Table 5. *Escherichia coli* (Biotype I) Distribution on Raw Beef Carcass Surface Samples

Range, cfu/cm^2	Number of Samples	Percent of Total	Cumulative Number	Cumulative Percent
<1 [1]	1,779	84.2	1,779	84.2
1 - 10	159	7.5	1,938	91.8
11 - 100	114	5.4	2,052	97.2
101 - 1,000	33	1.6	2,085	98.7
1,001 -10,000	15	0.7	2,100	99.4
10,001 - 100,000	8	0.4	2,108	99.8
100,001 - 1,000,000	4	0.2	2,112	100.0
TOTAL	2,112	100.0	-	-

[1] Negative by method.

Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows and Bulls (December 1993 - November 1994).

Table 6. *Clostridium perfringens* Distribution on Raw Beef Carcass Surface Samples

Range, cfu/cm^2	Number of Samples	Percent of Total	Cumulative Number	Cumulative Percent
<1 [1]	1,936	91.7	1,936	91.7
1 - 10	67	3.2	2,003	94.8
11 - 100	64	3.0	2,067	97.9
101 - 1,000	32	1.5	2,099	99.4
1,001 -10,000	10	0.5	2,109	99.9
10,001 - 100,000	3	0.1	2,112	100.0
TOTAL	2,112	100.0	-	-

[1] Negative by method.

Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows and Bulls (December 1993 - November 1994).

Table 7. *Staphylococcus aureus* Distribution on Raw Beef Carcass Surface Samples

Range, cfu/cm^2	Number of Samples	Percent of Total	Cumulative Number	Cumulative Percent
<1 [1]	1,934	91.6	1,934	91.6
1 - 10	91	4.3	2,025	95.9
11 - 100	62	2.9	2,087	98.8
101 - 1,000	22	1.0	2,109	99.9
1,001 -10,000	3	0.1	2,112	100.0
TOTAL	2,112	100.0	-	-

[1] Negative by method.

Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows and Bulls (December 1993 - November 1994).

Table 8. ***Listeria monocytogenes*** **Distribution on Enumerated Positive Raw Beef Carcass Surface Samples**

Range, MPN/cm^2	Number of Samples	Percent of Total	Cumulative Number	Cumulative Percent
<.03 [1]	122	52.8	122	52.8
0.03 - 0.30	69	29.9	191	82.7
0.301 - 3.0	28	12.1	219	94.8
3.01 - 30.0	11	4.8	230	99.6
>30.0 [2]	1	0.4	231	100.0
TOTAL	231	100.0	-	-

[1] Negative by quantitative MPN method.

[2] Maximum level detected =43.0 MPN/cm^2.

Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows and Bulls (December 1993 - November 1994).

Table 9. *Campylobacter jejuni/coli* Distribution on Enumerated Positive Raw Beef Carcass Surface Samples

Range, MPN/cm^2	Number of Samples	Percent of Total	Cumulative Number	Cumulative Percent
<.03 [1]	13	81.3	13	81.3
0.03 - 0.30 [2]	3	18.8	16	100.0
TOTAL	16	100.0	-	-

[1] Negative by quantitative MPN method.

[2] Maximum level detected = 0.23 MPN/cm^2

Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows and Bulls (December 1993 - November 1994).

Table 10. ***Salmonella*** **Distribution on Enumerated Positive Raw Beef Carcass Surface Samples**

Range (MPN/cm^2)	Number of Samples	Percent of Total	Cumulative Number	Cumulative Percent
<.03 [1]	32	60.4	32	60.4
0.030 - 0.30	16	30.2	48	90.6
0.301 - 3.0	1	1.9	49	92.5
3.01 - 30.0	3	5.7	52	98.1
>30.0 [2]	1	1.9	53	100.0
TOTAL	53	100.0	-	-

[1] Negative by quantitative MPN method.

[2] Maximum level detected = 240.0 MPN/cm^2

Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows and Bulls (December 1993 - November 1994).

Table 11: Number of Raw Beef Samples Containing One or More Species of Pathogenic Bacteria[1]

Number of Pathogens	Number of Samples	Cumulative Number of Samples	Cumulative Percent
0 [2]	1,538	1,538	72.8
1	484	2,022	95.7
2	82	2,104	99.6
3	8	2,112	100.0

