



**MAINTAIN**  
*the*  
**COLD**  
**CHAIN**

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# INTRODUCTION

The **USDA** handbook titled [Protecting Perishable Foods in Transport by Truck or Rail](#) was first authored in 1956 and then updated several times, most recently in 2019 to accommodate all the changes in the market and industry, especially pertaining to technology. Weighing in at over 200 pages “the handbook” has all the answers to properly maintaining the cold supply chain but is by no means intended for light reading. This eBook boils down a lot of the concepts and details into what a shipper needs to do to streamline their cold supply chain while still meeting all the current guidelines and regulations to ensure a safe flow of consumer foods from end to end.

To also better understand this material and learn best practices, watch our webinar featuring expert panelists from around the industry.

# FOOD WASTE IN THE SUPPLY CHAIN

Ready to hear some crazy statistics about America's food in the supply chain? Before I divulge any numbers, let's look at the big picture concerning the food we ship in this country.

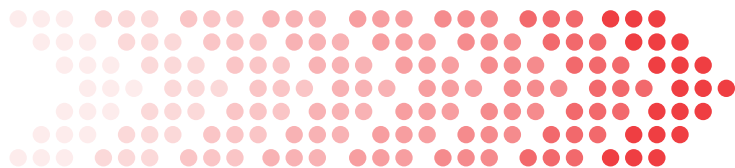
The food we grow in the United States combined with the food we import is more than enough to sustain the population amply. That's the good news. The bad news is there are still more than 37 million starving people in the U.S., reports Feeding America—but the real kicker? Of all the food waste in this country, up to 40 percent occurs in the supply chain, according to the USDA's website. Do we have any control over this astronomical percentage? Well, let's just say we can do better.

*Up to 40 percent of all food waste in the U.S. occurs in the supply chain, according to the USDA.*

It is unrealistic to eliminate all food waste, but there are many ways to improve this alarming statistic concerning the transport of perishable freight. One of our first steps toward progress in this country began almost a decade ago with the Food Safety Modernization Act (FSMA), which was signed into law on January 4, 2011. It wasn't until 2016, however, that the first stages of implementation were finalized and enforced. If you are unfamiliar with the FSMA mandate, they are a set of laws aimed at avoiding foodborne illnesses instead of responding to them. Get our whitepaper to learn more. So why are there still issues?

## AVOIDING FOOD WASTE

Shipping refrigerated and frozen food is tricky business, and it is important to learn all you can about the cold supply chain to avoid food waste, contamination, and unnecessary cargo claims. Knowledge is power!



Here are a few important topics you can brush up on to become an expert in temp-controlled shipping:

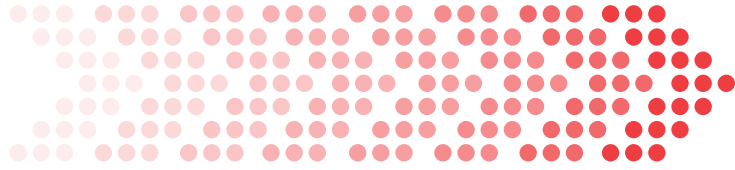
- Temperature-monitoring and location tracking
- Freight preparation (from palletizing to packaging)
- The use of slip sheets and proper ventilation
- Pre-cooling of trailers
- Humidity's role
- Loading best-practices
- Pulping and documenting
- Strict adherence to checklists and standard operating procedures (SOPs)

Even with SOPs, best practices, and FMSA in place, there are still many misconceptions about cold LTL and refrigerated truckload shipping practices, resulting in billions of dollars in lost product. In 2010, the USDA reported annual losses of approximately 133 billion pounds of food, costing \$161 billion in food waste. If 40 percent of that is attributable to the supply chain, well, you can do the math.

And with that much spoilage going on, it is likely that just as much gets through the system and winds up in grocery stores and fast-food chains, ultimately making it into consumers' hands. According to the CDC, more than 48 million people get sick every year from contaminated food, citing 128,000 hospitalizations and 3,000 deaths.

