In the decontamination of hospital surfaces (floors) it is possible to obtain low counts when effective disinfectant detergents are used together with good housekeeping technics. The means for achieving these aims are examined and evaluated.

INVESTIGATIONS ON DECONTAMINATION OF HOSPITAL SURFACES BY THE USE OF DISINFECTANT-DETERGENTS

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In recent years the Committee on Microbial Contamination of Surfaces of the American Public Health Association and other organizations, such as the National Sanitation Foundation,[1] have been concerned with the problems of decontaminating exposed surfaces in the hospital environment. The present report, confined to the hospital floors, demonstrates that extremely low "floor counts" can be obtained when *both* good housekeeping procedures and effective disinfectant-detergents are employed concurrently. At the onset of this investigation it was obvious to us that several questions required clarification, and we endeavored to determine: (a) What constitutes a clean floor, (b) what properties are necessary in order to constitute an effective disinfectant-detergent for hospital floors, and (c) how can effective hospital housekeeping be achieved?

To answer the above questions, a protocol was devised which included both laboratory and in-use testing of cleaning compounds. From our initial results it became apparent that high "floor counts" were recovered immediately after cleaning and disinfecting in spite of the fact that these floors were cleaned and disinfected with licensed products whose labels carried acceptable Association of Official Agricultural Chemists (AOAC) Test Results.

While we have no quarrel with the AOAC test,[2] employed by the Department of Agriculture as a means of judging the germicidal activity of a product when granting a license or registration number, it must be understood that this test is only a means of determining minimal germicidal activity under standard laboratory conditions. Satisfying the requirements of the AOAC test is no assurance that the product will yield effective germicidal results when incorporated with the cleaning and disinfecting procedures of a hospital.

The AOAC test does not begin to, nor does it pretend to, simulate in-use conditions. It is a laboratory test which requires standard technics and standard materials. The value of this standardized test is that it enables qualified laboratory personnel to obtain reproducible or comparable results, regardless of geographic location. The data obtained from such a standardized procedure may be of little practical value due to: (a) the use of a limited number of test cultures to determine germicidal activity, and (b) the use of ster-

ile distilled water as a diluent of the test product.

Since tap water, not sterile distilled water, is employed to prepare the use-dilution of the disinfectant-detergent used to clean and disinfect floors, and the like, it is only logical that tap water be the diluent in the laboratory and in-use evaluations of these products. As was previously reported by Yanis-Litsky,[3-5] the killing power of the disinfectant-detergent or disinfectant may be adversely affected by the hardness and/or pH of the diluent tap water. Realizing that hardness and pH of tap water vary with geographical location and geological conditions, any evaluation of a product, to be of practical significance, should be made using the tap water of the locale. Because of this, it is imperative that each hospital perform laboratory and in-use evaluations of disinfectant-detergents employing the local tap water in order to rate the product under actual working conditions.

In an attempt to overcome and expand the limits of the AOAC procedure, Yanis-Litsky,[3,4] proposed a new test that employs a liquid inoculum of seven (or more) test cultures that are recent isolates from the hospital environment. These organisms are exposed for a period of five minutes to 5 ml of the use-dilution of the test product that was prepared with the local tap water. When the laboratory results indicate that the product has a broad spectrum killing power, in-use tests are performed which evaluate the product under actual working conditions. Such testing provides information as to whether the disinfectant-detergent properties of the product are affected by the protein content of the wet mophead, the bacteria, and/or the debris picked up by the mophead during the scrubbing process. The in-use testing also indicates the need for, and frequency of, changing mopheads and bucket solutions in order to obtain maximum cleaning and minimal floor counts. To evaluate the cleaning program of a hospital, three disinfectant-detergents were studied in conjunction with various technics of floor housekeeping that included: no dust removal before floor scrubbing; dust removal before scrubbing by (a) freshly machine-laundered dry dust mophead, (b) chemically treated disposable dust mophead, and (c) dry vacuuming; scrubbing with the (a) one-bucket/one-mop system, (b) two bucket/two-mop system, and (c) the wet-vacuum pick-up machine.