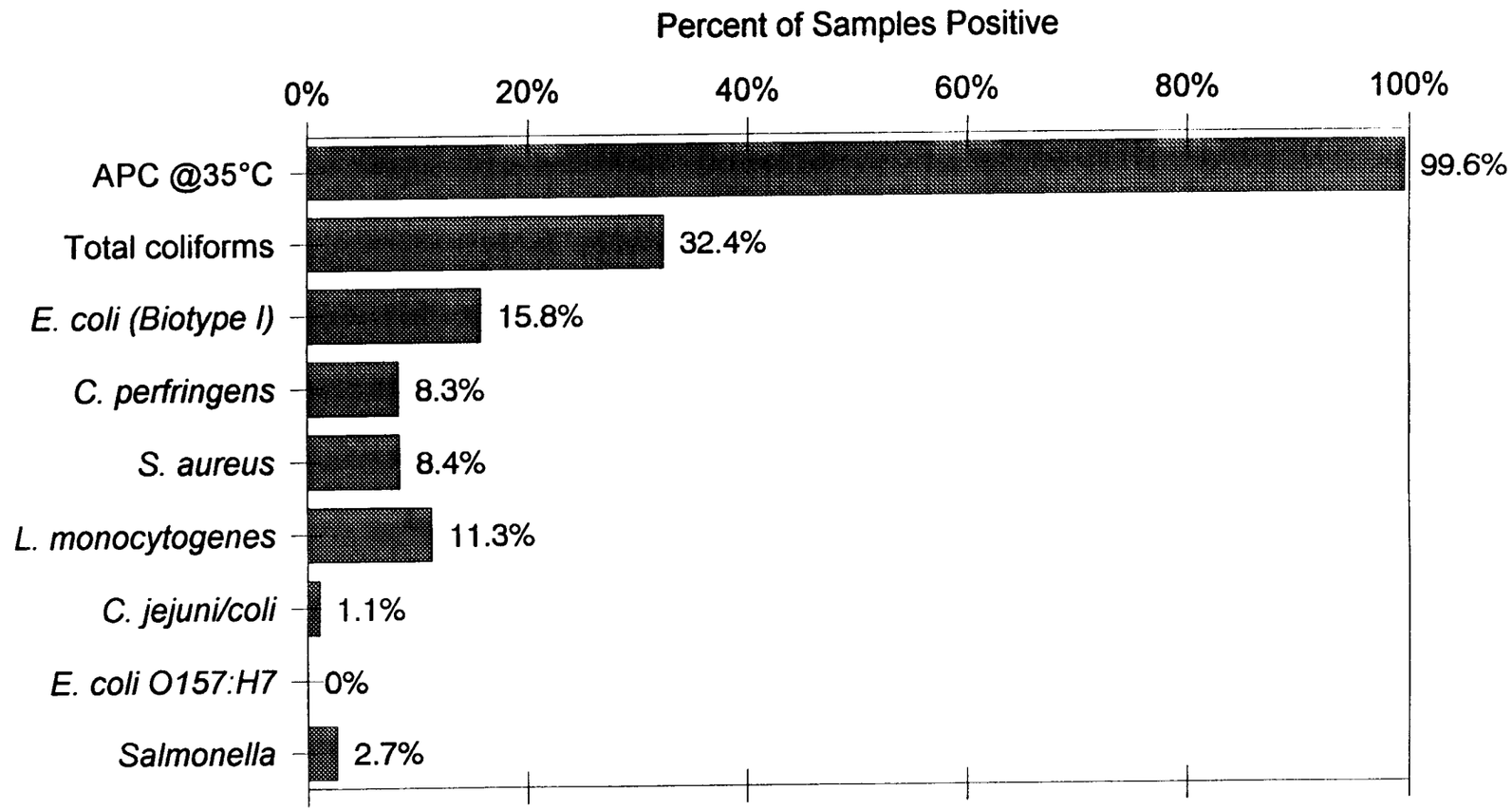
[1] *C. perfringens*, *S. aureus*, *L. monocytogenes*, *C. jejuni/coli*, *E. coli* O157:H7, *Salmonella* spp.

[2] Negative by method.

Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows and Bulls (December 1993 - November 1994).