## WHAT CAN GO WRONG?

A reefer unit malfunction is one of the most common problems in the cold chain. Failures on the road can create a multitude of problems. Heading issues off at the pass is always the best strategy. It all starts with the truck and driver. Are the carriers adequately vetted, and is the equipment in tip-top shape? If you are using a 3PL, like Choptank Transport, ask about the broker's vetting process for their carriers before awarding them a shipment. Stringent screening should be their standard protocol to assure the safety of every load.



Of course, it's a bonus if you have a driver who is familiar with their reefer unit and knows what can go wrong and how to fix minor problems if necessary. What exactly can break down on a reefer unit? Lots of things.

**Condenser Failures:** When a condenser has issues, it can be a disaster and undoubtedly affect the integrity of the shipment. Tubes, clamps, coils, and bolts in the condenser are all subject to corrosion or damage and may require replacement.

**Air Chute Damage:** Something as simple as a damaged air chute, for example, can happen when the product (usually produce) is brought onto a trailer, causing rips and tears that cause inconsistent airflow throughout the cargo space.

**Leaky Fluids:** A visual inspection of the reefer unit should be part of the daily checklist. Any leak, even a small one, can affect temperature maintenance.

**Sensor Malfunction:** Sensors also should be checked every time the reefer unit is serviced. A bad sensor can deliver misleading readings, and the driver may not even notice it until it conflicts with a temp-recorder on board.

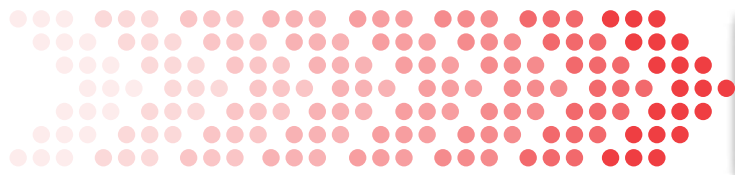
**Compromised Door Seals:** Drivers should check the door seals with every shipment. Old corroded hinges or damaged seals can allow outside air in, changing the internal ambient temperature. It can be especially problematic during the summer months when outside temperatures can be drastically different than the specified inside temperatures for the shipment.

## Mixed Loads

**Dairy, Meat, Poultry, and Frozen:** Each commodity has an ideal temperature for transport. Mixing shipments with varying temperature specifications can create big problems with spoilage and freight claims.

The ideal temperature for transporting meat products to avoid harmful bacteria growth is 40°F or under. Milk falls into a similar category; however, according to a fact sheet from Clemson University's College of Agriculture, Forestry and Life Sciences, "Bacteria in milk will grow minimally below 45°F. However, temperatures well below 40°F are necessary to protect the milk's quality." So, allowing the internal temperature of a reefer unit to rise to 45°F when shipping milk isn't adequate. (And just





an interesting sidebar about milk that most people don't know. According to this fact sheet, "Milk can be stored frozen at 0 °F for up to three months and will be safe to drink if it is thawed in the refrigerator, although it does not retain its smooth texture.")

Frozen seafood or ice cream, on the other hand, needs to be transported at -10°F to 0 degrees, or else you can expect a disastrous meltdown (by both the shipper and the product)!

**Plants and Nursery:** Most nursery freight should not travel above 33°F, and temperatures that fluctuate even a few degrees can damage plants, wilt leaves, and quickly kill flowers.

**Produce:** When people talk about cold chain shipping, the first thing that comes to mind is produce. Apples, grapes and leafy greens need to stay between 32°F-36°F while potatoes and green beans can be transported at slightly warmer temps, at 40°F-45°F. Bananas, cucumbers, and melons cannot get too cold, or they will quickly spoil. They require temperatures between 45°F-50°F. Knowing your freight's tolerance is the name of the game.