To illustrate the effect of bacteria and soil, picked up by the mop and bucket solution during the scrubbing procedure, on the killing power of a disinfectant-detergent, a study was initiated: (a) to determine the bacterial count of the bucket solution at various stages of the cleaning and disinfecting process, and (b) to determine the killing power of the bucket solution at various stages of the cleaning and disinfecting process.

A one-bucket/one-mop system was employed using five gallons of the label recommended use-dilution of each of the three test products to scrub three patient rooms. The three test products were "phenolics": Product A was an experimental formulation, while Products B and C are on the market and used routinely in hospital housekeeping procedures.

A total of five samples of each bucket solution were collected: (1) before immersing the sterile wet mophead, (2) after immersing the sterile wet mophead, (3) after scrubbing the first room, (4) after scrubbing the second room, and (5) after scrubbing the third room. These samples were collected with a sterile 50 ml syringe and transferred into sterile 100 ml bottles. Colony counts and the killing power of the bucket solution samples were determined in the laboratory. The colony count determinations results are tabulated in Table 1. While a low bacterial count was obtained

Table 1—Bacterial counts of bucket solutions of disinfectant-detergents prepared with tap water

Before scrubbing with sterile cotton mop						After scrubbing with sterile cotton mop								
Before immersing mop			After immersing mop			After scrubbing first room			After scrubbing second room			After scrubbing third room		
Product-results (colonies/ml)			Product-results (colonies/ml)			Product-results (colonies/ml)			Product-results (colonies/ml)			Product-results (colonies/ml)		
A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
0	0	0	0	0	0	0	0	250	0	4	300	4	8	490

0=No colonies grew.

after scrubbing three patient rooms with Products A and B, a relatively high bacterial count was observed with Product C after scrubbing only one room.

Table 2 summarizes the results of the killing power of these solutions against seven test cultures that were isolated from the hospital environment. It is of interest to note that immediately after diluting and prior to immersing the sterile wet mophead, Product C killed only one of the seven test strains and that it lost this killing power after scrubbing the second room. Products A and B, on the other hand, demonstrated sustained germicidal activity after scrubbing the three prescribed rooms.

When the test products were diluted with sterile distilled water, Product C demonstrated germicidal activity against

Table 2—The germicidal activity of disinfectant-detergent bucket solutions prepared with tap water and evaluated by the Litsky killing power test

	Sample of porter-prepared bucket solution obtained														
	Before immersing mop			After immersing mop			After scrubbing first room			After scrubbing second room			After scrubbing third room		
	Product-results			Product-results			Product-results			Product-results			Product-results		
Test organism	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Staphylococcus aureus	−	−	−	−	−	−	−	−	−	−	−	+	−	−	+
Escherichia coli	−	−	+	−	−	+	−	−	+	−	−	+	−	−	+
Klebsiella pneumoniae	−	−	+	−	−	+	−	−	+	−	−	+	−	−	+
Proteus vulgaris	−	−	+	−	−	+	−	−	+	−	−	+	−	−	+
Pseudomonas aeruginosa	−	−	+	−	−	+	−	−	+	−	−	+	−	−	+
Pseudomonas ephemerocyanea	−	−	+	−	−	+	−	−	+	−	−	+	−	−	+
Pseudomonas syncyanea	−	−	+	−	−	+	−	−	+	−	−	+	−	−	+

−=No growth of test culture.
+=Growth of test culture.

Proteus vulgaris which was lost in the presence of the tap water diluent. Products A and B showed no variation.