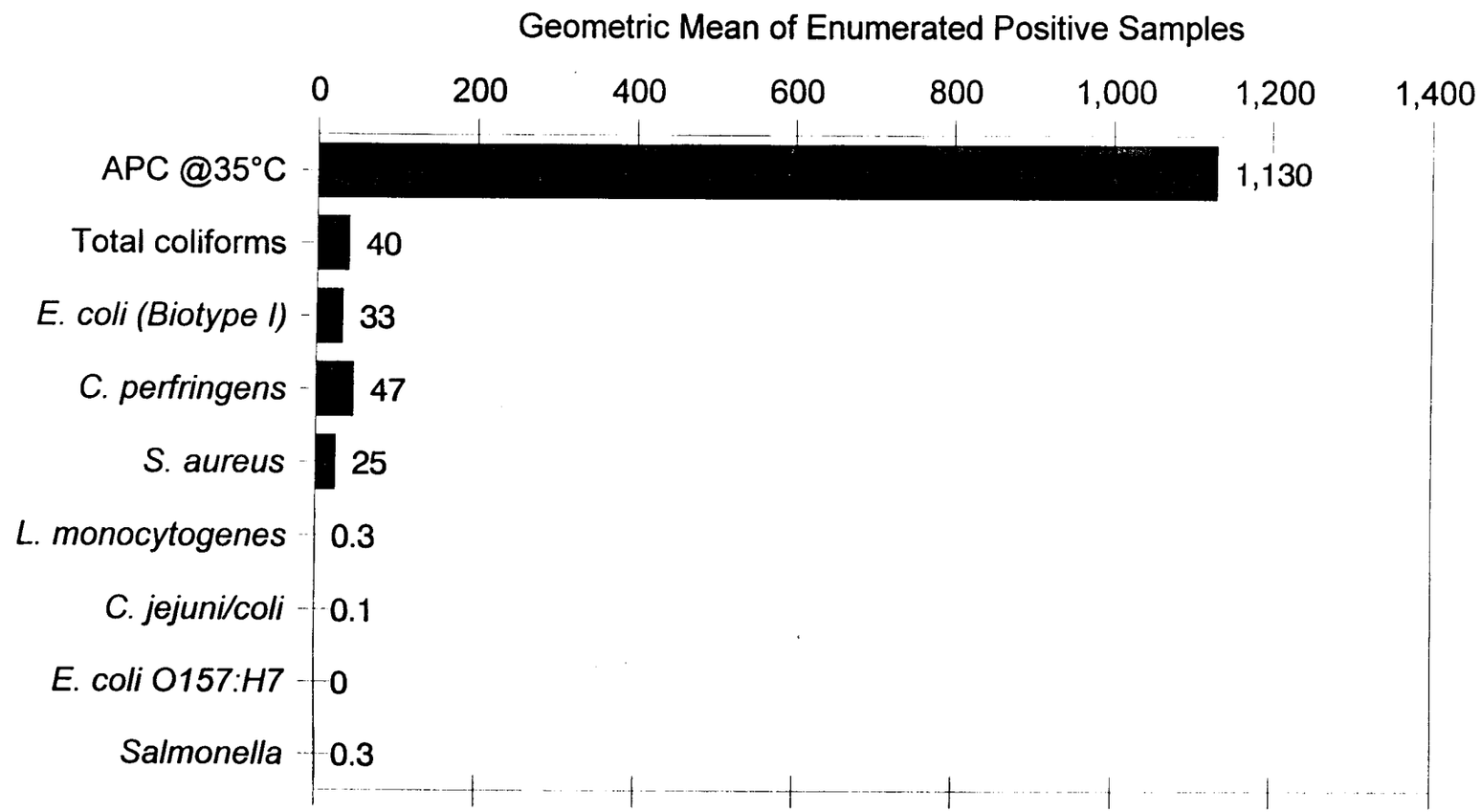
FIGURES

FIGURE 1. PREVALENCE OF SELECTED MICROORGANISMS ON RAW BEEF CARCASS SURFACE SAMPLES



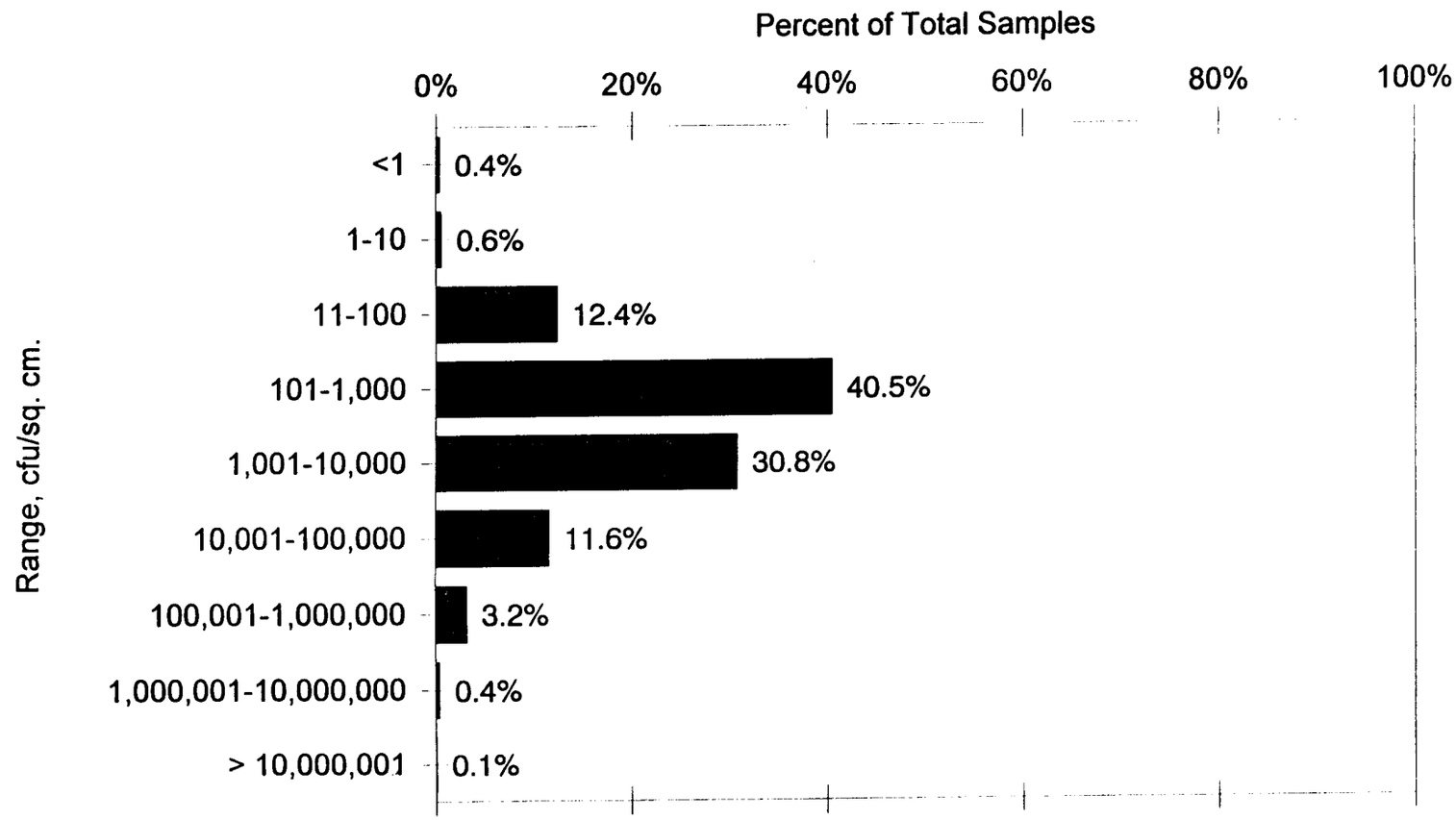
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993 - November 1994)

FIGURE 2. MEAN LEVEL OF SELECTED MICROORGANISMS PER SQUARE CENTIMETER ON RAW BEEF CARCASS SURFACE SAMPLES



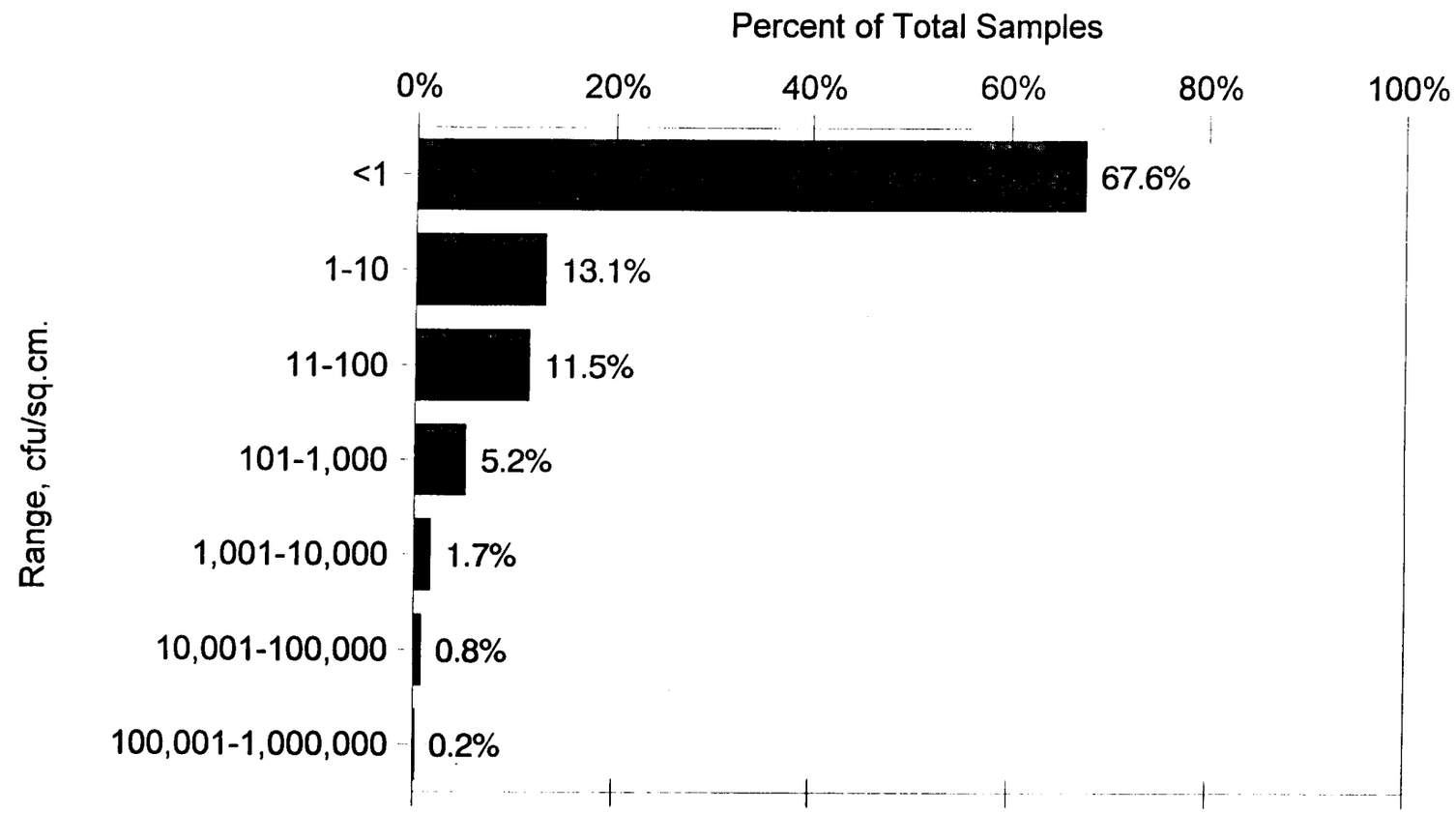
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 3. AEROBIC PLATE COUNT @35°C DISTRIBUTION ON RAW BEEF CARCASS SURFACE SAMPLES