*The ideal temperature for transporting meat products to avoid harmful bacteria growth is 40°F or under.*

IF A TRAILER'S  
TEMPERATURE  
INCREASES BY ONLY

2 ° FAHRENHEIT

→ IT CAN REDUCE PRODUCE SHELF  
LIFE BY AS MUCH AS:

50%



# PROPER PRODUCE PULPING

## What's the big deal about pulping?

Taking temperatures isn't just something you should do for COVID-19. It is an essential part of shipping produce on refrigerated trucks. In the logistics industry the process is called pulping, and it is the act of taking the fruit's or vegetable's temperature during various stages of the shipment.

***"Thou shalt not put a warm load of melons straight from the field into a pre-cooled truck and expect it to deliver on-temp."***

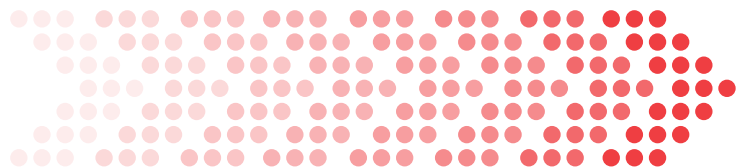
If God had written ten commandments for shipping produce, the first commandment would be, "Thou shalt not put a warm load of melons straight from the field into a pre-cooled truck and expect it to deliver on-temp." Every cold chain shipper should know this.

The misconception that a reefer trailer will cool down a product to the required specified temperature has gotten many shippers into trouble. Carriers are not responsible for a product's initial pulp temperature prior to loading – they are only responsible for maintaining consistent air temperature inside the trailer. Again, carriers are not responsible for a product's initial pulp temperature prior to loading, but only for maintaining constant ambient air temperature within the trailer. It is the shipper's responsibility to ensure that the product is already at the requested receiving temperature at the time of loading.

## Whose job is it to pulp—the carrier, driver, receiver or shipper?

Shippers should always pulp the product before loading and preferably do so in the presence of the driver. It can be done by using a digital thermometer or by a probe thermometer. Probes are more accurate, but because they pierce the product's skin, some prefer to go the digital route. Temperatures should be documented on the shipment's bill of





loading and signed by both the shipper and driver. Pulping at the shipment's place of origin helps protect both the shipper and carrier from claims if the product arrives at its destination and pulps off-temp.

Responsibility falls on the driver/carrier for having their equipment serviced regularly and for checking the reefer unit and trailer for leaks and malfunctions before loading. Monitoring temperatures while in transit can be done in several ways. Newer technologies provide a combination of GPS tracking with temperature sensor monitoring so that if the cargo experiences a temperature change, the dispatcher or fleet operator is alerted. Older reefer units may only have the temperature download information on the unit itself. Some shippers prefer to rely on a secondary monitoring system that rests on or within the product itself, called a temptale recorder. Temptales, like newer reefer units, also provide real-time information.



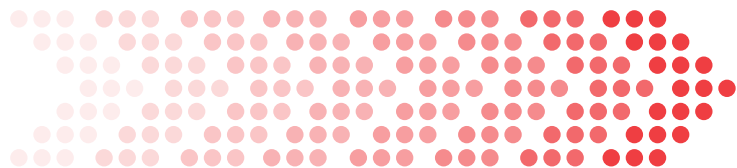
It is the receiver's responsibility to pulp the product for acceptance or rejection. If a shipment pulps differently than the specified temperature range on the bill of lading, the burden of proof then points back to the driver's equipment or the shipper. The final determination for freight rejection and claims depends on the documentation, including original specifications, sign-offs, and photos.

## How to Pulp

To get the most accurate reading when pulping produce, use a pulp thermometer to pierce the skin of the product. Leave the probe inserted for three to four minutes to get the most precise reading. If the product is individually bagged, like salad greens, you obviously can't pierce the bag, so fold the bag in half and place the probe in between the two sides. If you are using a digital thermometer, place it as close to fruit or vegetable as you can. To make sure your digital reading is correct, wait a few minutes and retake it in a nearby location for accuracy.