Each step in the cleaning and disinfecting of floors was evaluated bacteriologically. This phase of the study was initiated by evaluating the dust removal processes in the cleaning and disinfecting of floors. The first experiment attempted to ascertain the need for dust removal in the cleaning process by omitting any dust removal before scrubbing the floor with a one-bucket/one sterile cotton wet mop system. Colony counts of the floor, before and after scrubbing, were obtained by use of the Rodac plate technic. Fifteen lecithin agar plates were employed for each floor count. The porter prepared and used five gallons of the label recommended use-dilution of the test disinfectant-detergent to scrub three patient rooms. The results of these experiments are summarized in Table 3 and the products could be ranked A, B, and C in the order of performance. Without dust removal before scrubbing, the two effective disinfectant-detergents (A and B) reduced the floor counts between 67 per cent and 51 per cent, while Product C reduced the counts between 29 per cent and 6 per cent.

In studying various means of dust removal, two types of dust mops were employed: a freshly machine-laundered dry dust mop was used for three rooms and a fresh chemically treated disposable dust mop was used for each room. Following dust removal, three patient rooms were scrubbed with one bucket containing five gallons of a test solution and one sterile cotton wet mop. Floor counts were obtained by use of Rodac plates, before dust removal, after dust removal, and after scrubbing.

Table 4 summarizes the results when a freshly laundered dry dust mop was employed. Dust removal in the first rooms resulted in an average reduction of 55 per cent, 50 per cent in the second rooms, and 47 per cent in the third rooms. Scrubbing with Product A reduced the counts, after dust removal, in the three rooms with an average of 96, 93, and 93 per cent respectively. The per cent reduction after dust removal and scrubbing with Product A was 98, 97, and 96 per cent for the first, second, and third rooms respectively. Scrubbing with Product B reduced the counts, after

Table 3—Results of in-use testing employing one bucket* for cleaning and disinfecting three rooms—no dust removal before scrubbing with a sterile cotton mop

Product	Order of cleaning	Average floor count before cleaning	Average floor count after scrubbing	% reduction after scrubbing
A	first	113	37	67
(3 oz/5 gal)	second	140	55	61
	third	91	43	53
B	first	133	45	66
(1¼ oz/gal)	second	109	44	60
	third	138	68	51
C	first	195	139	29
(2 oz/gal)	second	162	130	20
	third	107	101	6

* 5 gallons of disinfectant-detergent (Product).

Table 4—Results of in-use testing employing one bucket* for cleaning and disinfecting three patient rooms—dust removal was accomplished by a freshly machine-laundered dry dust mop before scrubbing with a sterile cotton mop

Product	Order of cleaning	Average floor count before cleaning	Average floor count after dust removal	% reduction by dust removal	Average floor count after scrubbing	% reduction after scrubbing	% reduction after dust removal and scrubbing
A	first	160	71	56	3	96	98
(3 oz/5 gal)	second	+350†	146	58	10	93	97
	third	325	206	37	14	93	96
B	first	150	68	55	7	90	95
(1¼ oz/gal)	second	160	88	45	10	89	94
	third	200	125	38	11	91	95
C	first	150	68	55	60	12	60
(2 oz/gal)	second	225	122	46	102	16	55
	third	160	98	39	90	8	44

* 5 gallons of disinfectant-detergent (Product).
† +350 means too many colonies to count on a Rodac plate.

dust removal, 90, 89, and 91 per cent in the first, second, and third rooms respectively. The per cent reduction after dust removal and scrubbing with Product B was 95, 94, and 95 per cent for the first, second, and third rooms respectively. Scrubbing with Product C reduced the counts, after dust removal, 12, 16, and 8 per cent for the first, second, and third rooms respectively. The per cent reduction after dust removal and scrubbing with Product C was 60, 55, and 44 per cent for the three rooms.

