A spatial and temporal analysis of cull sow movements

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Key Points

- The cull sow marketing channel is vast and complex.
- Cull sows are in the marketing channel for extended periods.

Introduction

More than 3.2 million cull sows enter the US marketing channel annually or about 12,300 sows per day. The current market structure has most cull animals delivered to a local collection point and not directly to the slaughter plant, which is the usual process for market animals. Each slaughter plant prefers different classes of animals, and a plurality of slaughter plants are located east of the Mississippi River. The current marketing channel results in the mixing of sows from multiple farms before harvest. This structure creates the potential for a novel pathogen in one farm to spread and replicate within the marketing channel and infect other farms, as seen with the Seneca Valley virus.

Previous work in our laboratory documented the national scope of the cull sow market (Blair et al., 2019). Sows from 21 states, with 14% of cull sows moved between multiple collection points, were observed entering a single packing plant in one week. The cull sow marketing channel is a poorly understood and unmanaged reservoir population. It also has a high degree of connectivity, creating an ideal situation for the expansion and transmission of a novel pathogen in the US swineherd.

Objective

Describe the spatial and temporal movement of cull sows within the US marketing channel

Materials and Methods

Premise ID tags (TAG) were collected from the USDA-APHIS-VS Brucellosis Laboratory as part of routine Brucella surveillance for one week each month over six months. Data collected for each TAG included Sow ID, Premise ID (PREMID), state, plant, and kill date. Latitude and longitude, for each premise, were identified through a public database, and the location was confirmed using Google Maps® (www.maps.goolge.com) satellite view. A subset of PREMID, which was confirmed to be associated with a participating production system, was used to identify cull/removal dates of individual sows from farms. The total time spent in the market channel is the time between the slaughter date and the culling date. Distance traveled by each sow, farm to plant, was calculated using the straight-line distance from the PREMID location to the slaughter plant location.

Results/Discussion

A total of 17,493 individual TAGS were collected, representing approximately 8.4% of the total sows harvested each week at seven packing plants. These seven plants are responsible for 33% of the national kill, meaning that the collected data represents about 2.7% of the national cull sow harvest each week. TAGS from 32 states and 1211 unique PREMIDs were collected. An individual plant receives sows from a median 9.5(Q1=3.75, Q3=16.25) states and 71 (27, 106.25) unique premises in a single week. The largest plant in the data set received sows from 26 states and 170 different premise locations in a single week. Sows traveled a median straight-line distance of 472.7 (262.3, 715.9) km with a maximum straight-line distance of 2812.8km. A single premise delivered sows to 1, 2, or 3+ packing plants 59.7%, 33.4%, and 6.9%, respectively, overall sampling periods.

We collected cull/sow farm removal dates from 2886 (16.5%) individuals. Of these 2886 sows, 66.1% were in the market channel for <=3days, 25% for 4-5 days, and 8.9% for >5days. The median time from removal to slaughter was 3(2, 5) days with a maximum of 40 days for 2 individuals. These data suggest movement between multiple collection points before harvest for sows with extended time in the channel because regulations prohibit sows remaining at one location for more than 120 hours.

While this data is not a complete view of the cull marketing channel, we believe this to be the most comprehensive view of the US cull sow marketing channel to date. These data confirm Blair et al., 2019, that a small but significant number of sows move between collection points. These results suggest that the cull sow marketing channel provides an independent but interconnected population of swine that can maintain, expand, and transmit pathogens to the US swine breeding herd. Control and elimination plans for the novel, transboundary, and foreign animal diseases should include this population.

References
1. Blair, B. & Lowe, J. Describing the cull sow market network in the US: A pilot project. Prev. Vet. Med. 162, 107–109 (2019).