivity Group | | | | |
|---|---|---|---|---|---|
| | 1 | 2a | 2b | 2c | 3 |
| O26:B6 | 4 | 1 | 0 | 2 | 4 |
| O55:B5 | 3 | 7 | 1 | 0 | 5 |
| O86:B7 | 2 | 2 | 1 | 0 | 0 |
| O111:B4 | 6 | 13 | 0 | 0 | 1 |
| O112:B11 | 0 | 1 | 0 | 0 | 0 |
| O119:B14 | 0 | 1 | 2 | 0 | 4 |
| O124:B17 | 0 | 2 | 0 | 0 | 0 |
| O125:B15 | 1 | 1 | 0 | 0 | 0 |
| O126:B16 | 3 | 0 | 0 | 1 | 0 |
| O127:B8 | 2 | 0 | 7 | 0 | 0 |
| O128:B12 | 0 | 1 | 0 | 0 | 1 |
| Untyped | 6 | 1 | 0 | 0 | 12 |

nonpathogenic cultures for susceptibility to 12 "producers." Among pathogens, 87 per cent were susceptible to at least one antagonist, whereas only 36 per cent of the nonpathogenic strains were so affected. Of the nonpathogenic strains of *E. coli* tested, 91 per cent produced antagonistic substance, whereas only 27 per cent of the pathogens did.

Fredericq, Betz-Bareau, and Nicolle (Compt. rend. soc. biol., **150**, 2039, 1956) suggested colicine determinations might be important in bacterial typing. Hamon (Ann. inst. Pasteur, **96**, 614, 1959) expanded this idea. Both utilized colicine production by strains studied. Our work, in which we determined colicine sensitivity instead, offers an approach we believe as significant for epidemiological study, easier to carry out, and subject to rigid control. The method was to prepare pour plates of the organisms to be tested, on the solidified surface of which known "producer" organisms were spot-inoculated, several to a plate. Susceptibility is shown by zones of inhibition around the producer colony, developing in 24 or 48 hr. The 98 enteropathogenic *E. coli* were received from Doctors M. L. Cooper, A. D. Dulaney, W. Ferguson, P. J. Glantz, E. Neter, A. H. Stock, C. S. Stulberg, H. Thornton, and from local sources. For comparison, 39 strains of nonpathogenic *E. coli* were tested. All were subjected to the action of 21 "producers," including those of S. P. Halbert, N. G. Heatley and P. Fredericq. There was no pathogen not susceptible to at least one "producer," but they were acted upon by fewer colicines than were the susceptible nonpathogens. The pathogens fell into five definite reaction patterns of colicine susceptibility, whereas the nonpathogens did not. But these patterns did not correlate with serological groupings. These points are evident from data in tables 1 and 2, in which only 10 colicines are included because results with the other 11 were negative.

## SPRAY GUN FOR USE IN ELECTRON MICROSCOPY

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Backus and Williams (J. Appl. Phys., **21**, 11, 1950) described a spray gun used in electron microscopy for the enumeration of virus particles; the gun (figure 1) described here is a somewhat different apparatus. Brass was used in the construction, making the gun extremely durable and able to withstand higher spraying pressures than similar models of glass. A tuberculin syringe which fits directly onto the gun serves as the reservoir for the material to be sprayed, and

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