## Mixed Loads and Temperature Specifications

Blue Book Services offers an invaluable guide, "Compatibility, Temperature Guidelines, and



***Temperature and humidity play a significant role in keeping ethylene in check. If the ethylene concentrations are too high, it can promote premature ripening, leading to food waste and freight claims.***

Ethylene Sensitivity,” for anyone shipping produce on refrigerated trucks. The three-page document groups produce into categories according to their compatibility in transit. Factors that affect fruit and vegetable viability are recommended temperatures (listed in the guide as in Fahrenheit and Celsius), relative humidity requirements, and ice contact acceptability.

Ethylene is used in some produce to quicken the ripening of certain fruits and vegetables. Temperature and humidity play a significant role in keeping ethylene in check. If the ethylene concentrations are too high, it can promote premature ripening, leading to food waste and freight claims. Vegetables that are ethylene-sensitive should never be shipped with produce that emits ethylene.

Shippers sometimes want to ship multiple products requiring different temperature specifications, such as frozen and fresh food on the same truck, as a cost saving measure. This type of shipment is considered ‘high risk’ and is not recommended for several reasons. Frozen is typically transported at 0 to -10 degrees Fahrenheit while fresh runs at 28-38 degrees Fahrenheit. That means the temperature on the reefer unit is normally set at 0 degrees for frozen with an allowance of up to -10 degrees. For fresh product, the reefer unit is normally set at 28 or 35 degrees, but the allowance is up to 38 to 43 degrees. These variances are specified to accommodate multiple drops for LTL shipments when the doors are opened and closed for separate deliveries. Additionally, just as there are different commodities that make up frozen and fresh shipments, the requested temperature settings can vary, as well as the acceptable ranges.

# COLD FREIGHT PREPARATION

## Packaging, palletizing, staging & pre-cooling

It may sound simple, but shipping refrigerated cargo successfully starts with proper packaging, palletizing, and loading of the product. Many claims relating to spoiled or damaged temperature-controlled cargo begin with poorly executed pre-loading procedures.

These topics and others are the focus of our webinar, "Refrigerated Shipping: Myths versus Facts," with a link at the end. In the meantime, read on to learn some of the most important things shippers can do to keep their perishable freight safe.



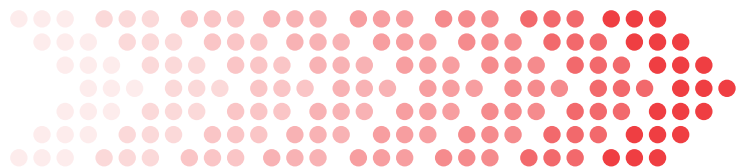
### Packaging

*Most cold products must be in sealed packaging to provide stability for temperature protection unless it is fresh produce or nursery freight.*

Most cold products must be in sealed packaging to provide stability for temperature protection unless it is fresh produce or nursery freight. While some freight is packed to retain the cold, others are packed to keep it from freezing. If you are concerned about keeping the product maintained within a specific temperature range, make sure before loading that is already within those designated temperatures or insulated at the required temps. When accidental freezing is a concern, pallets can be wrapped with thermal protective pallet covers or shipping blankets. These wraps keep the external temperatures from penetrating the freight's packaging and helps keep the product inside at a consistent temperature.

### Palletizing

Just like any other kind of freight, refrigerated cargo needs to be correctly palletized. Stacking boxes or bags neatly on pallets and then optimally loading them into a trailer is critical



to the safety of perishable freight. Automation and robotics have entered the picture in recent years, making the process more of an exact science for preparing shipments. For companies and distribution centers using them, these robotic palletizers (both case palletizers and bag palletizers) have helped eliminate human error and the need to spend hours laboring in cold warehouses in sub-zero temperatures preparing shipments. Read more about robotic palletizers.

If you are manually putting your product on pallets, be sure to follow best practices.

