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Resistance to Dryness of *Escherichia coli* O157:H7 Strains from Outbreak in Sakai City, Japan, 1996

To the Editor: A large outbreak of *Escherichia coli* O157:H7 with more than 6,000 cases occurred in Sakai City, Osaka Prefecture, Japan, in July 1996 (1); after the outbreak, more than 1,000 secondary infections occurred in the families of the patients (2). We studied the resistance of *E. coli* O157:H7 to dryness because the survival on surfaces of inert materials under dry conditions may be related to the transmissibility of the strains.

E. coli O157:H7 strains grown on 3.0% nutrient broth with 1.5% agar for 20 to 22 hours at 37°C were suspended at a concentration of approximately 5×10^8 cfu/ml in a 10% skim milk, 0.5% NaCl solution. Aliquots (10 μ l) of bacterial suspensions were spread to approximately 10 cm² on plastic petri plates for bacterial culture and dried under the air flow of a clean bench until no aliquots were evident. After storage in the dark at room temperature, bacteria were harvested with saline and gauze and the viable number was counted (n = 3).

The log reductions 12 hours after drying were employed to show the resistance levels of *E. coli* O157:H7 to dry stress. The log reductions of the three strains from the Sakai City outbreak (RIMD0509950, RIMD0509894, and RIMD0509951) were 0.04 ± 0.34 , 0.14 ± 0.06 , and 0.20 ± 0.60 , respectively (mean = 0.13), whereas those of the *E. coli* O157:H7 strains from the other cases varied from 0.71 ± 0.18 to 4.57 ± 1.02 . (RIMD0509861, 0.71 ± 0.18 ; ATCC35150, 1.15 ± 0.35 ; RIMD0509826, 1.23 ± 0.60 ; RIMD0509742, 1.28 ± 0.18 ; ATCC43890, 1.31 ± 0.17 ; RIMD0509933, 1.48 ± 0.19 ; RIMD0509932, 1.48 ± 0.22 ; RIMD0509765, $3.60 \pm$

0.24 ; RIMD0509764, 4.57 ± 1.02 ; mean = 1.87). Although the strain from the Sakai City outbreak (RIMD0509950) survived for at least 35 days under the dry conditions, the strains from the other cases had no viable cells after 7 days. The log reductions of *E. coli* JM109 and DH10B strains were more than 10, and no viable cells were detected in 12 hours.

The strains from the Sakai City outbreak also showed marked acid resistance. Acid resistance of *E. coli* O157:H7 has been reported to depend on *rpoS*, which is induced in a stationary phase (3). Since the *E. coli* O157:H7 strains in a stationary phase were more resistant to dry and acid stresses than those in a log phase, *rpoS* may also be associated with resistance to dry stress. However, no deletions of *rpoS* were detected by polymerase chain reaction analysis in the *E. coli* O157:H7 strains used in this experiment. Further study on the mechanism of resistance will be needed to establish new strategies for eradicating the bacteria.

A case-control study by the Ministry of Health and Welfare of Japan showed that uncooked radish sprouts were the vehicle of the largest outbreak in Sakai City (4). In two small outbreaks of *E. coli* O157:H7 in March 1997, the vehicle of infection might have been radish sprouts; therefore, the possible contamination of white radish seeds with *E. coli* O157:H7 has been discussed (5). If such contamination was present, dry resistance might be involved in the survival on or in white radish seeds because the bacteria were exposed to dry conditions for a long period before sprouting. We propose that dry resistance be considered an important factor in infection.

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Irradiation Pasteurization of Solid Foods

To the Editor: Osterholm and Potter have made a strong case for irradiation pasteurization of solid foods that enter kitchens as raw agricultural commodities, such as meat, poultry, and seafood (1). Irradiation pasteurization was advocated to protect against foodborne diseases caused by common pathogens such as *Campylobacter*, *Cryptosporidium*, *Escherichia coli*, *Listeria*, *Salmonella*, and *Toxoplasma* (2). An additional rationale for irradiation pasteurization is bacterial resistance to antimicrobial drugs, a major health concern, which will undoubtedly increase in magnitude unless new approaches become available (3). The widespread use of antibiotics in animal husbandry may be the cause of some of this resistance, for example, in vancomycin-resistant enterococci associated with the agricultural use of glycopeptide antibiotics (4,5). Furthermore, resistance to glycopeptide antibiotics can be transferred from enterococci to other gram-positive organisms, at least in the laboratory (6). Thus, resistant bacterial strains from animal sources may enter the human population through contaminated food without necessarily causing immediate disease but resulting in expanded human reservoirs of antimicrobial resistance through horizontal gene transfer (7). When such bacterial strains are subsequently transmitted to a susceptible person, serious disease could result, which would be exceedingly difficult to treat (8). Irradiation pasteurization of solid foods could reduce the magnitude of transfer of resistance genes through contaminated foods.

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Emerging Infectious Diseases in Brazil

To the Editor: Hooman Momen's update on emerging infectious diseases in Brazil (1) appears to be based solely on notifiable disease data, which cannot adequately describe the current situation. Additional data in several areas may be useful.

Parasitic diseases: Dr. Momen's update restricts itself to protozoal diseases and does not distinguish between mucocutaneous and visceral leishmaniasis. Visceral leishmaniasis is in fact expanding in many suburban and urban areas in the northeast. Mucocutaneous leishmaniasis, after a small retreat following extensive deforestation, has made a comeback; and in many suburban areas in Rio de Janeiro and São Paulo, in the southeast, transmission is occurring, probably because of changes in sandfly ecology (1).

A helminthic disease of interest is mansoni schistosomiasis, which has been expanding its area of transmission, reaching over to Santa Catarina, in the south, to Pará in the north, expanding also westward, to Mato Grosso and Mato Grosso do Sul. The number of cases, as well as the associated illness, has possibly been reduced, but there is no doubt that the disease can be found in a much larger area than 20 years ago. Other emerging helminthiases of interest, albeit not of public health concern, are