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Project Title: Prevalence and serotypes of intimin (eae) positive Shiga toxin-producing *E. coli* colonizing cattle arriving at fed beef and cull cow plants in the US.

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Objective: The objective of this study was to determine whether inherent differences in fed cattle and cull cattle sources affect the prevalence and serogroups present of intimin positive STEC, and identify unappreciated serogroups of non-O157 STEC present.

Experimental Treatments: Rectal anal mucosal swabs (RAMS) were collected to determine presence of intimin positive STEC colonizing 1,042 fed cattle and 2,081 cull cattle (1,062 cull dairy and 1,019 cull beef) at harvest in five regions of the US. The RAMS were enriched according to standard procedures, screened using molecular tests (PCR) to identify potential positive enrichments, then subjected to culture confirmation targeting top 7 and non-top 7 serogroup STEC. All isolates were characterized for virulence genes and serotyped.

Key Results:

Prevalence of the *stx* gene in feces was 91% in cull cattle and 99% in fed cattle ($P < 0.01$).

The predicted prevalence of intimin positive STEC (based on additional molecular markers) in feces of fed cattle was 77.2% and 43.2% in feces of cull cattle (47.7% dairy and 38.7% beef breeds).

The most common intimin positive STEC isolated was O157:H7, representing 21% of fed cattle isolates and 16% of cull cattle isolates

Non-O157 top-6 serogroup intimin positive STEC accounted for 20% of fed cattle isolates and 45% of cull cattle isolates. Significantly more ($P < 0.05$) isolates of O26 and O111 were found in cull cattle compared to fed cattle.

E. coli of "non-Top 7" serogroups (*i.e.* NOT O26, O45, O103, O111, O121, O145 or O157) accounted for 61% of fed cattle intimin positive STEC isolates and 39% of cull cattle intimin positive STEC isolates.

About a third of these isolates have been serotyped and identified as serogroups O5, O74, O109, O113, and O177; the remainder are still to be serogrouped. Of these “non-Top 7” isolates, significantly more ($P < 0.05$) O74 and O109 have been found in fed cattle compared to cull cattle. 5.8% of fed and 11.5% of cull cattle were culture confirmed to have two or more intimin positive STEC present. In these co-colonized cattle, equal numbers of O157 + non-O157 were observed as non-O157 + non-O157.

Characterization of the non-Top 7 intimin positive STEC isolates shows that they possess similar virulence genes as the Top 6 intimin positive STEC isolates and therefore are likely human pathogens and potential enterohemorrhagic *E. coli*.

How can this information can be applied in the industry? This data illustrates that the populations of intimin positive STEC colonizing fed and cull cattle are different. Processors dealing with cull cattle may encounter Top 6 STEC at a greater frequency than fed cattle processors, while fed processors may encounter non-top 7 STEC more frequently. The question of whether O157:H7 and Top 6 non-O157 STEC occur together or separately has been raised by industry and FSIS. This data suggests that most intimin positive STEC occur separately in cattle arriving at processing plants. Finally, the presence of non-Top 7 STEC is becoming a topic when regulators discuss non-O157 STEC. Our data identify the next most commonly present serogroups as O74 and O177. These two serogroups may need further study in the pre- and post-harvest arenas to ensure that they are no more resistant to interventions than O157:H7 or the top 6 STEC.

Pie charts showing serogroup distribution of isolated intimin positive STEC from feces of fed cattle ($n=165$) and cull cattle ($n=225$) collected at harvest.

