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Safe Processing, Safe Food: Food Processing Infosheets for Extension Educators

Abstract

An infosheet series titled *Safe Processing, Safe Food* has been developed and branded. The series is composed of peer-reviewed infosheets depicting conventional and emerging food processing technologies (FPTs) used to make foods safer. The goals of developing the infosheet series were to help Extension educators and, subsequently, the general public become more aware of FPTs and to dispel common myths associated with them. Extension educators can use the infosheets to familiarize themselves with the science and application of FPTs and can disseminate the infosheets to clientele such as small-scale agricultural producers, processers, and consumers.

Keywords: infosheets, food processing technologies, food safety, Extension educators, educational materials

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Introduction

Food processing technologies (FPTs) are evolving (Bridges, Rane, & Wu, 2018; Hertrich, Boyd, Sites, & Niemira, 2017; Huang & Chen, 2019). Despite the fact that FPTs are used to make foods safer, consumers have expressed negative perceptions of the term *food processing* and of different FPTs themselves (Bruhn, 2007; Cardello, 2003; Cardello, Schutz, & Lesher, 2007; Naqvi, 2011). For these reasons, Extension clientele, such as small-scale agricultural producers, processors, and consumers, may seek out information about FPTs. Because the science associated with FPTs can be complex, Extension educators need succinct information that is easy to interpret and understand that they can use to educate themselves and their clientele. To this end, we developed FPT infosheets to help Extension educators and, subsequently, the general public become more aware of FPTs and to dispel common myths associated with them.

Food safety information should be tailored to specific audiences/groups of people; food safety infosheets have proved to be an effective means of communication for experts, operators, and food handlers (Chapman, MacLaurin, & Powell, 2011). Although the term *infosheet* does not have a distinct definition, we aimed to develop concise and descriptive documents that provide easy-to-digest, science-based information. By using FPT infosheets, Extension educators can feel confident that they are obtaining and sharing with their constituents accurate and up-to-date food processing information.

Infosheet Development

We created a *Safe Processing, Safe Food* infosheet series. The first infosheet in the series summarizes general "food processing," and the remaining infosheets introduce conventional FPTs (pasteurization, microwave technology, high-pressure processing, and irradiation) and emerging FPTs (cold plasma, chlorine dioxide gas, ozone gas, and pulsed light).

Effective educational materials are written in active voice, have a positive tone, and comprise familiar wording and terminology (Niebaum, Cunningham-Sabo, & Bellows, 2015). In a focus group study evaluating food safety infosheets for food handlers, participants identified negative characteristics of infosheets, such as heavy text, extensive length, lack of visual appeal (color and pictures), and lack of context for food safety information (Chapman et al., 2011). As a result of attention to such findings, we developed infosheets that are no more than two pages in length and contain graphics. We also incorporated photos of the FPTs and their usages to provide context for how the technologies can be used. Inclusion of visuals in the infosheets can help Extension educators and their clientele envision food processes they may never have seen before. For ease of reading, each infosheet is divided into distinct sections—Background, How It Works, Technology, Efficacy, Benefits, and Current Usage (Table 1).

Table 1.

Safe Processing, Safe Food Infosheet Sections

Section title	Description
Background	Section provides general information about the FPT and associated nomenclature, history, and visual characteristics.
How It Works	Section describes how the technology is used and the mechanism by which the technology/method kills food-borne pathogens.
Technology	Section elaborates on the types of equipment used for different variations of product and packaging.
Efficacy	Section explains how well the FPT works on different foods, including the FPT's capabilities in killing pathogens and the FPT's limitations.
Benefits	Section compares the FPT to other methods and explains why an individual/group may choose to use the technology.
Current Usage	Section describes which types of foods and processes the FPT has been approved for by governmental agencies and acknowledges research that is still needed.

Creation of a Logo

To brand the series, we enlisted a graphic designer to develop a logo. Based on previously identified negative associations with the term/concept of "food processing" (e.g., unnatural, unhealthful, harmful), our goal was to create a logo that portrayed food processing in a nonthreatening manner (Bruhn, 2007;

Cardello et al., 2007; Naqvi, 2011). Iterations of the logo were shared with consumers and Extension specialists/personnel for feedback; some were aware of the context (i.e., that development of the logo was affiliated with a grant promoting emerging FPTs), whereas others were unaware. From the feedback we received, we settled on a final logo depicting an apple being processed to become applesauce (Figure 1).

