Coliform Bacteria Growth Demonstration

Materials required:

- 7 self-closing plastic bags
- supply of ground coffee (any dark material that will show up well in the plastic bags will work – avoid light colored materials like sand or sawdust)
- a scale that will weigh up to 300g

SMALL demo kit (easy to carry in overall pocket)
Use 7 small self-closing plastic bags (for example, about 1 litre)

Using a permanent black marker first label the bags as shown below. Then, add the matching amount of ground coffee to each bag. The starting amount is arbitrary. One, two or three grams will work. Just be sure to double the amount for each time period.

		Amount of ground coffee for each bag (grams)
Time after milking colostrum		
Start:	00:00 (1st bag)	2
(20 mins.)	00:20	4
	00:40	8
(1 hour)	01:00	16
	01:20	32
	01:40	64
	02:00 (7th bag)	128

LARGE demo kit (big enough for group presentation)
Use 7 large self-closing plastic bags (for example, about 4 litres)

Using a permanent black marker first label the bags as shown below. Then, add the matching amount of ground coffee to each bag. The starting amount is arbitrary. Four, five or six grams will work. Just be sure to double the amount for each time period.

Time after milking colostrum		Amount of ground coffee for each bag (grams)
Start:	00:00 (1st bag)	4
(20 mins.)	00:20	8
	00:40	16
(1 hour)	01:00	32
	01:20	64
	01:40	128
	02:00 (7th bag)	256

Technical Notes about the demonstration:

- Assumes colostrum temperature in the range of 39º. As temperatures get closer to 16º the time for bacteria population to double increases roughly from 20 to 150 minutes.

- Assumes no additives such as a bactericidal solution (chlorine solution) or growth inhibitor (potassium sorbate).

- Does not take into account the lag phase. Bacteria will take some time to accommodate to the environmental conditions of the colostrum prior to multiplication. To be more accurate, the first 20 to 30 minutes would represent the lag phase during which little or no growth occurs. Then, during the next 20 minutes, the first doubling would occur.

- Implications for enteric health of selected coliform counts

  Less than 5,000 cfu/ml – low impact, minor scours problems in less than one-third of the calves.

5,000-20,000 cfu/ml – moderate scours problems in up to three-quarters of the calves, tend to last 7 to 10 days rather than only 2-4 days.

21,000-50,000 – occasional deaths at 3-5 days, usually severe scours between 7 and 21 days in nearly all the calves.

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51,000-250,000 – very severe scours problems, enterotoxemia starting to be a problem causing rapid onset of death, bloated calves in 2-6 day range, scours problems that just won't stop up to three weeks of age affecting nearly all calves, respiratory illness frequently a secondary infection.

Over one-quarter million – frequent mortality associated with enterotoxemia, nearly all the calves have severe scours, most of the calves require antibiotic treatment, many require IV or SQ fluids.

Technically, all coliforms are not equal when it comes to causing enteric problems. Evidence points at fecal coliforms as the worst problem. Especially lethal are the enterotoxigenic E. coli (ETEC). The implications above, therefore, have to be interpreted with some caution when other strains are identified.

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