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### Transport of Market Hogs in Winter Months



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## Transport of Market Hogs in Winter Months

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This bulletin is presented as the companion  
submission to “Transport of Market Hogs in Spring  
and Summer Months” as presented in the spring Pork  
Quarterly, June 2018. McGlone et al. articulately state  
that ethical and economical transport of finishing pigs  
is an important aspect of swine production and welfare  
(1). Transportation is a known stressor for swine and the  
winter months offer particular challenges which may  
have a negative impact on pig welfare and subsequently  
meat quality prompting transporters to take responsible  
actions to protect their cargo (1-3).

Domestic pigs are sparsely covered in a bristly  
hair coat and are potentially vulnerable to extreme  
weather conditions. Pigs “do well” in a relatively narrow  
thermoneutral zone ranging from approximately 60°F  
to 80°F (4). Within a well-insulated environment pigs  
can maintain a stable body temperature (101° -102.2°F).  
Below that zone or lower critical limit, pigs will need to  
extend extra energy to maintain their body temperature  
(4). During cold weather, metal floor temperatures can  
be as cold as -20°C (-4°F). In spite of industry bedding  
recommendations, there was no evidence in this study  
to suggest that bedding depth had a measurable effect  
on the thermal comfort of the pigs (5), especially if  
the bedding is wet or frozen. Considering that during  
transport pigs may be exposed to temperatures as  
low as -5 degrees F; failure to maintain an appropriate  
thermal environment range during transport may result  
in compromised welfare and lower pork quality (6-8)  
Fitzgerald et al state that the percentage of total losses  
per trailer was greater during winter compared to  
mild weather and those losses were mainly a result of  
fatigued pigs, possibly attributed to shivering (1,9).

A closer inspection of the related issues of best

practices in both handling and transport in winter are both advisable and commendable. Winter month factors include: proper bedding, space allowance/loading density, frostbite, consideration of weather conditions, transport duration, fitness for transport, and low stress handling methods.

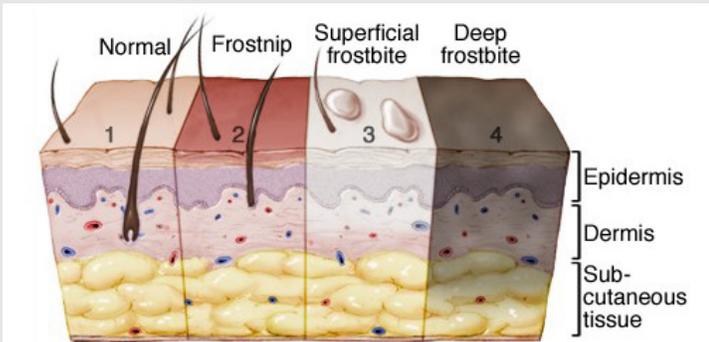
**Frostbite:**

Frostbite is perhaps one of the greatest concerns for pigs transported in cold weather (10,12). Frostbite is an injury caused by freezing of the skin and underlying tissues (12). Pigs arriving at abattoirs with frostbitten skin run the risk of condemnation by USDA inspectors or may result in a lower value carcass due to excessive trim losses by establishment personnel (13). Looking at the range of frostbite severity; frostnip is a form of frostbite injury that doesn't cause permanent skin damage but may be extremely painful (Images 1,2) (12). Personal observations suggest that frostnip, a milder form of frostbite, is observed most upon arrival at the abattoir. This observation does not exclude the fact that more severe stages of frostbite may also be observed.



*Image 2 Frostbite in a Market Hog: An example of frostbite (frostnip) in a market hog is shown above. The extreme reddening and damaged skin is apparent on the ham and shoulder in this image.*

on the National Pork Board's web-page (pork.org) in English and Spanish (9). The manual contains valuable information regarding transportation in extreme weather conditions presented in Chapter 4 of the manual. The manual provides both a Recommended Truck Set-Up Procedure based on air temperatures and a National Weather Service Wind Chill Chart provided graphically allowing the user to understand proper bedding and safe transport conditions for swine in cold weather (Figure 1) (8,9).



*Image 1 Stages of Frostbite: Four stages of frostbite are presented ranging in severity from normal unaffected skin to deep frostbite which are caused by exposure of skin to extreme cold temperatures (12).*

**Bedding/Trailer Maintenance/Weather**

To reiterate; the National Pork Board's Transport Quality Assurance™ (TQA™) program is recognized as the swine industry's best practices for handling and transportation. The program was designed to help swine producers, transporters, and handlers understand the best practices for not only handling, moving and transporting pigs but also in understanding the impacts their actions may have on pig welfare and pork quality (14). The latest version of the TQA™ program is available

Recommended Truck Setup Procedures Based on Air Temperatures (Market Pigs)		
Estimated Air Temperature	Bedding* (minimum recommended bags/trailer)	Side-Slats (% closed)
≤ 10°F	Heavy (6 bags)	90-95%
11-20°F	Heavy (4-6 bags)	75-90%
21-30°F	Heavy (4-6 bags)	50-75%
31-40°F	Medium (3-4 bags)	50-75%
41-50°F	Medium (3-4 bags)	25-50%
51-60°F	Medium (3-4 bags)	0-25%
61-90°F	Medium (3-4 bags)	0%
> 90°F	Light (1-2 bags)	0%

\*Bedding refers to a 50-pound bale of wood shavings.

