

Safe Distribution of Food Products

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Introduction

Many factors can play into transporting different food products and non-food products that require different conditions.

The distribution of food products, like the storage of food products, must be done under conditions that will not be detrimental to the safety and quality of a particular food product or to other food products transported with it.

To ensure that safety and quality, a risk assessment must be part of determining how distribution is performed. Many factors can play into transporting different food products and non-food products that require different conditions: controlling temperature; preventing cross-contamination from a product, food and/or non-food, to a food product; preventing cross-contact with allergens; product security from tampering – all of which, alone or in combination, can result in a product becoming unsafe to eat. A risk assessment is based on the severity and probability of a condition happening and the consequences of any unsafe transportation condition compromising the products being transported.

This document is intended to provide guidance to food distributors on how to transport foods safely so that the end-consumer is not exposed to problems caused by the unsafe distribution of food products.

Remember, trailers/trucks/vans are mobile food warehouses. Storage and palletizing should be treated with the same considerations that would happen in a distribution center.

Food Type

Transportation condition requirements can vary considerably based on the type of food product – frozen, refrigerated and shelf stable – as well as whether it be raw or ready-to-eat. Additionally, shipping allergens, non-food products, cleaning chemicals, highly aromatic or perfumed products, soil, pesticides, herbicides, etc., require additional consideration. Protecting transported food from deliberate acts of tampering is a risk that cannot be ignored either.

Given these many variables, each distributor must establish risk-based transportation methods to ensure that these products or others shipped with them do not become contaminated or unsafe.

Product Mix

Most food distributors do not have the luxury of being able to ship different products separately as the nature of their business requires they be a multi-product supplier to their clientele. Therefore, there should be a plan in place for loading the trailer. That plan should encompass how to maintain temperature, where applicable; keep ready-to-eat products above those that are not ready-to-eat to avoid cross-contamination; eliminate cross-contact between allergens and nonallergens; and prevent any possible product tampering. This can be further complicated by the fact that some food products, such as shell eggs, raw fish, and edible crustacean, have pathogen concerns as well as allergen concerns and must be evaluated for both of these risks.

Transportation Distance

Transportation of foods is not without risk and the risk has to be controlled to meet regulatory, customer and consumer health requirements. The further food is transported, the greater the risk that shipping conditions can become unstable, increasing the possibility of foods becoming unsafe to eat.

Each distributor needs to assess their transportation risks based on the food type and product mix being distributed, the distance to transport the products, and the temperature requirements. Distribution, if done by contract service providers versus using the distributor's own vehicles, can bring additional concerns as the product is out of the direct control of the distributor, who may still own the product until it is delivered.

This paper specifically addresses food distributed by a distributor using its own trucks and drivers. It will cover temperature requirements, co-mingling of products and security risks.

Most distributors are faced with the challenge of shipping a mixture of products that require different temperature conditions in order to maintain the food safety and quality of the products.

This can be done safely in the same trailer/truck if certain basic requirements are put in place as follows:

Frozen Foods

Frozen foods are frozen as a means of increasing the shelf life by inhibiting the growth of both spoilage bacteria and harmful bacteria. It is essential that distributors transport frozen foods under conditions that will maintain the quality and food safety of the product.

When frozen food is allowed to warm up from $<0^{\circ}$ F it begins to thaw out and bacteria will begin to slowly grow. It should be noted that the acceptable temperature for ice cream is -20 to -25° F.

From a food safety perspective this is not a problem as long as the food does not reach 41° F or higher. However, thawing can affect food quality and result in an unsatisfactory product for the customer or end-consumer.

Transportation of frozen foods for long distances requires the trailer/truck to have the capability to keep the food below 10° F. This requires an efficient reefer unit set at this temperature or lower.

For short distances, shipping can take place on a refrigerated trailer/truck at temperatures between $34 - 40^{\circ}$ F as long as the frozen food reaches each customer at or below the temperatures they have set as their acceptable receiving temperatures of either $<10^{\circ}$ F or $<15^{\circ}$ F.

Ice cream requires temperatures of a minimum -20° F to keep it frozen solid, so shipment of this even on frozen trailers may require the use of dry ice, heavy blankets or an insulated container to prevent quality issues.

Frozen foods that thaw out and are then re-frozen have noticeable quality issues with the possible formation of ice crystals and change in mouth feel.

Refrigerated Foods

Although some foods requiring refrigeration to maintain their quality do not necessarily need to be at $<41^{\circ}$ F, this has become the acceptable temperatures at which to ship "perishable" foods. Depending upon the time of year and the expected outside air temperatures, most trailer/trucks being should be set at $34-38^{\circ}$ F.