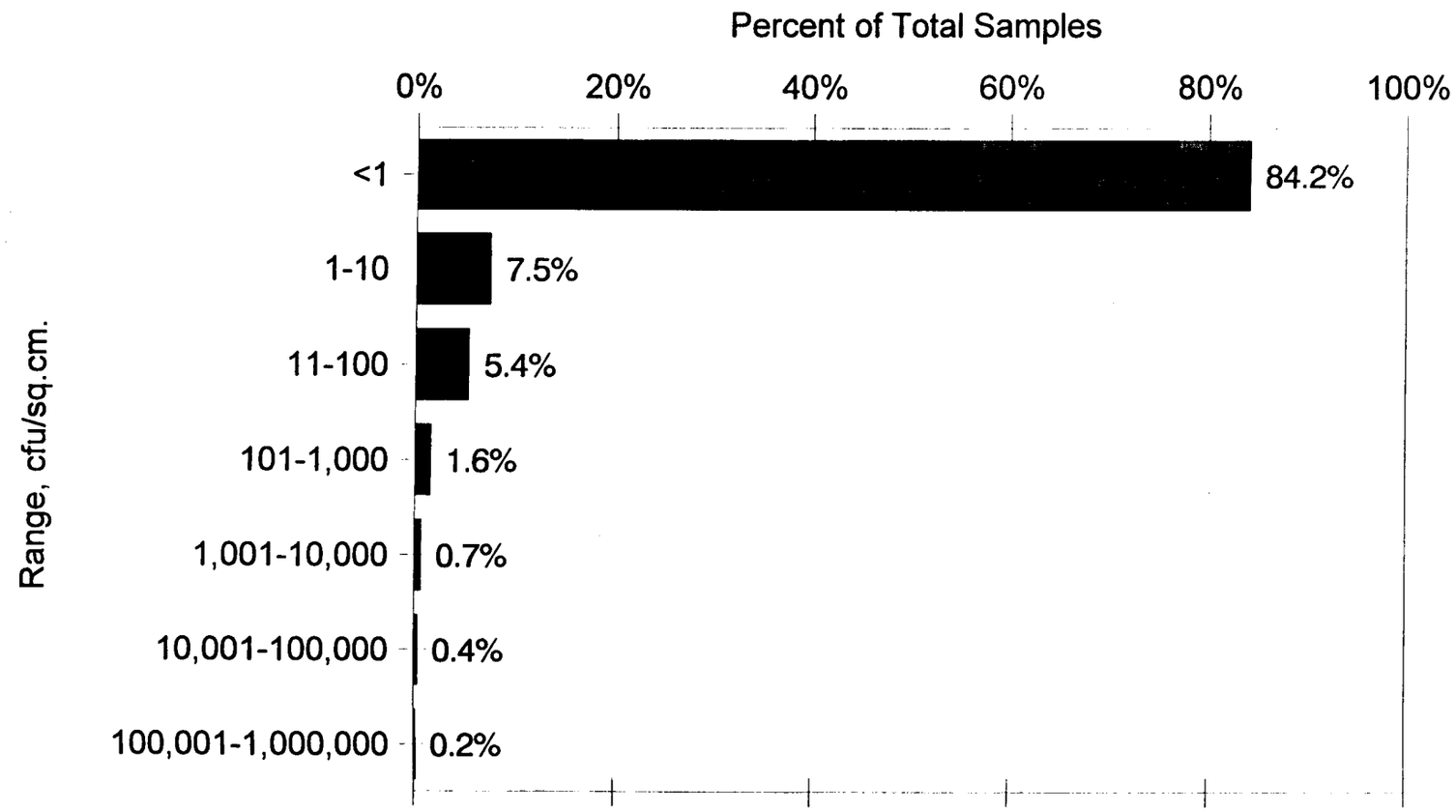
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 4. TOTAL COLIFORM DISTRIBUTION ON RAW BEEF CARCASS SURFACE SAMPLES



