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ANTIBIOTIC RESISTANCE FROM FOOD

To the Editor: Resistance to antibiotics is common in the intestinal bacteria of healthy people. Resistant strains of *Escherichia coli*, a reservoir for transmissible R plasmid, are found in 50 to 80 percent of fecal specimens in the normal population.[1] In the same person, periods when no resistant *E. coli* isolates can be detected in feces alternate with periods when the resistant bacteria outnumber susceptible bacteria.[2] Because of the absence of person-to-person transmission of *E. coli*,[3] and because some foods carry numerous gram-negative bacilli,[4,5] we investigated the effect of a sterile diet on the excretion of resistant enterobacteria.

Six healthy volunteers ate a nearly sterile diet for a mean period of 17 days, after a control period of 21 days. They were on their usual diet during the control period, and their foods were heated at 105°C for one hour during the sterile-diet period. This procedure sufficed to destroy an inoculum of 10^8 viable cells of *E. coli* that was injected into the food. Volunteers washed their hands with ethanol before meals. Fecal samples were collected and analyzed daily. Comparative counting procedures were used to determine the incidence of resistance to ampicillin, tetracycline, and streptomycin in lactose-fermenting enteric bacilli.[2]

During the control period, the populations of fecal resistant lac+ enteric bacilli varied with time, periodically reaching a high level of 10^8 per gram. The day after the start of the sterile diet, the fecal concentration of resistant bacteria dropped, and fell to a minimum in a mean time of three days. No resistant strain could be detected in the feces of three volunteers, whereas in those of the other three, some could be detected sporadically. The sterile diet reduced the number of tetracycline-resistant bacilli in all volunteers (Table 1). It also reduced the number of bacilli resistant to ampicillin and streptomycin (data not shown).

Table 1. Log Number of Total and Tetracycline-Resistant Lac+ Enteric Bacilli per Gram of Feces, in Volunteers on a Sterite Diet.•

Volunteer	Control Diet		Sterile Diet ❖	
	Total	Tet^R	Total	Tet^R
1	6.5±1.4	4.1±1.8	5.5±1.1 #	1.4±0.1 §
2	7.1±0.7	4.8±1.3	7.1±1.0	1.7±0.7 §
3	7.4±0.9	4.9±2.5	7.1±0.7	1.7±0.8 §
4	7.9±1.0	5.7±1.5	6.3±1.0 §	2.3±1.7 §
5	7.0±0.8	4.0±1.3	7.4±0.9	2.7±1.2 #
6	8.4±0.6	7.5±1.0	8.4±0.5	5.3±1.0 §
Total	7.4±0.7	5.2±1.3	6.9±1.0	2.5±1.4 ✦

• Data for the control diet and the sterile diet are means ±SD for 21 and 17 daily counts, respectively. Tet^R denotes tetracycline resistant.

❖ Counts below the detection limit (25 cells per gram) were converted to 1.4 for calculation of mean values.

# $P<0.01$ for the difference between the control and the experimental periods in the same person, by the Mann-Whitney test.

§ $P<0.001$ for the difference between the control and the experimental periods in the same person, by the Mann-Whitney test.

✦ $P<0.001$ for the difference between the control and the experimental periods, by paired Student's t-test.

Thus, most fecal resistant lac+ enteric bacilli come from contaminated food: transient strains enter the intestines with food and are excreted in feces.[6,7] Although resistant lac+ enteric bacilli present no direct threat to public health, they may transfer their resistance to pathogens, destroy antibiotics in the gut, or cause urinary tract infections, posing clinical problems. Hence, it may be desirable to reduce the prevalence of resistant bacteria in human intestines and, on the basis of the data reported here, in foods. The foods most likely to carry large numbers of resistant bacteria are raw vegetables and salads.[5] Thus, the flow of resistant genes from the environment to humans that is caused by the contamination of vegetables by sewage and manure should be re-duced.[8,9] In patients with severe granulocytopenia, systemic infections have often been shown to be caused by resistant bacteria from the gut. Our results show that such patients should be given a nearly sterile diet.[10]

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Added post-publication:
Full data from this study (table, figure) have been published in Corpet (1993) Vet. Microbiol. **35,** 199-212