EMPRES Food Safety

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Prevention and control of Hepatitis A Virus (HAV) and Norovirus (NoV) in ready-to-eat semi-dried products

Summary

- Enteric viruses, such as Hepatitis A virus (HAV) and Norovirus (NoV) are an important cause of foodborne disease.
- Manufacturers should consider enteric viruses as a major public health risk in their Hazard Analysis and Critical Control Point (HACCP) plans.
- Semi-processed foods require sufficient viral inactivation treatments to ensure food safety.
- Proper hand hygiene should be maintained to prevent and control virus contamination in ready-to-eat semi-dried products.

Manual sorting of semi-dried tomatoes.
Proper hand hygiene is essential to prevent viral contamination.

Background

Hepatitis A virus (HAV) and Norovirus (NoV) have been currently recognized as the most common causes of foodborne diseases in developed countries, linked to contamination of the following three priority food groups: fresh produce, seafood and ready-to-eat foods. The joint Food and Agriculture Organization of United Nations (FAO)/World Health Organization (WHO) Meetings on Microbiological Risk Assessment (JEMRA) have aimed at providing guidance on the issue of viruses in food.

The Codex Alimentarius Commission is currently drafting guidelines on general hygienic practices for the aforementioned priority food groups.

Ready-to-eat semi-dried products (e.g., sun-dried tomatoes, dates, dried apricots, raisins, etc.) may fall between the categories of fresh products and ready-to-eat products. For they are often subject to further preparation and processing before packaging. While production practices vary among different dried products, and there is a lack of information on human pathogenic virus uptake via the roots of edible plants, the document focuses on the factory-level post-harvest process.

Introduction to viruses in food

In their HACCP plans, food businesses have identified "bacteria" as one of the most common food safety hazards. That is why most of the Critical Control Points (CCPs) focus on decreasing the amount of bacteria present in food. While bacteria usually require greater quantities to be infectious, the infectivity of enteric viruses requires small quantities to cause a disease. In addition, measures taken in reducing growth or eliminating bacteria do not necessarily lead to a decrease in the virus prevalence. On some occasions, these measures may even preserve viral particles, as in the case of refrigeration. Moreover, there is not an established correlation between the presence of these viruses and the commonly used bacterial

indicators for faecal contamination. HAV is a non-zoonotic pathogen. Therefore, it is found only in humans and spread by faecal-oral transmission.

While a high number of viruses are shed by infected humans, it is only a low number of virus particles that is required to cause infection. This means that once food is contaminated, a significant reduction in the number of virus particles is required to ensure safety. Such reduction factors, however, do not apply to the commonly implemented production processes involved in ready-to-eat semi-dried products, especially when contamination occurs just prior to packaging.

Contamination of foods is likely to remain undetected, as laboratories and methods for detection of viruses in foods are not widely available. The minimal amount of virus particles causing illness tends to be below detection limits of analytical methods currently applied on food samples. As a result of the shortage of laboratories and limitations of methods available, viral foodborne incidents remain vastly under-recognized and under-reported.

Prevention of viral contamination

Throughout production, several steps will result in reduction of viral contamination (drying, washing, long-term storage, etc.). Therefore, if production steps are appropriately controlled, it is less likely that low level contamination occurring in the field will lead to a microbiological risk in the final product.

With respect to production and washing water, the Recommended International Code of Practice – General Principles of Food Hygiene (CAC/RCP 1-1969) can be followed. It is important to ensure the quality of water used, as it can be an important source of contamination.

Special attention is required at the final stages of production, as moisture content in the end product may be corrected by adding water. If appropriate production and washing water are used, it is unlikely that they will introduce contamination.

Bare hand contact with the semi-dried products can occur at several points during post-harvest production in the processing plants. This contact may occur just prior to packaging (i.e. at a stage not followed by any risk mitigation step). Therefore, hand hygiene in the processing plant is considered to be the most critical control point in preventing viral contamination.

Options for reduction of viral contamination

Prevention of contamination will depend on a very high level of compliance with hand hygiene (i.e. handwashing with running water and soap, and drying with disposable towels). Always wash hands after using the toilet and before entering the production facility. The proper use of gloves throughout the process will also ensure optimal hand hygiene. The use of hand alcoholic sanitizer alone is not sufficient to achieve the reduction needed for viral safety.

Based on the literature, a reduction of 1-2 $\log_{10}$ can be achieved by a standard product washing step. This might be increased to a reduction of 2-3 $\log_{10}$ by adding 20-200 ppm free chlorine (if the washing water is not highly contaminated/polluted/of high chlorine demand). Since washing occurs at the beginning of

Adequate handwashing facilities are essential. Hand hygiene is the most critical control point in preventing viral contamination.

the process in the plants, it is very important to refrain from bare hand contact after the washing step(s).

A post-packaging treatment available to reduce viral contamination is heat-treatment at ≥ 90^0 C for ≥ 90 sec, or pasteurization at ≥70^0 C for ≥ 15 minutes (Sattar et al., 2000). These treatments are very likely to render the foods safe from viral infectivity.

Other technologies (e.g. high pressure processing, irradiation, etc.) or combinations of technologies are being developed. Prior to implementation in the food production chain, virucidal treatments should be validated with the hazard/food combination and, if possible, should use methodologies that can distinguish between infectious and non-infectious material to ensure that treatments are effective and can be applied consistently.

Studies on the effect of UV and ionizing irradiation on virus infectivity in foods are limited. Irradiation does reduce virus infectivity, but its effectiveness is highly dependent on the presence of the virus on the surface of the food, the virus (sub)-type and the food matrix. It cannot be considered an effective generic measure to reduce viral loads on or in food.

Specific considerations on HAV

HAV causes infection and is shed by humans only. It is very common in several regions around the world, and both symptomatic and asymptomatic infections (particularly in children) occur.

In many of the semi-dried product production areas, the prevalence of HAV infection is changing from high (or intermediate) to intermediate and low endemicity, respectively as a consequence of public health programmes. As a result of the changing endemicity patterns, fewer individuals are developing immunity following exposure to the virus at an early age, and an increasing proportion of the adult (working) population is expected to become prone to HAV infection. In low endemic countries, foodborne introduction of HAV coincides with the imports of the ready-to-eat semi-dried products, which pose a high risk for large susceptible non-immune populations.

Controlling the number of HAV shedding persons in the food chain is another possible measure to prevent HAV contamination of foods. Anti-HAV antibodies are produced during an infection earlier in life or by vaccination and remain present and protecting for life. Vaccination, however, will not help in reducing the risks associated with hand contamination (e.g. taking care of infected and shedding children), nor will it help reduce the risk of contamination by any other pathogen.

Recommendations on prevention and control of HAV

In addition to safety regulations already in place, measures need to be taken to ensure provision of virus-safe foods in order to prevent contamination.

Considering the high prevalence of foodborne infections by viruses, one should exercise precaution. Proper hand hygiene should be maintained, personally and during food preparation, to prevent contamination of food and spread to other persons.

Once contamination of foods has occurred, the following mitigation strategies can be employed:
(i) disposal of contaminated foods; or
(ii) heat treatment (at ≥ 90^0 C for ≥ 90 seconds and pasteurization at ≥70^0 C for ≥ 15 minutes).

Further reading

For detailed information on viruses in food (JEMRA):
http://www.fao.org/ag/agn/agns/jemra_riskassessment_viruses_en.asp

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