Never allow any overhang on pallets

Shrink wrap and/or strap all cargo to every pallet

If varying box weights, heaviest boxes go on bottom

Do not stack in a pyramid

Leave no voids or spaces between products

Use slip sheets every 3-4 layers to distribute weight

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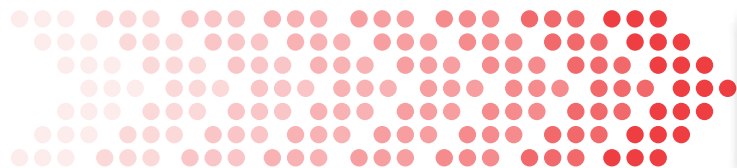


**How to Palletize Guide**

## Staging Your Shipment

Products should be ready to go when the truck arrives. Freight with temperature requirements of less than 40 degrees Fahrenheit should be documented before going on the truck. Make sure to properly stage your shipments so that loading time can be kept to a minimum. For multi-stop LTL shipments, freight that delivers first should be put into the trailer last. Have the pallets lined up in the order in which they get loaded on the trailer. Timing is especially important during summer months and at cross-docking facilities where exposure to the heat is greater.

If you are unsure how to optimize your cargo's pallet space inside a trailer, there are software programs that can do it for you. If you are working with a freight broker, they usually provide this valuable information as part of the service. Choptank Transport's ORBIT TI, the company's custom-built transportation management system, not only



provides its customers with this service, they also provide analytics on capacity utilization metrics. This information gives shippers a record of how much of the available cargo space has been used during each trip.

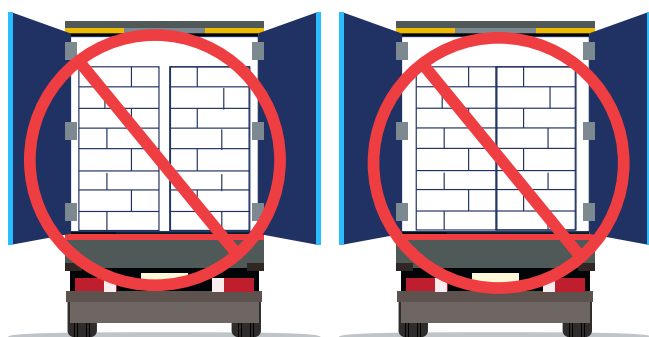
Making sure there is adequate air circulation around the product by using spacers is another key factor in keeping the product within a specified temperature range. Cool air must be able to move over, under, around, and preferably up through the pallets. If you don't have proper airflow, goods in the center of the shipment can become warmer. This practice is called center loading, and it means that the product should never be pushed up against the sides of the trailer, directly on the floor, or against the back of the trailer doors as these areas can conduct heat from external temperatures.

## Pre-cooling the Trailer

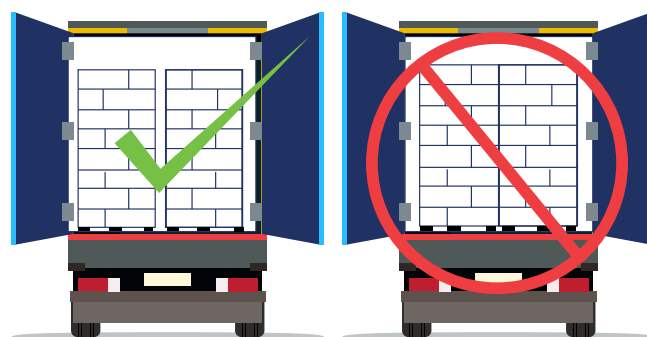
Before the shipment is ready to be loaded, the trailer must be pre-cooled. Reaching the required stable temperature can take an hour or sometimes longer. If a trailer has real-time telematics on board, the shipper may be alerted when the trailer is ready for loading. If not, the dock manager must check the trailer manually before it is ready to be loaded. Be sure to clarify and document if the shipment needs to run "continuous" or if it can run "start/stop." The set temperature should be to the coolest requirement since there will be some loss when the doors open for loading. The reefer unit should be turned OFF when loading. Why? Keeping the unit off when loading does a couple of things.