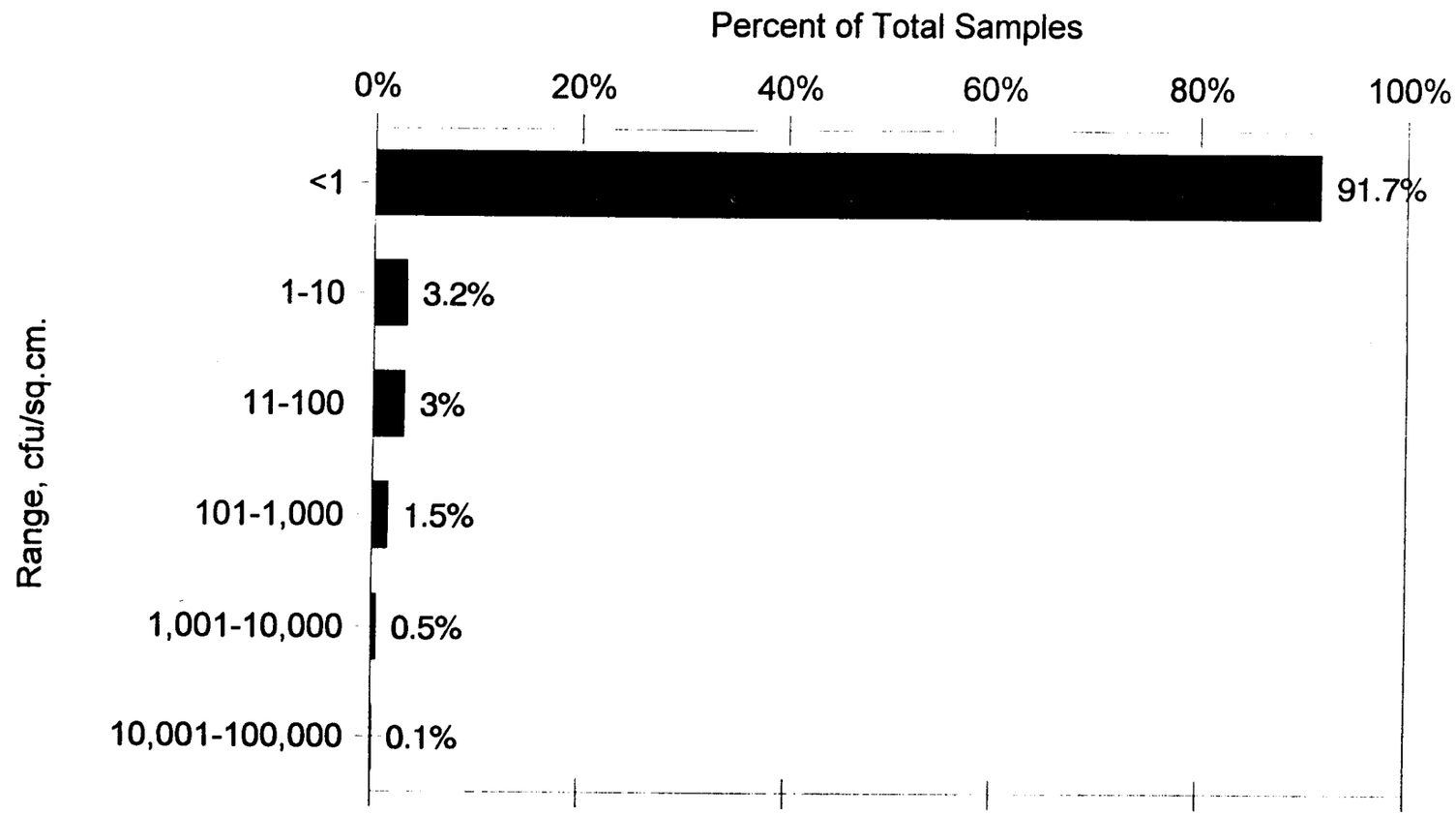
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 5. *ESCHERICHIA COLI* (BIOTYPE I) DISTRIBUTION ON RAW BEEF CARCASS SURFACE SAMPLES



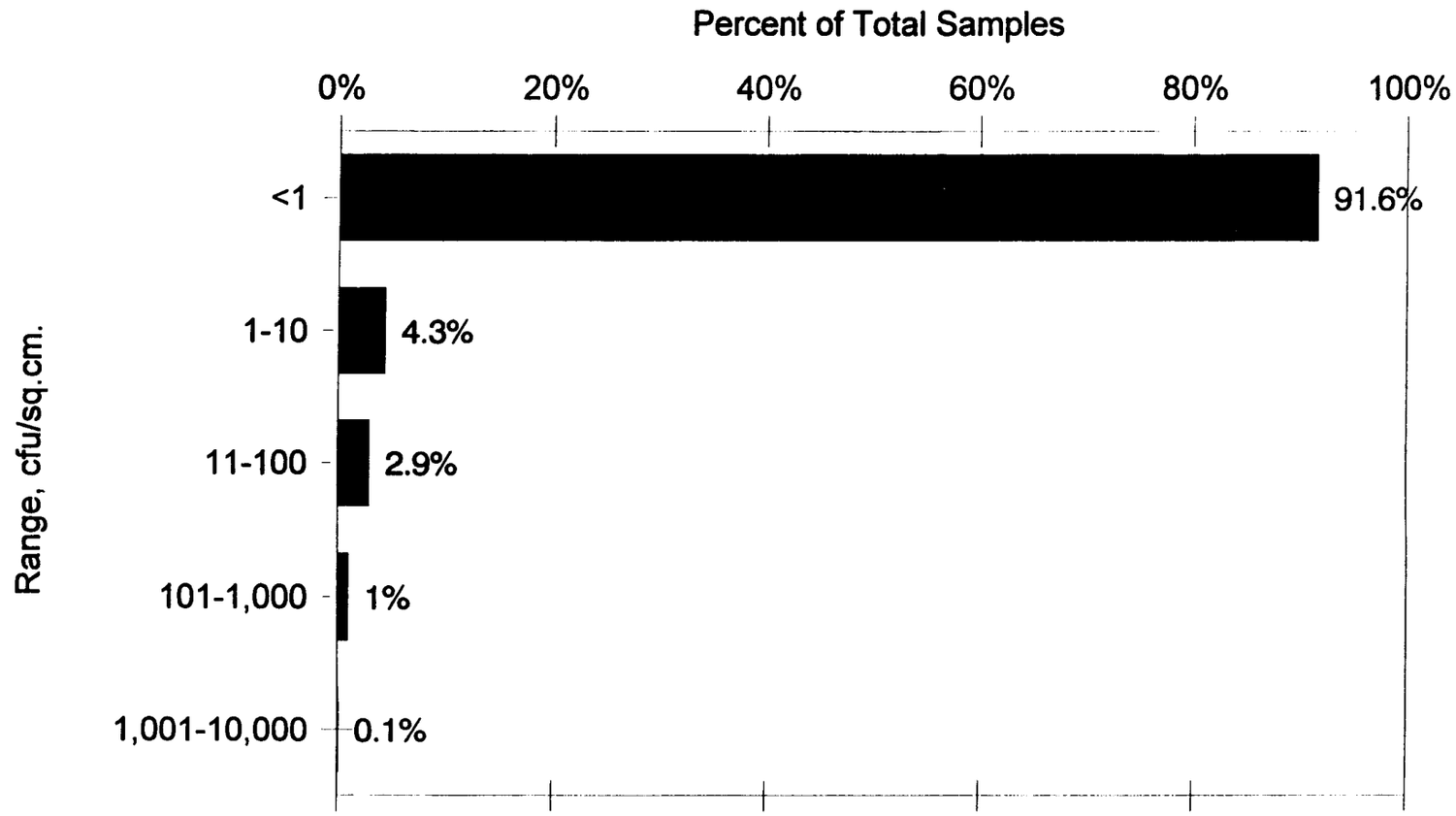
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 6. *CLOSTRIDIUM PERFRINGENS* DISTRIBUTION ON RAW BEEF CARCASS SURFACE SAMPLES