Table 5 indicates the results obtained when a chemically treated disposable dust mop was used for dust removal in one room. The floor counts were reduced on the average of 86 per cent. Scrubbing followed, using one bucket containing five gallons of disinfectant-

Table 5—Results of in-use testing employing one bucket* for cleaning and disinfecting three patient rooms—dust removal by a fresh chemically-treated disposable dust mop for each of the three rooms before scrubbing with a sterile cotton mop

Product	Order of cleaning	Average floor count before cleaning	Average floor count after dust removal	% reduction by dust removal	Average floor count after scrubbing	% reduction after scrubbing	% reduction after dust removal and scrubbing
A	first	331	32	90	1	97	99.7
(3 oz/5 gal)	second	148	18	88	1	94	99.3
	third	101	20	80	2	90	98
B	first	189	20	89	1	95	99.5
(1¼ oz/gal)	second	120	22	82	2	91	98
	third	200	20	90	3	85	99
C	first	340	60	82	40	33	82
(2 oz/gal)	second	+350†	34	90	30	12	91
	third	302	59	81	50	15	83

* 5 gallons of disinfectant-detergent (Product).
† +350 means too many colonies to count on a Rodac plate.

detergent and a sterile cotton wet mop for three rooms. Scrubbing with Product A reduced the counts, after dust removal, 97, 94, and 90 per cent in the first, second, and third rooms respectively. The per cent reduction after dust removal and scrubbing with Product A was 99.7, 99.3, and 98 per cent respectively. Scrubbing with Product B reduced the counts, after dust removal, 95, 91, and 85 per cent in the first, second, and third rooms respectively. The per cent reduction after dust removal and scrubbing with Product B was 99.5, 98, and 99 per cent respectively. Scrubbing with Product C reduced the counts, after dust removal, 33, 12, and 15 per cent in the first, second, and third rooms respectively. The per cent reduction after dust removal and scrubbing with Product C was 82, 91, and 83 per cent respectively.

A wet-vacuum pick-up machine, used dry, was also evaluated as a means of dust removal prior to floor scrubbing with one sterile cotton wet mop and a bucket containing five gallons of disinfectant-detergent used for three rooms. The results are recorded in Table 6. Floor counts were reduced on the average of 88 per cent by the "dry vacuum" dust removal process. Scrubbing with Product A reduced the counts, after dust removal, 100, 94, and 88 per cent for the first, second, and third rooms respectively. The per cent reduction after dust removal and scrubbing with Product A was 100, 99.7, and 98.8 per cent respectively. Scrubbing with Product B reduced the counts, after dust removal, 94, 100, and 95 per cent for the first, second, and third rooms respectively. The per cent reduction after dust removal and scrubbing with Product B was 99.1, 100, and 99.2 per cent respectively. Scrubbing with Product C reduced the counts, after dust removal, 29, 25, and 14 per cent for the first, second, and third rooms respectively. The per cent reduction after dust removal and scrubbing with Product C was 93, 93, and 84 per cent respectively.

Thus far, in this study, the one-bucket/one-mop system was employed for scrubbing while various dust removal technics were varied for evaluation. At this point the scrubbing technics were varied and the two-bucket/two-mophead system was evaluated. Each bucket contained six gallons of the label recommended use-dilution of the test disin-

Table 6—Results of in-use testing employing one bucket* for cleaning and disinfecting three patient rooms—dust removal was accomplished by a wet-vacuum pick-up machine used dry before scrubbing with a sterile cotton mop

Product	Order of cleaning	Average floor count before cleaning	Average floor count after dust removal	% reduction by dust removal	Average floor count after scrubbing	% reduction after scrubbing	% reduction after dust removal and scrubbing
A	first	102	14	86	0	100	100
(3 oz/5 gal)	second	323	17	95	1	94	99.7
	third	85	8	91	1	88	98.8
B	first	115	18	84	1	94	99.1
(1¼ oz/gal)	second	113	8	93	0	100	100
	third	121	19	84	1	95	99.2
C	first	146	14	90	10	29	93
(2 oz/gal)	second	120	12	90	9	25	93
	third	115	21	82	18	14	84

* 5 gallons of disinfectant-detergent (Product).

