

Evaluation of impact of emulsion matrix on survival of *Salmonella* during simulated gastric digestion

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Summary:

This study used simplified water-in-oil (W-O) emulsion and oil-in-water (O-W) emulsion to demonstrate the protective effect of W-O emulsion on *Salmonella* survival against gastric digestion stress.

Introduction: *Salmonella enterica subsp. enterica* serovar Typhimurium is one of the emerging foodborne pathogens worldwide. While its resistance to acid and osmotic stresses as well as its pathogenicity have been investigated over the years, there is a necessity to systematically study how food matrices impact *Salmonella*'s survivability in the digestive tract.

Method:

In this study, simplified water-in-oil (W-O) emulsion and oil-in-water (O-W) emulsion were prepared with peanut oil and DI water with 10% dispersed phase and stabilized with 2% (w/v) soy lecithin for W-O emulsion or 3% (w/v) sunflower lecithin for O-W emulsion. During the homogenization process, samples were inoculated with *Salmonella* in oil or water phase and equilibrated at room temperature (21 ± 2 °C) overnight. The emulsion matrices were then challenged with simulated gastric fluid (SGF) (pH 2, 3g/L pepsin) facilitated with stomacher mixing at 37 °C, and samples were taken periodically, serially diluted, and plated on tryptic soy agar (TSA) to measure bacterial inactivation.

Results:

When *Salmonella* was inoculated in the dispersed phase (water) of the W-O emulsion, 2.4 ± 0.41 log CFU/ml total reduction was achieved after 120 minutes of SGF exposure. In contrast, a significantly ($P < 0.05$) higher 5.08 ± 0.44 log CFU/ml reduction was achieved when it was inoculated in the dispersed phase (oil) of the O-W emulsion. A similar trend persisted when *Salmonella* was inoculated in the continuous phases (oil in W-O emulsion and water in O-W emulsion), in that higher reduction was observed in O-W emulsion than W-O emulsion ($P < 0.05$), indicating that protection offered by W-O emulsion to *Salmonella* inactivation was independent of its phase of inoculation.

Significance:

W-O emulsion offers better protection to *Salmonella* against inactivation than O-W emulsion during simulated gastric digestion, indicating food matrix can affect *Salmonella* survivability during digestion.