SUMMARY

Every year an estimated 171 million pigs are transported within the EU, including 3.5 million in Sweden. The entire transport process, from pen to abattoir, puts the pigs under stress. Stress factors include regrouping, new environments, vibration during transit, and, particularly during the summer, uncomfortable climate. The greatest stress is experienced during loading and when the truck is standing still in warm weather. The ventilation inside is poor and there is little chance for the air to move freely unless the trailer is fitted with fans.

The temperature can reinforce or mitigate the effects of the other climate factors and is therefore critical to the pigs’ well-being. Loading on very hot days increases the risk of heat stress, which prevents the animals from cooling themselves down effectively.

Stress also increases the amount of heat emitted by the pigs into their surroundings. Heat is transferred, by the laws of physics, via conduction, convection, radiation and evaporation. The first three of these are governed by the temperature differential between the animal and its immediate environment. The relative humidity of the air is also significant, especially at temperatures above 30°C. As there is no exact definition of an upper critical temperature, it is set at the point when the animal has to activate physiological mechanisms to prevent its body temperature rising.

A free flow of air is needed to remove heat and moisture from within the truck. The ventilation inside the trailer and the density of the animal cargo affects the ambient transit temperature and subsequently the quality of the meat. Ventilation is an important determiner of this temperature, and pursuant to EU recommendations is to have a capacity of at least 60 m³/hour and 100 kg animal mass. The most important factor deciding the interior ventilation is the size of the ventilation grills, which should make up 20 percent of the floor space.

There are two types of ventilation system that can be used for animal transportation: natural and mechanical, the former being the most common. This system is based on the temperature difference between the external and internal air, wind speed and, most crucially, the speed of the vehicle itself. It thus varies considerably. Mechanical fans can be mounted inside to provide a more even ventilation effect and to guarantee that the trailer remains ventilated for the entire journey – even when the truck is standing still.

The purpose of the present study is to improve our understanding of the thermal dynamics at various points within the trailer. The main body of the study comprises a comparison between natural and mechanical ventilation. A commercial pig truck was fitted with climate sensors that registered temperature, humidity, carbon dioxide levels and direct sunlight every 30 seconds between source farm and slaughterhouse. Ten measurements were made in total, five with mechanical ventilation, five with only natural ventilation. Interior climate readings were taken during loading, when the truck was standing still, when the truck was in motion, and during unloading.

One important lesson from this study is the significance of loading times. When the truck is standing still, the temperature rises in the container, with or without mechanical ventilation. Although the temperature gradient is shallower and flattens out more
quickly when mechanical ventilation is used. This indicates that mechanical ventilation helps to improve the interior climate, mainly when the truck is standing still.

When the wind was low and natural ventilation used, a temperature rise of 0.21°C per minute was measured. With mechanical ventilation the rise was only 0.10°C per minute. No differences in temperature rise could be observed windy days.

A difference in temperature distribution could be seen in the animal compartment. It was considerably warmer in the front, 3.4°C, during loading. During standing still time, fully loaded, the temperature difference increased with natural ventilation and decreased with mechanical. This shows the slower rise in temperature when fans are used.

A difference in humidity could also be detected. In average, when natural ventilation was used, the relative humidity leveled at 97%. This should be compared with the level when mechanical ventilation was used; 82%. This shows that fans help to remove moisture from the animal compartment.

The carbon dioxide rose quickly during loading. The level stabilized at 2 000 ppm when the fans started to work. With natural ventilation, the level kept rising. No difference in carbon dioxide level (600-700 ppm) could be seen during the transportation.

Loading times varied considerably during our study, which suggests that effects on the well-being of the livestock have not been given sufficient attention.

One disadvantage of mechanical ventilation is the noise, which reaches between 75-81 dB(A). This increases the pigs’ resistance to board the truck and thus lengthens loading times. Animals loaded first then have to stand for long periods of time in the standing vehicle, aggravating the effects of heat and social stress and escalating the duration of fights.

The main conclusion of this study is that mechanical ventilation is indeed beneficial when compared with natural ventilation. It gives lower temperatures, lower humidity and higher air velocity. Thereby the risk for heat stress during loading is decreased hot days.

The overall conclusion is that there is no one catch-all solution to improve animal transportation. Nevertheless, it is important to make many, smaller continual improvements in order to optimize the process in terms of both animal welfare and meat production. These two perspectives seldom prove to be mutually exclusive: the humane handling and transportation of pigs produces greater efficiency in the production chain and better quality meat. Moreover, the converse also seems to apply: the presence of many, though not necessarily serious, deficiencies lead to stress, which prolongs the production chain and impairs the quality of the meat. Prevention is thus just as important as cure.