Figure 1.
Finalized *Safe Processing, Safe Food* Logo

Peer Review

Each infosheet in the series underwent the Virginia Cooperative Extension (VCE) publication peer review process. Extension educators were involved in the review of the infosheets to ensure comprehensibility and feasibility of use. In addition to the VCE internal peer review process, we collaborated with research scientists working directly with FPTs to ascertain the scientific merit and completeness of the infosheets.

An example of a peer-reviewed infosheet in the *Safe Processing, Safe Food* series—titled *How is Cold Plasma Used to Process Food?*—is shown in Figure 2.

Figure 2.

How is Cold Plasma Used to Process Food? Infosheet

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How is Cold Plasma Used to Process Food?

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Background

Cold plasma, or CP, is a food processing method in which plasma, a reactive state of gas, is used to kill bacteria (pathogens) on foods. It has the potential to be used to process fruits, vegetables, meats, poultry, and nuts. The term "cold" is used because this process does not require heat.

How It Works

CP reactions take place in the air above the food. Reactive particles are created when high-voltage electricity is passed through the air or through another type of gas, such as oxygen, nitrogen, or helium. The electricity energizes the gas particles, which then come in contact with the bacterial cells on the food and break the chemical bonds holding together the bacteria's protective cell wall. As the cell wall becomes damaged, the particles penetrate the bacteria and break apart the cell's interior organs, including DNA and proteins, killing the bacteria. While this method is powerful against bacterial cells, the type of cells that make up foods are barely affected.

Technology

Many different technologies produce CP. They are defined by how closely the CP comes into contact with the food product (figures 1-3). The specific technology is normally chosen based upon the food being treated.

Efficacy

With CP technologies, harmful pathogens such as *Salmonella*, *E. coli* O157:H7, *Listeria monocytogenes*, and *Staphylococcus aureus* can be reduced by over 99.999 percent (a 5-log reduction). CP effectiveness is influenced by a number of factors,

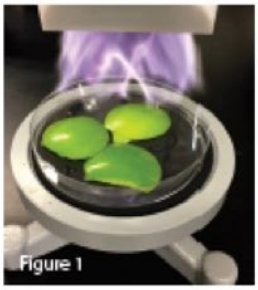
Figure 1

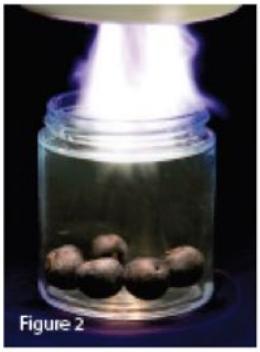
Figure 2

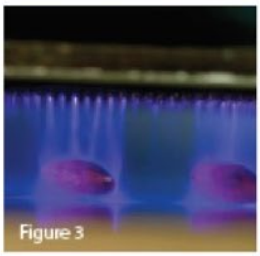
Figure 3

Figures 1-3. The cold plasma process being applied to apples, blueberries, and almonds. (Photos courtesy of Brendan Niemira, U.S. Department of Agriculture, Agricultural Research Service, Eastern Regional Research Center.)

including application method, time, gas(es) used, flow rate, moisture, and temperature. The success of the method also depends on the type of food being treated and the pathogen being killed.

Benefits

CP does not use water or chemicals, nor does it negatively affect the quality of the food. CP could replace some commonly used methods that use lots of water, generate expensive waste, and are not as effective. This technology has the potential to significantly benefit the environment.

Current Usage

While CP is effective in the laboratory, more research must be conducted to determine the effect on foods' taste and texture and on its efficiency and cost-effectiveness at a larger scale. As of spring 2019, CP is not yet approved by the U.S. Food and Drug Administration for commercial use.

Resources

The information in this publication was modified, with permission, from:

Niemira, B. A. 2012. "Cold Plasma Decontamination of Foods." Annual Review of Food Science and Technology. 3:125-42.

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Conclusion

Extension educators can use the infosheets series described here to become more familiar with the science and application of conventionally used and emerging FPTs. Because we designed the infosheets with the

general public in mind, they also are appropriate for dissemination to clientele who have questions about food processing and specific FPTs. Extension educators also can adapt the FPT infosheets and information contained therein to address needs unique to their clientele.

The peer-reviewed FPT infosheets are available at VCE's Publications and Educational Resources webpage: https://www.pubs.ext.vt.edu.

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Author Note

Nicole Arnold is currently an assistant professor in the Department of Nutrition Science at East Carolina University.

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