TQA

*Figure 1: Recommended Truck Setup Procedures Based on Air Temperatures*

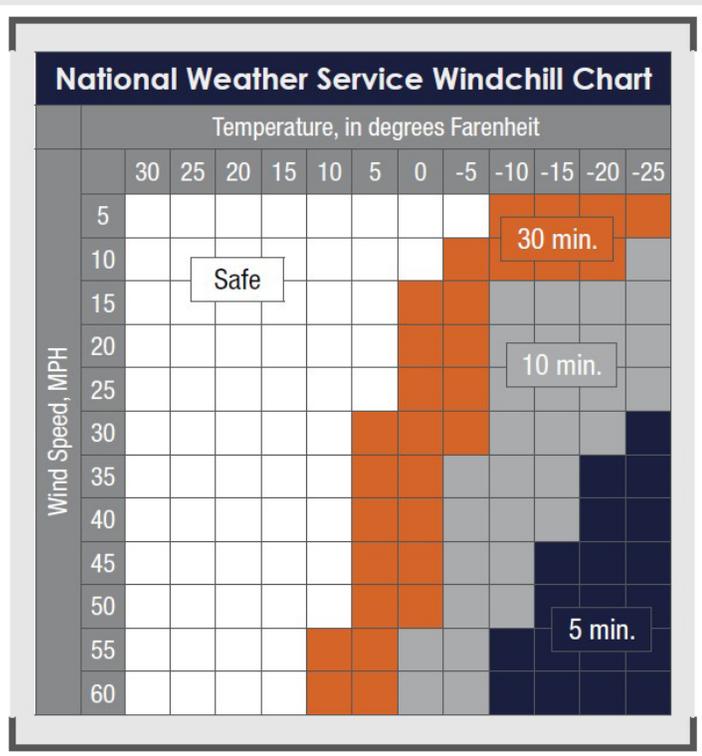


Figure 2: National Weather Service Windchill Chart

### Recommendations for Adverse Weather Conditions

The Recommended Truck Set-Up Procedure Based on Air Temperatures and the National Weather Service Wind Chill Chart can be found in the current TQA™ manual v.6 (13). In an attempt to keep pigs warm and to prevent unnecessary injury to extreme temperatures (frost bite), deep (heavy) bedding with either straw or shavings in a dry trailer is required when the temperature is below 32°F, and straw is recommended for extra warmth when the temperature drops to 10°F(4).

- Figure 1 as referenced from the TQA™ manual v.6 associates air temperature with bedding and slat closure percent to provide appropriate care for pigs in transport. Figure 1 states that pigs transported in cold temperatures less than 22°F should be heavily bedded with clean, dry, fresh woodchips to prevent the pigs from coming into direct contact with cold metal. In extreme conditions it may be advisable to line the trailer compartments with wood or a rubber membrane to avoid the pigs from coming into contact with the cold metal (10,15,16).

- Figure 2 plots temperature vs wind speed. Extreme cold and wind chills are hazardous to pigs in transport. Figure 2 allows the transporter to understand

their impact on hogs in cold weather conditions by demonstrating how quickly frost bite can occur under severe condition (5, 10 or 30 minutes) if appropriate actions are not taken (13). This information should be taken into account when using boards or plugs on a trailer (13). Clearly, a colder temperature (-25°F) and higher wind speed (55 mph) is less ideal which would result in frost bite in 5 minutes as compared to a higher temperature (30°F) and a lesser wind speed (55 mph) and no risk of frost bite.

### Space Allowances

Over stocking livestock trailers increases stress and death loss of pigs (7,17). Recommended truck space allowances are presented in Table 1 (18). The “ideal” transport space per pig is still uncertain and, logically, varies with the ambient temperature. Research suggests, however, that transport losses are minimized between 55 and 58 lb./sq. ft (19). The TQA manual suggests loading fewer pigs/load in cold weather (14). The type of trailer used to transport pigs may also influence pig losses as the environment of distinct compartments may be more susceptible to extreme weather conditions (20,21) (Image 3). You may consider pre-sorting pigs, weighing and stocking individual pens in the barn the day prior to loading so that each pen represents a truck compartment on the day of loading. This will dramatically reduce stress of both employees and pigs on the day of loading and may reduce transport losses by 66 percent (22-24).

