A Research Note

SOME OBSERVATIONS ON THE MICROFLORA OF DISPOSABLE PAPER HAND-WIPES[1]

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ABSTRACT

A total of 38 samples of disposable hand towels and napkins were analyzed for their microbial content. Total counts on 50% of the samples were <100 organisms per gram of towel, with the remaining counts ranging upward to 7,200 per gram. *Bacillus* species represented 90% of the flora; the remaining organisms were actinomycetes, clostridia, micrococci, molds, and diphtheroids. *Bacillcs cereus* was isolated from 5 samples.

The increasing use of disposable paper goods in the home and industry has raised the question of their expected microbial quality. Many consumers use these disposable paper goods as if they were sterile even though not so advertized. In particular, the wide-spread use of roll towels for wiping surfaces which come in contact with food, and the direct contact of foods with paper towels on which they are laid out to dry or drain, would seem to necessitate making this information available. Therefore a study was undertaken to determine the kinds and numbers of microorganisms present in paper towels and napkins.

Preliminary studies indicated that the predominant organisms found were sporeforming bacilli. No gram-negative organisms were isolated, *Clostridium perfringens* was not recovered, and only on rare occasions were other morphological types isolated. Therefore, the following procedure was adopted in setting up the samples reported in this study.

MATERIALS AND METHODS

Five grams of paper were blended in 245 ml of phosphate buffer *(1)* and four sets of duplicate plates were prepared with plate count agar using 1 ml of the 1:50 dilution per plate as inoculum. Two sets of plates were incubated at 32 C, one aerobically and the other anaerobically (Gas Pak-BBL). The other two sets were incubated at 45 C under the same conditions.

The plates were counted after 48 hr. When growth permitted, five colonies were picked from each incubation condition. When the colonies on the plate exceeded five, the number of colonies picked approximated the square root of the number of colonies on the plate. Colonies from the aerobic plates were transferred to Tryptic Soy Broth and those from the anaerobic plates into Thioglycollate Broth. Each available brand of paper towel was sampled twice, yielding 245 isolates from 38 samples. Samples were obtained from retail outlets in the Gainesville, Florida area and only samples with a protective overwrap were purchased for this study.

Standard microbiological techniques were employed in the identification of the organisms. The *Bacillus* species were identified following the scheme outlined in *Identification Methods for Microbiologists (3)* supplemented by descriptions from *Bergey's Manual of Determinative Bacteriology (2)*.

RESULTS AND DISCUSSION

The total counts were generally low (Table 1) with 50% of the samples having 100 organisms or less per gram. The highest count was 7,200 per gram. Clostridia were isolated from 5 samples and on further testing were found not to be *C. perfringens*. Miscellaneous organisms such as molds, diphtheroids, coagulase-negative micrococci, as well as actinomycetes were isolated from 16 samples, usually at low levels. The actinomycetes were found in all four samples representing two brands. In one brand the dye was water soluble and was extracted during the blending process. Napkins yielded low counts, as did the two samples of brown paper hand towels tested. Results between duplicate samples were generally consistent, either both low or both high. Of the 245 isolates, 220 (90%) were sporeforming bacilli, with 5 of the samples yielding *Bacillus cereus*.

Bacillus licheniformis was the most often isolated aerobic sporeforming organism, followed by *Bacillus brevis, Bacillus macerans, Bacillus circulans, Bacillus megaterium, B. cereus, Bacillus subtilis, Bacillus firmus, Bacillus pulvifaciens, and Bacillus polymyxa*, respectively.

It appears that the general microbial quality of these products is good. The assumption by consumers, however, that disposable hand towels are sterile is not correct, and a need for caution is indicated when these products are used in contact with foods.

REFERENCES

1. American Public Health Association. 1966. Recommended methods for the microbiological examination of foods. Amer. Public Health Ass., Inc., New York. p. 205.

[1]Fla. Agr. Exp. Station Journal Series No. 4032.

TABLE 1. DISTRIBUTION OF ORGANISMS ISOLATED FROM DISPOSABLE PAPER PRODUCTS

Sample	Brand	Counts (No./g)				*Bacillus* species (Percent of total isolates)										Misc. (Percent)	
		Aerobic 32 C	Aerobic 45 C	Anaerobic 32 C	Anaerobic 45 C	*cereus*	*macerans*	*circulans*	*megaterium*	*subtilis*	*polymyxa*	*licheni-formis*	*brevis*	*firmus*	*pulvifaciens*	(non-identifiable)	Clostridia	Mold, Diph., Actino., Micrococci
Brown towels	A	100	100	25	175		33					67						
		100	0	75	150							75		25				
Napkins	B	25	0	50	0							100						
		150	75	25	75			16				54		7		16		7
	C	0	0	0	0													
		0	0	0	0													
	D	25	25	0	0							50						50
		25	25	0	25								33			33		34
	E	25	0	0	25				100									
		0	0	0	0													
Roll towels	F	25	150	25	0							50	50					
		0	50	50	0								100					
	G	50	0	0	0													100
		0	100	0	0							25		75				
	H	25	0	0	0	100												
		50	25	300	0			20				20				40		20
	I	75	175	0	0				12.5	12.5		75						
		75	100	0	0							60						40
	J	700	1100	225	50					5	14	76						5
		850	2100	200	50		10					90						
	K	0	0	0	0													
		0	0	0	0													
	L	1350	25	150	25		27	36				9	9				19	
		675	0	125	25	12.5	25	50				12.5						
	M	4150	3000	450	450		27	23	8			4	12	4		15	4	3
		7200	3500	750	350	3	35	34	3	3						11	11	
	N	125	50	50	100		50					25					25	
		175	175	25	50	12.5				12.5						37.5	12.5	25
	O	0	25	0	0											100		
		0	0	25	0													100
	P	200	350	75	0		22					11	22		33			12
		250	275	0	25		12.5						37.5		25			25
	Q	100	50	0	0								75					25
		125	25	0	0								75			25		
	R	150	200	0	0				40			20						40
		100	225	0	25	17	33		33							17		
	S	0	25	0	0					100								
		0	0	50	0													100

2. Breed, R. S., E. G. D. Murray, and N. R. Smith. 1957. Bergey's manual of determinative bacteriology. 7th edition. Williams and Wilkins Co., Baltimore, Md. p. 1094.

3. Gibbs, B. M., and D. A. Shapton. 1968. Identification methods for microbiologists. Part B. Academic Press, New York. p. 212.