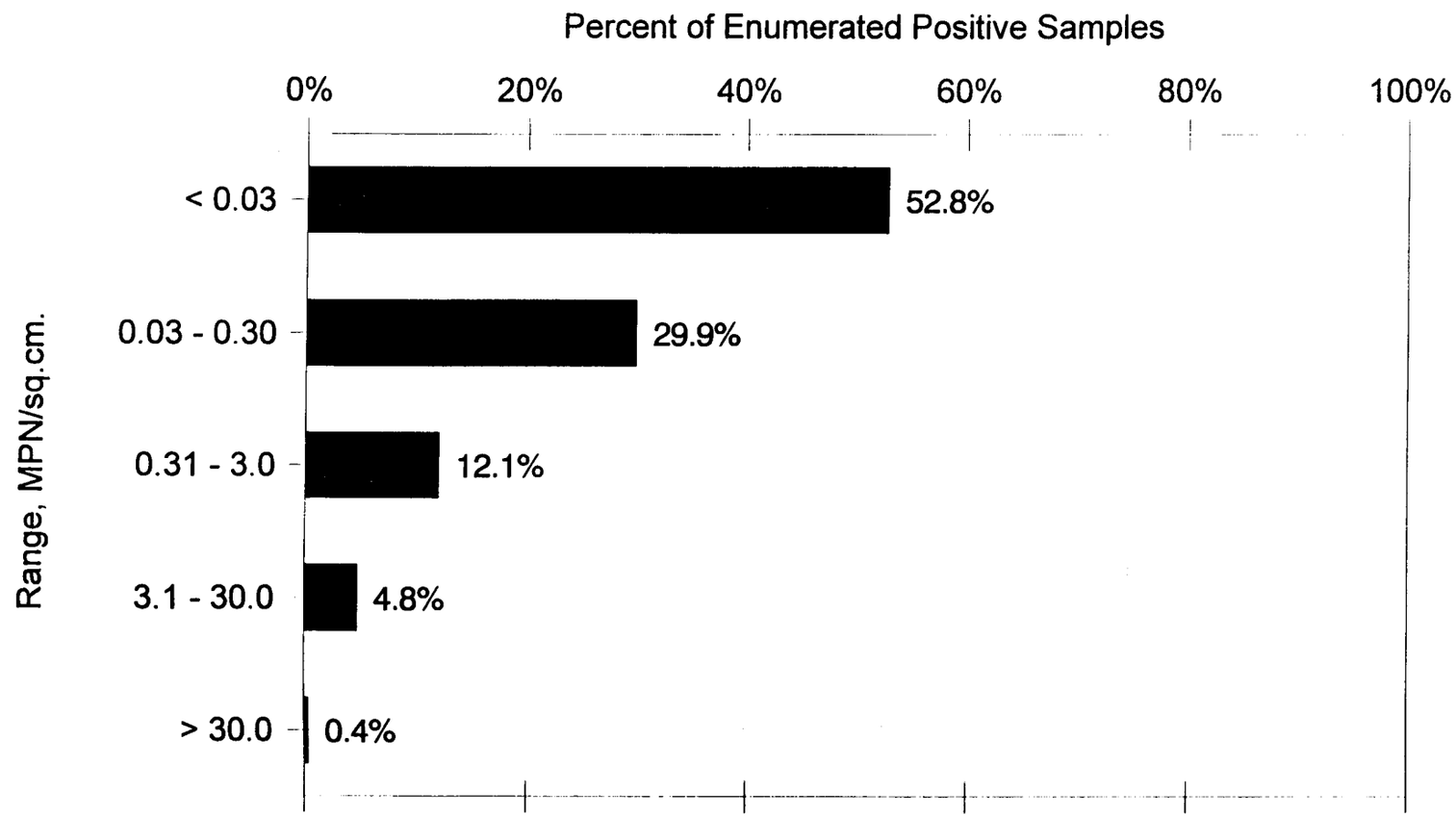
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 7. *STAPHYLOCOCCUS AUREUS* DISTRIBUTION ON RAW BEEF CARCASS SURFACE SAMPLES