Market Swine		Winter (cold weather)	
Weight Kg	Lbs.	m <sup>2</sup>	ft <sup>2</sup>
45	100	0.22	2.4
91	200	0.32	3.5
114	250	0.40	4.3
136	300	0.46	5.0
182	400	0.61	6.6

Table 1: Recommended Space Allowances on Trucks In Winter

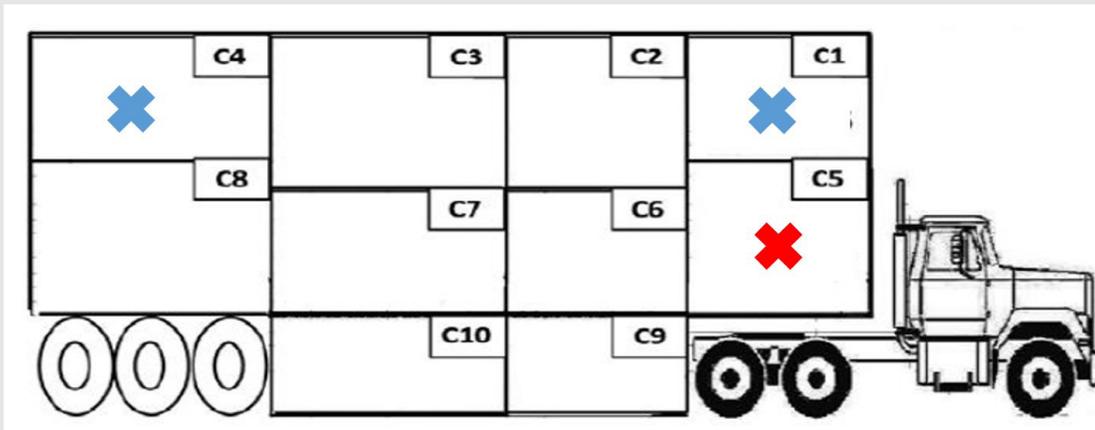


Image 3: Understanding the Impact of Livestock Trailer Compartments

The Federation of Animal Science Societies (FASS) has published a table of Recommended Space Allowances on Trucks for variable weight and season (18). The table provides an easy method calculating the stocking density of a particular compartment as a function of pigs/square foot or meter.

The type of trailer and weather conditions may affect pig welfare. Somnavilla (2017) reported that during the winter, the temperature in compartments C1 and C4 were lowest as compared to other compartments. Compartment C5 was found to be the warmest in winter (21).

### Scheduling and Transportation

Transporters should prepare trailers for current or impending adverse weather conditions using appropriate bedding, slats and perhaps lining compartments with wood or a rubber liner in more extreme conditions to maintain pig welfare and reduce the incidence of transport losses.

Stopping the trailer while transporting pigs should be avoided if possible, as proper ventilation is best maintained while the vehicle is in motion however; if stopping is necessary, adjustments to ventilation may need to be made just before moving or when the vehicle stops to control condensation (11,14). Drivers may also consider direction of prevailing winds and parking between 2 freight trailers at the truck stop to shield the animals from the cross-wind (3).

### Fitness for Transport/Low Stress handling

While it is the trained and competent transporter's responsibility to protect pigs during all weather conditions, responsible producers should not load pigs unfit for transport (12). The fitness of pigs intended

for transport should be assessed prior to loading (23). It is critical to have alternative management options to manage pigs unfit for transport. Pigs which are compromised or unfit for transport should not be loaded and either treated or humanely euthanized. Dead and non-ambulatory disabled pigs at the packing plants cost the U.S. swine industry approximately 46

million dollars annually and negatively affect pig welfare and public perception (21).

As stated previously, transportation and cold temperatures are, individually, challenging stressors for pigs and their combined impact...even greater. Pigs should be moved using low-stress handling methods minimizing fear and physical force. Nancy Lidster of DNL Farms Ltd. states that for pigs to feel safe, they need to be aware of their surroundings, be given time and space to move, be able to get release from pressures, and stay with other pigs (25). Attention to low stress handling is just one more factor in improving pig welfare and pork quality in transport of pigs in the winter months.

### Side Notes on Transport of Weaned Pigs:

Recommendations on transport of weaned pigs are not as well documented as those for market weight pigs. Zhao et al. (2016) reported that transport mortality for weaned pigs is approximately 0.0333 percent (26,27).

Weaned pigs are more able to tolerate heat than cold which is attributable to their poor thermoregulatory capacity due to a lack of brown adipose tissue (28,29). Recommended truck space allowances are presented in Table 2.