Table 7—Results of in-use testing employing the two bucket*-two rayon nonsterile freshly machine-laundered wet mop system for scrubbing five patient rooms

Product	Order of cleaning	Average floor count before cleaning	Average floor count after dust removal (using a disposable dust mop)	% reduction by dust removal	Average floor count after scrubbing	% reduction after scrubbing	% reduction after dust removal and scrubbing
A	first	149	14	91	1	93	99.3
(3 oz/5 gal)	second	102	20	80	2	90	98
	third	85	20	77	2	90	98
	fourth	201	21	95	10	52	95
	fifth	161	29	82	16	45	90
B	first	187	18	90	1	94	99.5
(1¼ oz/gal)	second	251	45	82	4	91	98
	third	201	38	81	8	79	96
	fourth	194	38	80	16	58	92
	fifth	147	31	75	20	46	86
C	first	101	19	81	12	37	88
(2 oz/gal)	second	98	15	85	12	20	87
	third	85	10	88	10	0	88
	fourth	102	21	79	38	increased	64
	fifth	80	10	88	60	increased	25

* 6 gallons of disinfectant-detergent (Product) was used in each bucket.

fectant-detergent. Five patient rooms were scrubbed using the two buckets and two freshly machine-laundered nonsterile rayon mops. The first bucket had a red marking and contained mop number one; the second bucket had a blue marking and contained mop number two. The red bucket was employed as an initial floor scrub and the blue was used for the second scrub. This regimen was carried out for cleaning and disinfecting five rooms. The mopheads were not interchanged nor was the order of using the buckets. The heavy soil was picked up by mop number one and placed into the red bucket. A chemically treated disposable dust mop was used in each room before scrubbing. Rodac plate impressions were made and bucket samples were obtained at various stages of the floor cleaning and disinfecting process for colony counts and killing power determinations.

Table 7 indicates that the floor counts were reduced by use of a fresh chemically treated disposable dust mop on the average of 84 per cent. Scrubbing with Product A reduced the counts, after dust removal, 93, 90, 90, 52, and 45 per cent for rooms one to five respectively. The per cent reduction after dust removal and scrubbing with Product A was 99.3, 98, 98, 95, and 90 per cent respectively. Scrubbing with Product B reduced the counts, after dust removal, 94, 91, 79, 58, and 46 per cent for rooms one to five respectively. The per cent reduction after dust removal and scrubbing with Product B was 99.5, 98, 96, 92, and 86 per cent respectively. Scrubbing with Product C reduced the counts, after dust removal, 37, 20, and 0 per cent for rooms one, two, and three, while rooms four and five actually showed an increase in the floor counts. The per cent reduction after dust removal and scrubbing with Product C was 88, 88, 88, 64, and 25 per cent respectively.

Table 8—Bacterial counts of the solutions of disinfectant-detergents prepared with tap water and used in the two-bucket system

Product in bucket	Bacterial colonies per ml of porter-prepared bucket solution — Samples of bucket solution obtained													
	Before mop immersion		After mop immersion		After mopping first room		After mopping second room		After mopping third room		After mopping fourth room		After mopping fifth room	
	Red	Blue	Red	Blue	Red	Blue	Red	Blue	Red	Blue	Red	Blue	Red	Blue
A (3 oz/ 5 gal)	0	0	0	0	0	0	0	0	0	0	2	0	2	2
B (1¼ oz/ gal)	0	0	0	0	0	0	0	0	0	0	0	0	2	1
C (2 oz/ gal)	0	0	8	7	200	250	360	390	503	599	2,001	3,012	3,500	10,000

0=No colonies grew.

Table 8 summarizes the bacterial counts of the bucket solution collected at various stages of the cleaning and disinfecting process using the two-bucket/ two-mop system. Noting that the counts of Product C increased greatly after scrubbing the first room, it is conceivable that subsequent rooms were actually contaminated by this so-called "disinfectant-detergent."