The practice of loading cold products on pre-cooled trailers/trucks with reefers set to maintain <41° F is not considered sufficient as the only temperature control program. Under the Food Safety Modernization Act of 2010, distributors are now required to demonstrate that a temperature of <41° F is maintained during the entire delivery process to the last delivery point. This can be achieved by using temperature recorders that record the internal trailer/truck temperature during the entire delivery process or the driver can take and record manual temperatures at each delivery stop to document temperatures have not exceeded 41° F.

Shelf-Stable Foods

Shelf-stable foods do not support the growth of harmful bacteria and can be stored and transported at ambient temperatures. However, they may require some temperature control to prevent quality issues, for example, chocolate products that may melt or bloom due to heat exposure. A distributor may want to transport these products under some degree of refrigeration for this reason.

The challenges of shipping these three types of food products together – frozen, refrigerated and shelf stable – is it requires at a minimum two temperature compartment trailers/ trucks. If the distances are long, three compartment trailers/trucks are needed.

This can be achieved using bulkheads in the trailers to separate the sections. When deciding how to load a trailer, this would be a determining factor on how pallets are put together when picking orders, and subsequently, how those pallets are loaded on the trailer to keep them at the appropriate temperature.

- In a three-compartment trailer, standard procedure is for the front compartment to be the frozen section, refrigerated the middle section, ambient the rear section.
- If using a two-compartment trailer, then either the front section is frozen with the rear section being refrigerated or the front section is refrigerated and the rear section is ambient.
- In a one-compartment trailer/truck either it is all ambient, as refrigeration is not required, or it is all refrigerated and any ambient products on the trailer are transported cold.

Transportation Conditions Designed to Avoid Cross-Contamination

Cross-contamination is the transfer of harmful bacteria from one product to another resulting in a product becoming contaminated. If the contaminated product is a ready-to-eat product, it becomes unsafe to eat and could cause a foodborne illness when consumed.

When selecting or picking products to be placed on pallets, it is essential that the selectors/pickers are trained to avoid placing cases of refrigerated raw products over cases of ready-to-eat products so as to avoid the possibility of cross-contamination during transit. As pallets are not double stacked on trailers, the selector/picker only has to be careful on how they assemble a pallet of mixed products.

If the items are frozen and the trailer is designed to keep them frozen then how they are stacked on the pallet is not a concern. However, if the distributor is going to allow the frozen products to start to thaw or slack out, as their customer requires this, then the products must be handled as if they are already unfrozen.

Raw products to exercise care with, when assembling a pallet, are raw meats (beef, lamb, pork, poultry, etc.), raw fish, raw seafood, dirty produce (particularly when iced, as melting ice can readily wash dirt to items below), shell eggs, etc. These products need to be either on separate pallets or on the bottom of the pallet, with ready-to-eat refrigerated products above them. Only place similar items above these raw products: beef over beef, fish over fish, etc.

Relying on the integrity of packaging as the only prevention against cross-contamination is not a wise decision. Soft packages such as paper and plastic bags can leak due to their nature or due to damage, resulting in products below becoming contaminated. These packages can become compromised by tears, liquids, or even through pre-manufactured holes designed to let air escape.

Use conditions that you might observe in a distribution center as a guide to preparing your pallets. For example, in meat coolers, blood on the floor demonstrates that meat packages are not always leak proof; similarly, iced down poultry and produce drip water; stored shell eggs can break and drip or leak, etc.

The table in the section titled “Reference Guide When Considering How to Palletize” is a guide for determining biological hazards associated with different food products.

According to the Food Allergy and Anaphylaxis Network, an estimated 4% of adults and 8% of children have food allergies, and a 2008 study by the U.S. Centers for Disease Control and Prevention (CDC) indicates that among children, these allergies have increased by nearly 18% over the last decade. It is important that this be taken into consideration when assembling pallets in addition to how you store allergens in your distribution center. Cross-contact of products with allergens can make non-allergen foods hazardous to the consumer.

Non-allergen foods contaminated by contacting those with allergens may not be noticeable to the consumer. Those individuals with sensitivity that consume a contaminated food could have an allergic reaction that can be as severe as anaphylactic shock or even death.

When assembling pallets, the selectors/pickers need to be trained in identifying allergens and how to properly store products containing allergens so that they do not contaminate other food products on the same pallet.

In the United States, the CDC has identified eight major allergens that cause 90% of all food allergy reactions.

- Peanuts
- Tree nuts (almonds, walnuts, pecans, etc.)
- Fish
- Seafood (shrimp, lobster and crab)
- Wheat
- Soy
- Eggs
- Dairy products (milk, yogurt, etc.)

Not all allergen-containing products need to be handled as carefully as others as the risk of crosscontact is sufficiently low if the product that contains an allergen is in a hard type package (glass, metal, cardboard) and plastic (if not a liquid, which can be prone to leak).

The highest-risk products that need to be handled with care are those which are 100% allergen (shell eggs, milk, peanuts, flour, wheat, soy, fresh fish, tree nuts, seafood, etc.) and those packaged in fragile packaging paper or plastic. Fragile packaging increases the likelihood for these products to leak, break or spill out and potentially contaminate other products.

