Microbial Testing: *Salmonella* & STECs

International Center for Food Industry Excellence (ICFIE)
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- ***Salmonella***
  - **What is it and why is it important?**
    - → Organism known to reside in gastrointestinal tract and ultimately feces of ruminants and monogastrics
    - → More than 2,500 different serotypes (CDC, 2011)
    - → *Salmonella* from livestock sources causes 80.3 million illnesses and 155,000 deaths globally each year (Majowicz et al., 2010)

Figure 1. BGS agar

- **Shiga-toxin producing *Escherichia coli* (STECs)**
  - **What is it and why is it important?**
    - → Group of pathogenic *E. coli* with the potential to cause very serious human illness (such as hemolytic uremic syndrome) and potentially death
    - → In U.S., *E. coli* O26, O45, O103, O111,O121, O145 & O157:H7 are adulterants in ground beef
    - → Globally STECs estimated to cause 2.8 million illnesses and 230 deaths (Majowicz et al., 2014)

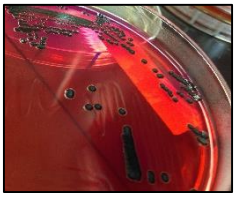

Figure 2. XLT4 agar

- **Traditional culturing methods**
  - → Typically take 3-5 days to obtain results
  - → Selective and differential media allow for selection and identification based on recognition of typical colonies based on biochemical reactions
    - *Salmonella* media examples: Tetrathionate (TT) broth, Rappaport-Vassilliadis (RV) broth, Xylose Lysine Deoxycholate (XLD) agar, Brilliant Green Sulfa (BGS) agar, Xylose Lysine Tergitol 4 (XLT4) agar
    - STEC media examples: Gram Negative (GN) broth, modified Tryptone Soya Broth (mTSB), modified Rainbow Agar (mRBA), ChromaO157 Agar, etc.
  - → Further confirmation is needed to improve accuracy of test results (ex: latex agglutination)

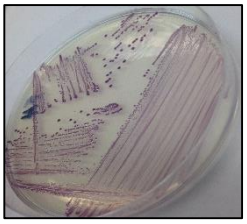

Figure 3. ChromO157 agar

- **Polymerase chain reaction (PCR)** (*Salmonella* or STECs)
  - → A more rapid test, usually giving results in approximately 48 hours
  - → Uses a very small quantity of the sample to search for targeted DNA
  - → Most PCR methods have a very low detection of target organism
  - → PCR presumptive positives need a confirmation test, but can be a helpful screening tool for high volumes of samples, or when a faster response is needed

Figure 4. PCR example (GeneDisc)

- **Serotyping**
  - If the serovar or serogroup of the organism needs to be identified more intensive analysis can distinguish specific genes present
    - → This may be necessary if trying to identify the exact pathogen being dealt with or trying to match isolates together

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