**Training Supplement: Understanding potential hazards associated with fermenting vegetables.**

While the process of fermenting vegetables extends shelf life and enhances flavors, this process can also pose a serious public health threat if not performed according to safe guidelines.

Holding cut vegetables, and especially items such as cut leafy greens or cut tomatoes, at temperatures between 41oF and 135oF provides favorable conditions for growth of several naturally occurring and potentially harmful bacteria (*pathogens*), such as ***Salmonella*, *E. coli* O157:H7,** and ***Listeria monocytogenes***, as well as spoilage bacteria. Naturally occurring spores of other toxin-forming bacteria such as ***Clostridium botulinum*** may also be present. Cuts and bruising or damage from harvesting provide areas of the fruit or vegetable that are especially likely to harbor harmful bacteria, making inspection before processing a necessary measure to reduce risk. The process of fermenting vegetables may result in conditions that allow any of these pathogens to grow to potentially dangerous levels, or to produce harmful toxins. Use of salt, or sugar and salt together,in the correct percentages encourages the growth of desirable fermentation bacteria. These ingredients also limit or prevent growth or toxin formation by harmful bacteria. Fermentation relies heavily on rapid reduction of pH (increasing acidity) to ensure a safe product. Proper fermentation takes place in the range of room temperatures (65 to 85oF); lower temperatures are not acceptable to achieve the required pH drop because this slows the fermentation process to a potentially unsafe rate. Good handling and hygienic practices, and proper cleaning and sanitizing are essential to reduce the risk of cross-contamination or recontamination of ready-to-eat foods with *Listeria monocytogenes* or other pathogens.

*E. coli* O157:H7 and other pathogenic *E. coli* strains, *Shigella* and *Salmonella* are natural contaminants in certain raw foods. These pathogens can also be transmitted by human carriers to food through improper hygienic practices and failure to follow the employee health policy. Other human pathogens, such as *Staphylococcus aureus*, Norovirus and Hepatitis A virus, can also be transmitted to food from food workers, creating the risk of infecting customers who consume those foods. Proper handwashing, glove use and other procedures for handling of ready-to-eat foods, good employee hygienic practices, and carefully following the Employee Health Policy are essential to preventing contamination of food and protecting the health of consumers.

Preserving safe food by fermenting relies on proper use of the above controls, as well as other essential practices such as effective sanitation, good employee hygienic practices and employee health. These additional procedures become even more important in preventing cross-contamination when the finished product is considered ready-to-eat without cooking.

**Definitions of HACCP Terms:**

***Corrective action*:** one or more actions to be taken when monitoring at a CCP demonstrates failure to meet a critical limit. Corrective actions should address the actual *cause* of the observed problem. Example: If an oven fails to reach the set temperature, corrective action *may* be to repair or replace the oven.

***Critical Control Point (CCP)*:** A process step at which control must be applied, to prevent or eliminate a hazard, or to reduce it to an acceptable level.

***Critical Limit (CL)*:** The maximum or minimum allowed value for a control measure, separating acceptability from unacceptability. For example, cooking instructions: “Cook to at least 165oF for 15 seconds at the thickest part of the thickest piece of chicken in the coolest part of the oven.” At retail level, most CLs are defined by regulations (example: SC Regulation 61-25). Critical Limits established in the HACCP Plan must be no less strict than current regulatory standards.

***Flow diagram*:** A visual illustration of the sequence of steps in a food preparation process, from receiving of raw materials to the finished product as it is presented to the customer.

***HACCP Plan*:** a written document based on international standards for HACCP, defining the formal procedures to be followed to assure control of identified food safety hazards in a specific process.

***Hazard*:** A biological, chemical, or physical contaminant that has the potential to cause injury, illness, or death. Salmonella, cleaning chemicals, and bone fragments are examples of the three types of hazards.

***Hazard analysis*:** The process of collecting and evaluating information on potential hazards and the conditions leading to their presence, to identify significant hazards that must be addressed in the HACCP Plan.

***Monitoring*:** Conducting ongoing, planned routine observations or measurements of control parameters to determine whether a CCP is under control. Recording measurements of batch temperatures, cooking times, and verifying presence of batch date marks are examples of monitoring.

***Prerequisite Programs (PRPs)*:** Programs, policies and procedures that are separate from the HACCP Plan, but which are essential to the effectiveness of the HACCP Plan. PRPs are a critical part of any food production operation. Examples of PRPs include sanitation procedures (SSOPs), pest control, supplier approval and purchasing specifications, employee hygiene policy, hand-washing requirements, no bare-hands contact with ready-to-eat foods policy, employee training procedures, and good retail practices.

***Preventive (control) measure*:** an action or activity in a food preparation process that is used to prevent or eliminate a food safety hazard, or to reduce that hazard to an acceptable level. Examples: approved supplier; freezing fish for parasite destruction.

***Validation*:** Obtaining technical evidence that the elements of the HACCP Plan for your process are capable of achieving their intended purpose. May include such materials as scientific literature, regulatory references, a Product Assessment, or testing data from your own process monitoring.

***Verification*:** The use of observations, procedures, tests, auditing, or other means, *other than routine monitoring activities*, to assess compliance with the HACCP Plan. Examples include managerial review of temperature charts, batch pH records, thermometer calibration records, and planned observation of employee hand-washing procedures.