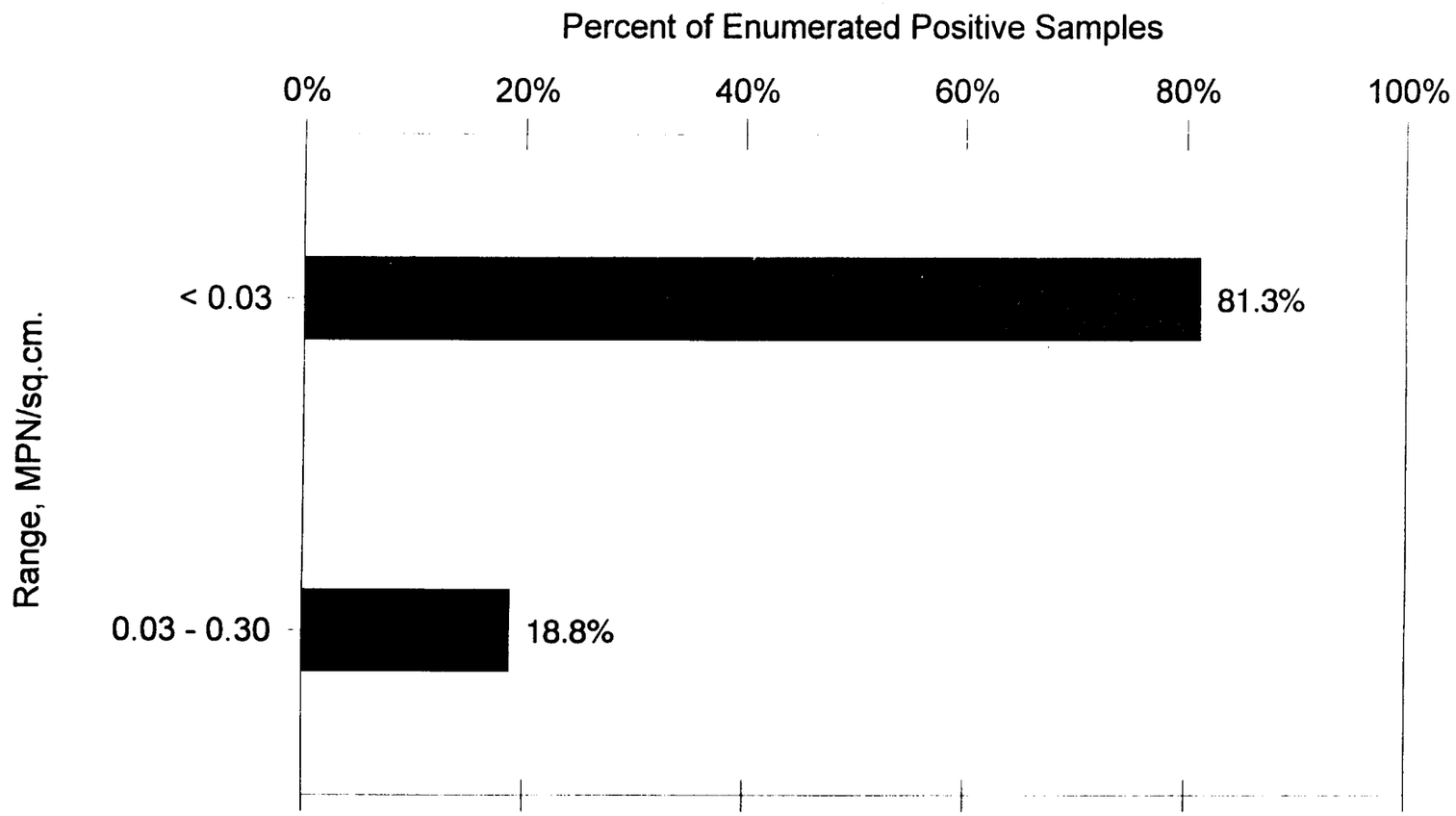
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 8. *LISTERIA MONOCYTOGENES* DISTRIBUTION ON ENUMERATED POSITIVE RAW BEEF CARCASS SURFACE SAMPLES



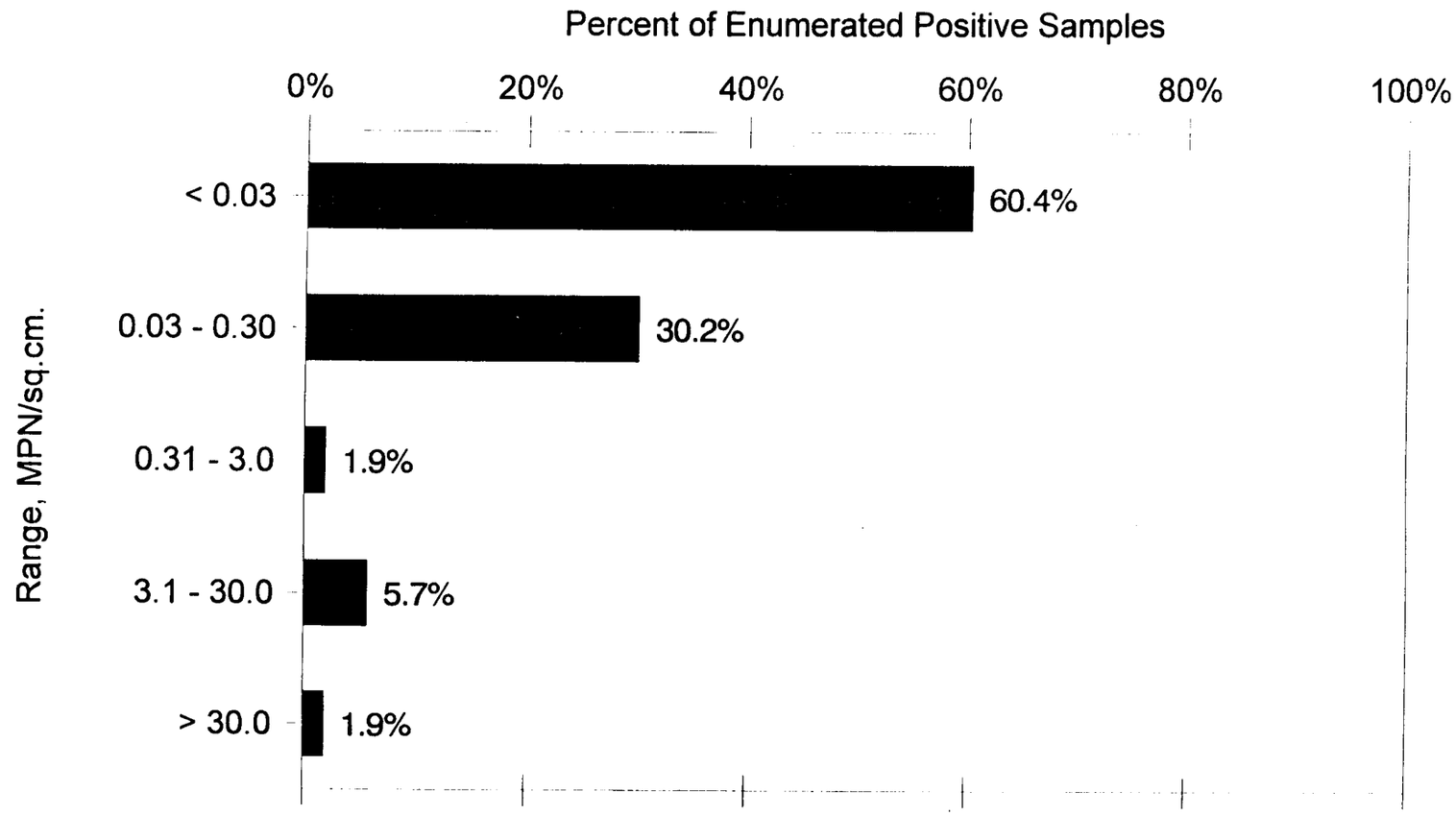
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 9. *CAMPYLOBACTER JEJUNI/COLI* DISTRIBUTION ON ENUMERATED POSITIVE RAW BEEF CARCASS SURFACE SAMPLES



