Survival of Non-spore Forming Foodborne Pathogens In Cold Brewed Coffee

Mark A. Daeschel-1, Nathan Armbrust-2 and Christine Vieru-1
Department of Food Science and Technology-1
Corvallis, OR USA Stumptown Coffee-2, Portland OR USA
Mark.Daeschel@oregonstate.edu

Abstract

Increasingly popular among coffee consumers is a product known as "Cold Brew" that is made by water extraction of ground coffee at ambient temperature for 16-24 hours; then filtered, bottled, and kept under refrigeration to the point of retail sale. The product does not receive any thermal processing and has a pH of about 5.0. Thus, it is a low acid food whose preservation is dependent upon refrigeration and any inherent antimicrobial characteristics. Processors avoid pasteurization, acidification, or preservatives for quality concerns. The objective of this study is to document the survival/growth of foodborne pathogens intentionally introduced into "Cold Brew" products held at commercial refrigeration temperatures. Fresh cold brewed coffee in sealed bottles was obtained from a regional coffee roaster. Populations (~ 1x10^5 CFU/ml) of (3 strains each of *E. coli O15:H7, Salmonella* species and *Listeria monocytogenes*) were introduced individually into cold brew (pH 5.0) and into controls (0.1 M potassium phosphate buffer, pH 5.0) and held at 4° C / 21 days. Enumeration was at 2 day intervals. Growth was not observed in either the coffee or controls with any of the strains (n=3). Viable cells were not recovered (n=3) after (7 days- *Salmonella*), (11-days *E. coli*), and (14 days- *L. monocytogenes*). During the same time intervals, populations in the buffer controls experienced only a 1-1.5 log reduction (the range n=3). We observed "Cold Brew" does not favor the survival or growth of non-spore forming bacterial pathogens; likely due to a lack of nutrients and or the presence of antimicrobial factors from the coffee. Other investigation is being conducted to assess if *Clostridium botulinum* poses a safety threat to this low-acid product.

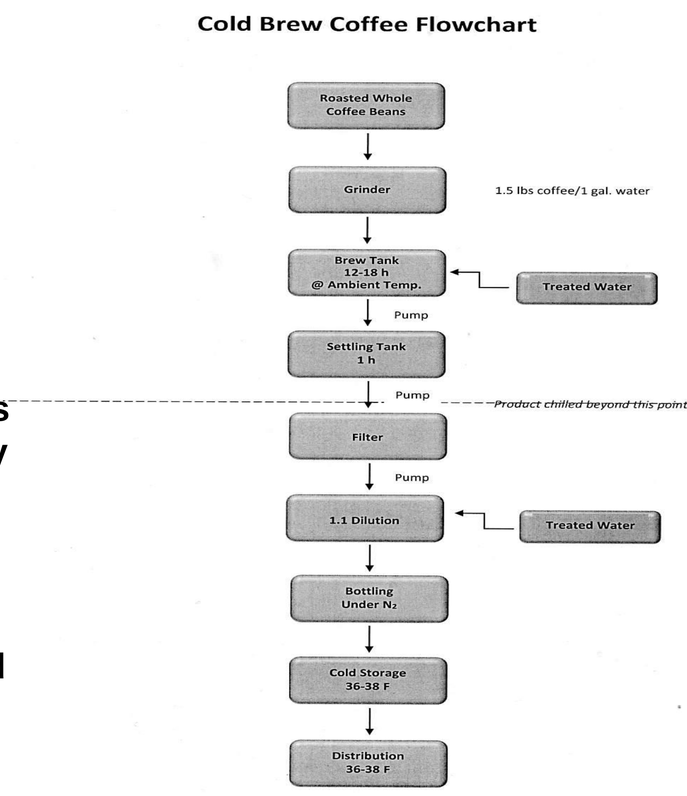
Introduction

Commercial processors of Cold brewed coffee products are hesitant to use pasteurization, acidification or the addition of preservatives to extend shelf life or to insure safety. Anecdotally, it is believed that such treatments significantly diminishes the delicate flavor and aroma characteristics of "Cold Brew". Questions have arisen regarding the microbial stability of the finished product as the only extrinsic hurdle is that of constant refrigeration. The ground coffee extraction procedure at ambient temperature may also be a process point where microbial stability may be in doubt. To our knowledge no studies have addressed these particular points of the "cold brew" process in regard to the intrinsic microbial populations and their behavior. Furthermore, there apparently have not been any challenge studies conducted with food borne pathogens to assess their growth, survival or persistence in this type of product. The objective of this study is to document the survival of foodborne pathogens intentionally introduced into "Cold Brew" products held at ambient and refrigeration temperatures.