It prevents:

- Ice accumulation on the coil
- Any blockage of cold air movement
- Accumulation of moisture on the evaporator
- Poor performance of the refrigeration unit



**LOAD ON SLIP SHEETS**



**LOAD ON PALLETS**

# DOCUMENTATION

*“...there is a better chance of winning a claim if you are able to provide verification.”*

## Tracking & Real-Time Visibility

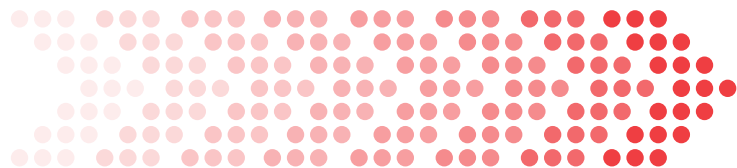
Less than a decade ago, a shipment of frozen fish would leave a dock in California and possibly go through several different states and several different temperature zones before arriving at its destination. It also may have had several deliveries along the way. The shipper knew it was frozen when it left its place of origin, and the receiver made a notation that it was frozen upon arrival at its destination. But what about the four hours it sat in an open truck while other cargo was being unloaded on a hot 102°F day in the Southwest? Before GPS tracking and real-time visibility, there was no way of knowing what happened in between points A, B, C, and D.

Today, technology allows us to keep an eye on the movement and condition of every shipment. We now have the visibility to know where the truck is in real-time as well as the temperature of the inside trailer. This information is captured by either the reefer unit on the trailer or the temperature monitoring device (TMD) attached on or near the product on board.

The beauty of this transparency is that everything can now be documented and recorded. Reefer units have downloadable information, and the sensor readings on TMDs can be captured by photo or signed off on by dock masters or drivers. No more he said, she said.

As much as this documentation helps with cargo claim disputes, there still can be issues with the accuracy of the information. Reefer units may not have been checked or calibrated within the standard amount of time (90 days is recommended), or sensors may not have been placed in the proper position to get an accurate reading of the cargo in question. Still, there is a better chance of winning a claim if you are able to provide this kind of verification when it comes to damaged or spoiled cargo.





## Food Safety Modernization Act (FSMA)

The Food Safety Modernization Act, passed January 4, 2011, is an essential piece of legislation that overhauled old, inadequate rules for manufacturing, handling, and transporting food safely. The objective was to be proactive in preventing food contamination instead of merely reacting to outbreaks of foodborne illnesses. In the world of transportation, the ruling applied to the sanitary transport of food and included new requirements for shippers, receivers, loaders, and carriers. Get the Food Safety Whitepaper.



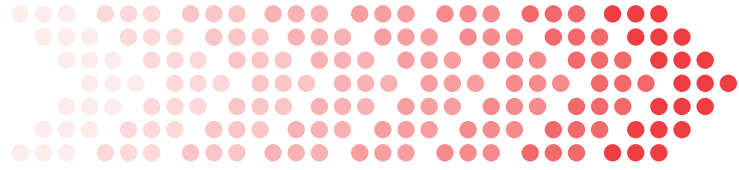
In 2016 the FDA implemented the Sanitary Transportation of Human and Animal Food (SFT) rule, which is one of seven overall regulations. The SFT rule states that mandatory safety practices be followed and documented to ensure that perishable or temperature-sensitive food is adequately kept at specified temperatures throughout the supply chain. It also addresses the need to clean vehicles and equipment between loads properly. Inspection requirements include all equipment such as the inside of trailers, forklifts, crates, boxes, paper, and plastic—meaning anything and everything that comes in contact with the product.

The ruling put the onus not on just one accountable partner, but on every step of the supply chain, and documentation plays a pivotal role in enforcing it. Shippers, receivers, loaders, and carriers are all expected to communicate with one another regarding safety protocols. Checklists and standard operating procedures (SOPs) have become critical verification tools for all parties involved.