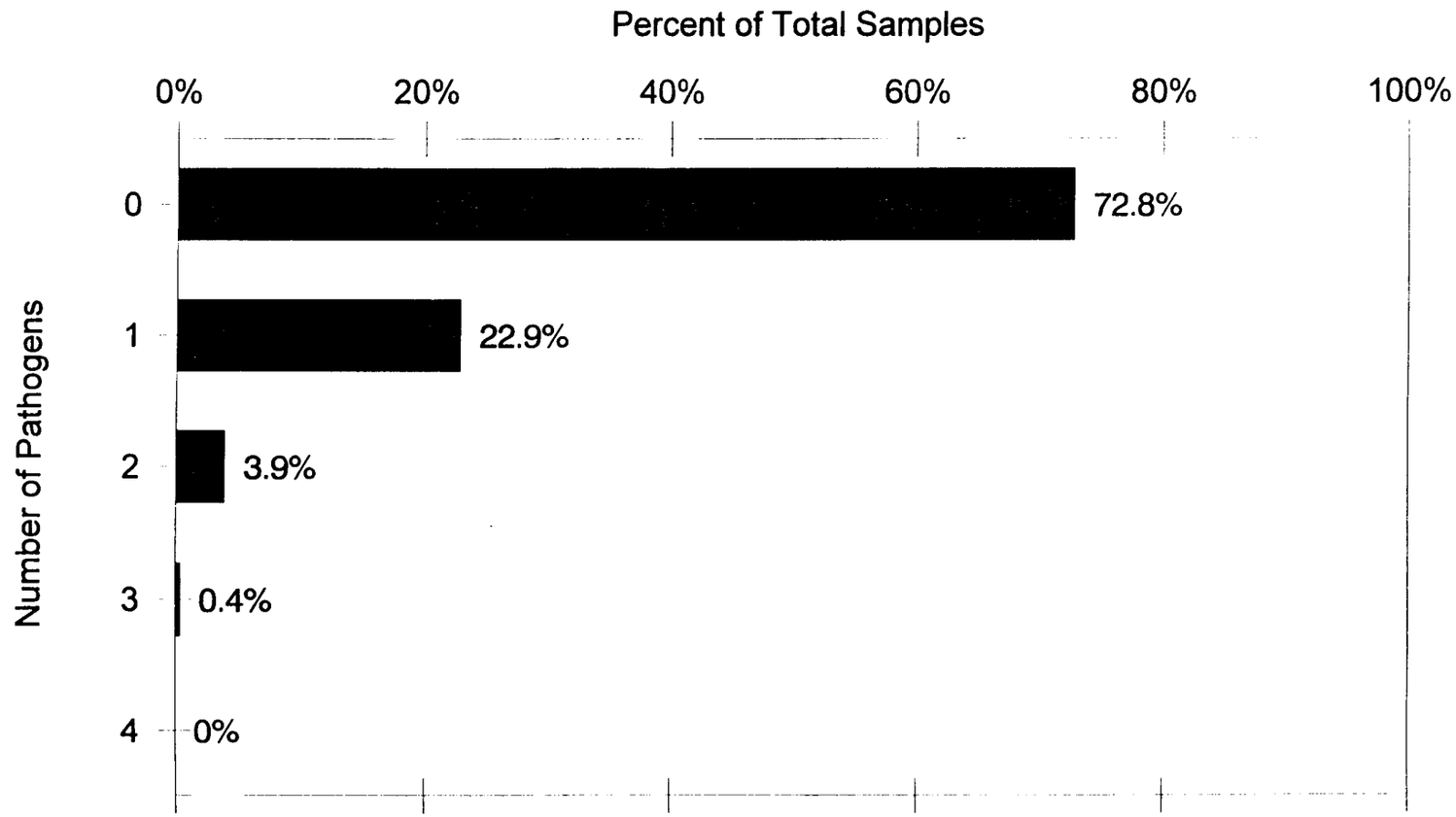
Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 10. *SALMONELLA* DISTRIBUTION ON ENUMERATED POSITIVE RAW BEEF CARCASS SURFACE SAMPLES



Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

FIGURE 11. PERCENT OF RAW BEEF SAMPLES CONTAINING ONE OR MORE SPECIES OF IDENTIFIED PATHOGENIC BACTERIA



Source: Nationwide Beef Microbiological Baseline Data Collection Program: Cows & Bulls (December 1993-November 1994)

REFERENCES

1. Subcommittee on Microbiological Criteria, Committee on Food Protection, Food and Nutrition Board, National Research Council. 1985. An Evaluation of the Role of Microbiological Criteria for Foods and Food Ingredients. National Academy Press, Washington, DC.

2. Food Safety and Inspection Service. 1994. Nationwide Beef Microbiological Data Collection Program: Steers and Heifers. U.S. Department of Agriculture, Washington, DC.

3. Ingram, M. and T. A. Roberts. 1976. The Microbiology of the Red Meat Carcass and the Slaughterhouse. Royal Society of Health Journal. *96*:270-276.

4. Charlebois, R., *et al.* 1991. Surface Contamination of Beef Carcasses by Fecal Coliforms. J. Food Protection. *54*:950-956.

5. Nortje, G. L. and R. T. Naude. 1981. Microbiology of Beef Carcass Surfaces. J. Food Protection. *44*:355-358.

6. Bean, N.H. and P.M. Griffin. 1990. Foodborne Disease Outbreaks in the United States, 1973-1987. J. Food Protection. *53*:804-817.