MicroSnap™ determines bacterial risk in West African milk

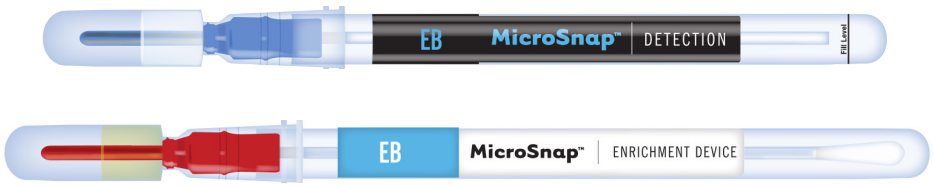
More than six billion people consume milk or related products worldwide, and most consumers live in low-income countries.

Many of these countries rely on livestock, such as cows, sheep and goats, for their livelihood as well as a source of milk. However, many residents drink unpasteurized products, which puts them at high risk of bacterial infections, including from *E. coli*, *Salmonella*, and *Listeria*.

The west coast nation of The Gambia, one of the poorest countries in Africa, is home to 2.1 million people, 60 percent of whom rely on agriculture to earn a living. Milk provides a ready and affordable source of nutrition, and adults consume it either raw or fermented ("sour"). The country also suffers from high rates of diarrheal diseases, which contribute to high infant mortality and malnutrition. Pasteurization of milk was common in The Gambia until the early 2000s, but now it is not a common practice, due to widespread beliefs that boiled and pasteurized milk loses its nutritional value and may even kill cattle. Not much is known about how milk is processed and sold through various markets in the country, and therefore not much is known how infection from drinking raw milk could be prevented.

A recent study by the United Nations Food and Agriculture Organization (FAO) looked at milk contamination in the Gambia, Guinea and Senegal. Samples were tested for coliform bacteria, *E. coli*, coagulase-positive *Staphylococci* spp., *Salmonella* spp., *Listeria* spp. and H2S- reducing *Clostridia*. The researchers found that raw milk in all three countries was highly contaminated, including more than 88 percent of samples from the Gambia testing positive for coliform bacteria. High rates of contamination were also found in fermented milk, with the highest counts from Gambian fermented milk at about 19 percent of samples showing more than $1x10^6$ CFU/ml of coliform.

MicroSnap™



Jennifer Washabaugh, a graduate student in anthropology at the University of Colorado at Boulder, and her colleagues recently examined how milk is consumed in the Gambia and used the Hygiena MicroSnap™ EB indicator organism test to rapidly determine *Enterobacter* levels in milk in the country. Their work was published in the journal *Food Control*.

Washabaugh used the *Enterobacter* family of bacteria as an indicator of overall contamination by specific microorganisms. Both *Enterobacter* and coliforms can suggest fecal contamination of food, and high levels can show an elevated risk of infection from consuming unpasteurized and contaminated milk.

Washabaugh's team compared traditional cell culture with the Hygiena EnSURE™ MicroSnap EB test, which can detect and enumerate members of the *Enterobacteriaceae* family, including *E. coli, Klebsiella, Citrobacter, Enterobacter, Serratia, Shigella, Salmonella* and *Yersinia*. The MicroSnap EB test uses the EnSURE luminometer to detect light that is generated when enzymes in EB react with substrates in the MicroSnap test. The system screens for EB contamination of raw materials, environmental surfaces and equipment, providing results within 8 hours after sample collection.

Because of anticipated high levels of contamination based on previous analysis (see Hempen et al., 2004), the milk samples in this study were diluted 1:1000 with sterile Maximum Recovery Diluent (MRD). The bioluminometer system produced measurements in relative light units (RLUs), which are correlated to CFUs produced from traditional plating methods. The researchers could then determine *Enterobacter* counts in milk that was purchased in different markets and originated from different sources and compare which markets/sources had higher bacterial loads.

The team found that sour milk had lower EB counts than fresh milk, and that reductions in pH (leading to fermentation) that arose from leaving milk out at ambient temperatures also resulted in reduced (but not absent) bacterial counts. Visible impurities were present in 58.5% of milk samples. *Enterobacter* concentrations were $>10^4$ CFU/mL in 92.5% of fresh raw milk and 96% of milk samples left out for at least 24 hours (to begin fermentation), and were therefore considered unsafe for human consumption.