Methodology

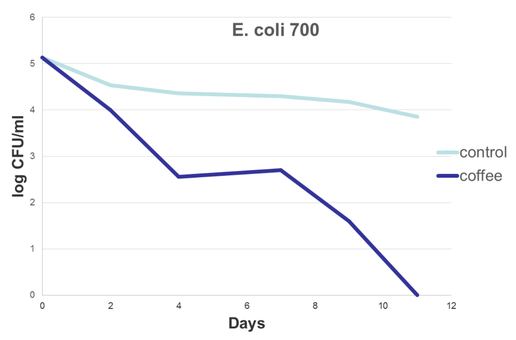
Cold brewed coffee was obtained from a regional coffee roaster. Refrigerated product was received in 11 oz bottles sealed with crown caps. Manufacture date was 7days from receipt. The manufacturing process for this specific product is portrayed in the flow diagram in the next column. The following pathogens were used to inoculate (1x10 5 /ml) coffees to be held at ambient and refrigeration studies. Controls consisted of pH adjusted (5.0) 0.1M phosphate buffer

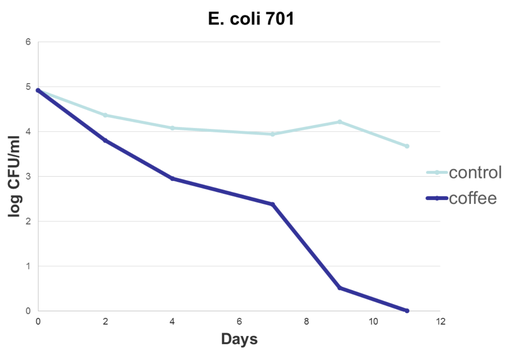
666	Salmonella hartford
667	Salmonella enterica typhimurium
668	Salmonella enterica stanley
702	Salmonella ubandaka
628	Listeria innocua ATCC 33090
632	Listeria monocytogenes ATCC 19115
633	Listeria monocytogenes 675-3
669	E. coli O157:H7 ATCC 43894
700	E. coli O157:H7 ATCC 43895
701	E.coli O157:H7 F-4546

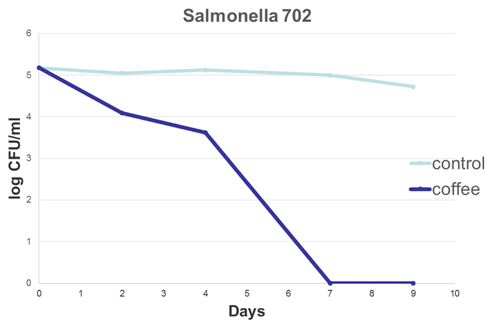


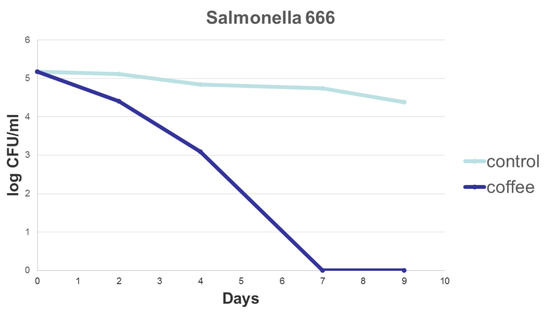
Results

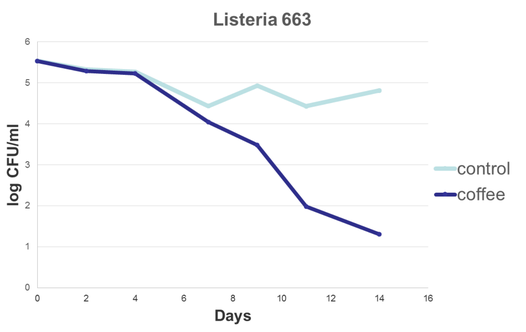
Refrigerated (4 C) Studies

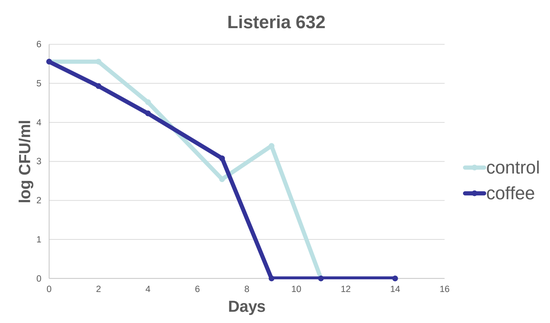












Conclusions

Our studies have consisted of challenge studies that introduce into "Cold Brew" strains of *E.coli O15:H7, Salmonella* species and *Listeria monocytogenes* which are implicated in the majority of food-borne outbreaks. Populations of microorganisms were introduced aseptically into bottles of fresh cold brew and held at refrigerator temperature and at room temperatures for periods up to 3 weeks. No growth of any microorganisms was observed during this period but rather they died off during that time. The numbers of microorganisms initially was on the order of 100,000 per ml of brew which is far in excess of what levels of contamination would be in a food processing facility. Our conclusion is that "Cold Brew" does not favor the survival or growth of vegetative bacterial pathogens most likely due to a lack of microbial nutrients and or the presence of antimicrobial factors originating from the coffee.