When developing a pallet diagram for the safe transportation of allergens, it is essential that each distribution center develop a list of all allergens carried at the facility and the type of containers these allergens are packaged in.

Specific palletizing concerns around each of these allergens are listed below.

- Shell eggs are high risk because of the potential for them to contain pathogenic bacteria, as well as them being an allergen. Therefore, shell eggs should never be stored on a pallet over anything other than other shell eggs. As shell eggs are fragile and can break if heavy products are placed on top of them, this limits where on a pallet you can store them. They should be placed on the bottom of a pallet with only lightweight products on top of them.
- Liquid eggs, although safe from harmful bacteria, are still an allergen and need to be treated in the same manner as shell eggs are treated when placing them on a pallet. They should only be placed over shell eggs.
- Liquid milk cannot be allowed to drip down onto non-milk containing products. Care must be taken in how liquid milk is placed on a pallet with other products, as milk containers (plastic gallons, half gallons, quarts) tend to leak. Place liquid milk under other products.

Concerns with yogurt, cottage cheese, butter and sour cream are minimal as these products generally do not leak and, unless the casing is damaged, they are not likely to contaminate non-milk containing products.

- Wheat flour and soy flour are generally packaged in paper bags or sacks that tend to allow the contents to come out of the package and contaminate the surroundings, even when the package is not damaged. This is clearly visible in distribution center slots where they are stored. If the package gets damaged, then large quantities of the allergen will be spread around. When placing these products on pallets, it is preferable for them to be on the bottom of the pallet. Where this is not possible, a slip sheet needs to be placed under them to protect the products stored on the pallet below them.

Caution: Soy and wheat are different allergens and cannot be stored over each other without a slip sheet between them.

- Peanuts in string bags and tree nuts must be stored on the bottom of pallets or on top of a slip sheet. A slip sheet should also be used between different types of nuts if the warehouse carries different types, as each type of nut is a separate allergen.
- Fresh fish and seafood cannot be stored over other products unless in containers (pails, glass, cans) where the risk of leakage is very low.

When developing how you want the pallets assembled to prevent cross-contamination caused by bacteria or cross-contact caused by allergens, it is helpful if the distribution center slots are set up so that items that need to be on the bottom of the pallet are at the beginning of the selector/pickers route. SAI Global recommends the best practice of storing allergens on separate pallets. Carrying as few allergens as possible is recommended.

Reference Guide When Considering How to Palletize

FOOD ITEM	BACTERIAL CONCERNS	ALLERGEN CONCERNS
Shell Eggs	Yes	Yes
Liquid Pasteurized Eggs	No	Yes
Peanuts	No	Yes
Tree Nuts	No	Yes
Liquid Milk	No	Yes
Flour (Wheat)	No	Yes
Soy Powders	No	Yes
Raw Fish (Fresh)	Yes	Yes
Raw Seafood	Possibly	Yes
Raw Meats (Pork, Beef, Lamb)	Yes	No
Raw Poultry	Yes	No
Raw Produce	Possibly	No

Transportation Conditions Designed to Avoid Contamination of Foods by Non-Food Products

Non-food products must be transported with care to avoid contamination of food products

This review would not be complete without considering the possibilities of contamination of food products through the unsafe palletizing of non-food products on pallets containing food products or intentional tampering.

Non-Food Products

There are many items that can be classified as non-food products, including cleaning chemicals, bags of soil, retail pesticides, herbicides, motor oils, pharmaceutical products, and more. Although it is not illegal to transport these products on a trailer with food products, every care should be taken to avoid any contact between these non-edible products and human or animal foods.

Non-food products should be placed on their own pallets or in suitable containers (small brutes, lockers, etc.) designed to protect the food products from exposure to odors or spillage from non-food products.

Food Security

Since the terrorist attacks of September 11th, 2001, government and regulatory authorities have stressed the need for increased vigilance against intentional tampering that would contaminate foods with dangerous bacteria or make them unsafe to eat in any way.

To date, the best practice to maintain food security is for food distributors to seal or padlock their trailers/trucks between stops and when not in eye contact with their vehicle at a delivery stop.

Resources

Food Allergy and Anaphylaxis Network. "Food Allergy Facts and Statistics for the United States." Retrieved from <http://www.foodallergy.org/page/facts-and-stats>, accessed July 12, 2012.

U.S. Centers for Disease Control and Prevention (2008, October 22). "CDC Finds 3 Million U.S. Children Have Food or Digestive Allergies." Retrieved from http://www.cdc.gov/media/pressrel/2008/r081022.htm?s_cid=mediarel_r081022, accessed July 12, 2012.

U.S. Centers for Disease Control and Prevention. "Food Allergies in Schools," Retrieved from <http://www.cdc.gov/healthyyouth/foodallergies/>, accessed on July 12, 2012.

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