Transported weaned pigs may

Weight Kg	Small Pigs		
	Lbs.	m <sup>2</sup>	ft <sup>2</sup>
4.54	10	0.06	0.70
9.07	20	0.084	0.90
13.60	30	0.093	1.00
22.70	50	0.139	1.50
31.20	70	0.167	1.80
36.30	80	0.177	1.90
40.80	90	0.195	2.10

Table 2: Recommended Space Allowances for Small Pigs

benefit from slightly less space in cold weather and just a bit more space in warm weather (Figure 1). Suggested truck space allowances for weaned pigs are 0.06 m<sup>2</sup>/pig or 0.07 m<sup>2</sup>/pig, particularly in summer (18,28).

As previously mentioned, deep bedding with either straw or wood shavings is required when the temperature is below 32°F (0°C) and straw is recommended for extra warmth when the temperature drops to 10°F (-12°C) (4). When the outdoor temperature is below 20°F (-6°C) the trailer should be 96 percent boarded (30). During extreme cold, the trailer may also be lined with wood or a rubber membrane to prevent the pigs from contacting cold metal sides (10,15,16).

Ensuring the safety and welfare of pigs in transport during the winter months is our duty as responsible swine producers and is essential in maintaining animal welfare and preventing unnecessary losses. Strategies to manage the environment in the trailer are not surprisingly, multi-factorial and may include frostbite, proper bedding, trailer maintenance, consideration of weather conditions, time of day for transport, space allowance/loading density, transport duration, fitness for transport, handling methods, and trailer management. Thoughtful consideration of the strategies presented may improve pig welfare, pork quality and have a positive financial impact for producers.

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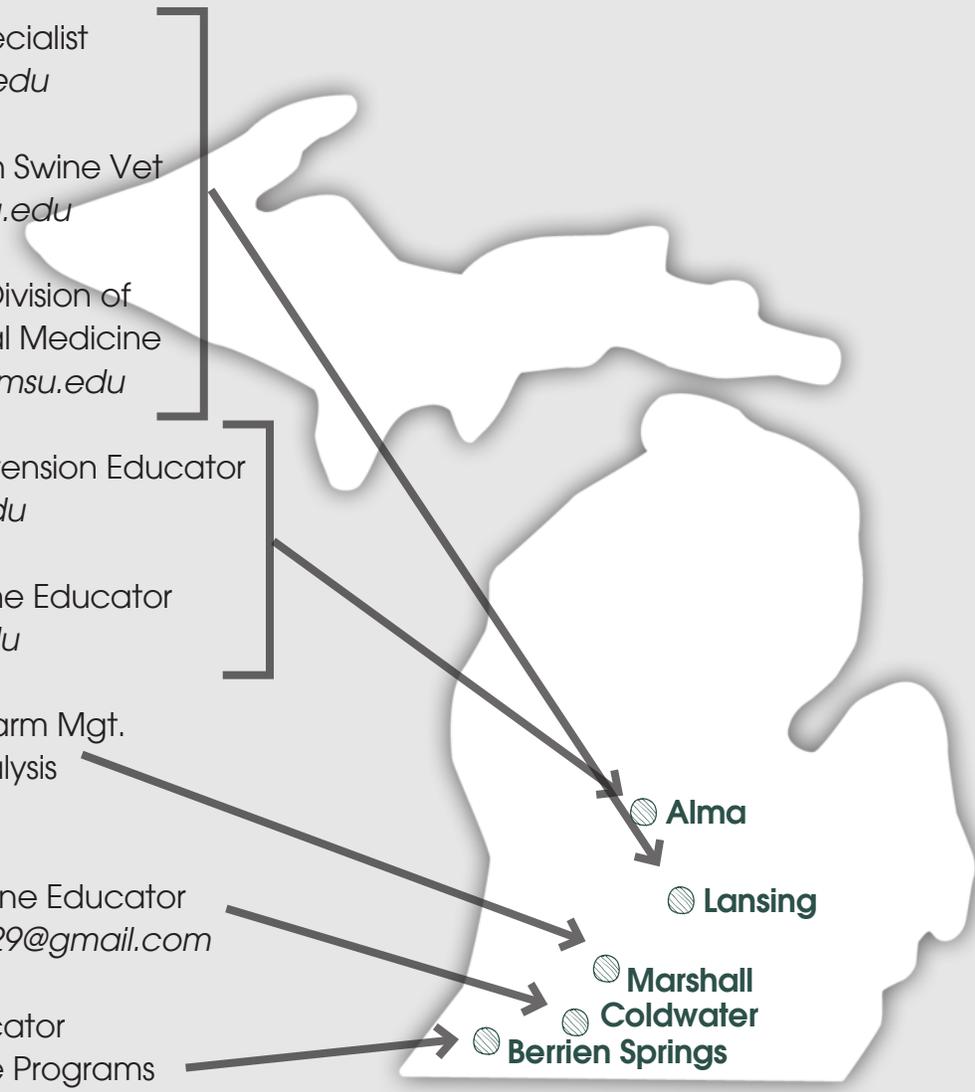
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