## Checklists for Compliance

It is crucial to know who is responsible for what in the supply chain. This STF guide is one of the best references for clarification. As you can see, some parties have a **PRIMARY** responsibility for understanding and *implementing* the industry's best practices to achieve regulatory compliance. Other parties have a **SECONDARY** responsibility role for *verifying* that compliance is met by the appropriate parties in an integrated cold chain. A Shipper's Roadmap to FSMA Compliance is another resource that provides a quick overview of some important steps shippers must take to remain compliant.





## Standard Operating Procedures

Checklists are helpful and necessary, but standard operating procedures are just as important to keep practices habitual and part of the everyday routine. When workers are familiar with documented procedures, and it becomes only another part of their workday, fewer problems are likely to occur. Here are 8 Things Shippers Can Do to for FSMA Compliance. SOPs should be created by companies involved in the preparation and shipping of cold freight and made easily accessible to all employees. That may mean posting them around the facility, training the appropriate personnel, and making sure everyone has access to them on their computers. This Shipper's Guide to Sanitary Food Transportation infographic outlines some of the basics.

**CHOPTANK**

**8 Things Shippers Can Do Today for FSMA Compliance**

- 1 Have appointed personnel whose main responsibility is to ensure compliance with all FSMA regulations.
- 2 Get verification in writing of temperature monitoring and recording systems of freight during transport.
- 3 Check that all surfaces inside trailers are free of chips, flakes or rust.
- 4 Have written or SOPs for safe practices regarding loading, unloading, and while in transit, including temperature requirements, sanitation and handling procedures.
- 5 Make sure that all required load temperatures and sanitary requirements are given to carriers in writing.
- 6 Make sure there is no cross-contamination between raw foods and non-foods.
- 7 Inspect pallets and any equipment used to transport food by making sure they do not contribute to contamination or food exposure.
- 8 Determine set protocols when temperature violations occur.

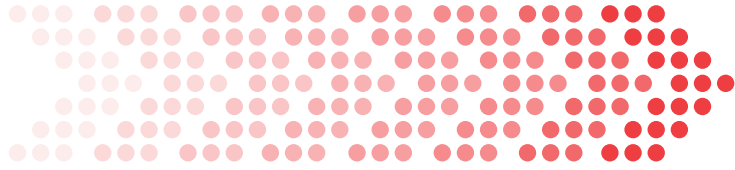
**How CHOPTANK CAN HELP**  
Over 20 years of experience with a foundation in refrigerated food shipping logistics. Our proprietary software is designed to monitor the carriers and give you alerts and reports at your fingertips. To learn more about how Choptank can help you be FSMA compliant, visit [www.shipchoptank.com](http://www.shipchoptank.com)

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**A Shipper's Road Map to FSMA Compliance**

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## Knowing your Transportation Provider

So here is the bottom line. The safety of your freight depends on the quality and service of the transportation provider(s) you use and the ability to have real-time information at your fingertips.

There are a few questions you might want to ask yourself if you are using a third-party to handle your transportation needs. Has the 3PL you are working with invested in the latest technology so that you know where your shipment is at all times? Do they have a good relationship with your business and its staff so that you know they have your back when things get tough? And lastly, how well do they vet their carrier pool?

These are all critical questions that need clarification if you are shipping perishable freight. There are so many variables in shipping temperature-controlled freight; you should always seek professional services. At Choptank Transport, our mission is to provide you with the gold standard in transportation services, from the latest technology to the most professional, courteous, and knowledgeable staff in the industry.

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Choptank Transport is a nationwide third-party logistics company that specializes in truckload and temperature-controlled freight services as well as less-than-truckload, intermodal, port & drayage, and heavy-haul shipments. The company's headquarters is in Preston, Maryland, with regional locations that include Baltimore, Denver, Dallas, Atlanta, and Tampa. For more information about Choptank Transport, visit our [Facebook page](#) or go to our website at [www.choptanktransport.com](http://www.choptanktransport.com).

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