Because of the limited effectiveness of the dry and wet mops, a study was conducted to evaluate the efficiency of a wet-vacuum pick-up machine when used dry for dust removal and wet for "scrubbing" (actually a flooding process). Table 9 summarizes the results obtained employing a wet-vacuum pick-up machine for the "scrubbing" process after it was used for dry dust removal. The reduction in floor counts using the dry vacuum process averaged 87 per

Table 9—Results of in-use testing employing the wet-vacuum pick-up machine both dry for dust removal and wet for "scrubbing"

Product	Room No.	Average floor count before cleaning	Average floor count after dust removal	% reduction by dust removal	Average floor count after scrubbing	% reduction after scrubbing	% reduction after dust removal and scrubbing
A (3 oz/5 gal)	353 Pat. Rm.*	190	20	89	0	100	100
	OR#5†	16	2	88	0	100	100
B (1½ oz/gal)	357 Pat. Rm.*	101	12	88	0	100	100
	OR#2†	13	2	85	0	100	100
C (2 oz/gal)	561 Pat. Rm.*	200	27	87	16	41	92
	OR#3†	15	2	87	11	increased	27

* 1 gallon of disinfectant-detergent (Product) was used from a sprinkling can to flood the floor of a patient room.
† 2 gallons of disinfectant-detergent (Product) were used from a sprinkling can to flood the Operating Room floor.

cent. Using the wet-vacuum pick-up machine for the "scrubbing," after dust removal, and Product A or Product B, separately, counts were reduced on the average of 100 per cent. Using Product C for "scrubbing," after dust removal, the counts in the patient room were reduced 41 per cent, while the counts in the Operating Room were increased more than fivefold. The per cent reduction after dust removal and "scrubbing" with Product C was 92 per cent in the patient room and 27 per cent in the Operating Room.

Conclusion

The data presented in Table 1 demonstrate that a bucket containing the use-dilution of an effective disinfectant-detergent, such as Product A or B, will not permit the bacteria, picked up by the mop during the cleaning process, to remain alive as does an ineffective disinfectant-detergent, such as Product C.

Table 2 illustrates the broad-spectrum killing power of effective disinfectant-detergents, Products A and B, which have been diluted with the tap water of the particular hospital. Such a laboratory test is an indication as to how the product will perform under in-use conditions. Product C performed very poorly under these test conditions.

Table 3 demonstrates the need for dust removal before scrubbing in order to obtain low floor counts. The use of a dry dust mop, even though freshly machine laundered, is the least effective method of dust removal evaluated in this study as shown in Table 4.

Table 5 demonstrates that the use of a chemically treated disposable dust mop is a highly effective dust removal technic. Tables 5, 6, 7, and 9 illustrate the value of effective dust removal in the cleaning and disinfecting of floors. As noted in these tables, the floor counts were not appreciably lowered when scrubbed with Product C, an ineffective disinfectant-detergent. However, it was found that the final counts, after both dust removal and scrubbing, were reduced markedly which indicates the role of effective dust removal.

Table 6 demonstrates that the wet-vacuum pick-up machine, used dry, is a superior technic for dust removal and should be the method employed in such areas as the Operating Room, Delivery Room, and Nursery.

Table 7 demonstrates that employing the two-bucket/two-mop system (non-sterile freshly machine-laundered rayon wet mopheads), after effective dust removal, effective cleaning and disinfecting of at least four average size patient rooms can be accomplished.

Table 8 demonstrates that the germicidal activity of a disinfectant-detergent bucket solution is most important in controlling the spread of bacteria from one room to another. These data demonstrate that Products A and B were most effective in destroying the bacterial flora picked up by the mop. On the other hand, Product C, having little or no germicidal activity, allowed these bacteria to remain viable in the bucket solution. It is also observed that the population of the solution built up by continued use to the extent that the bucket solution was adding to the bacterial population of the floor it was supposedly cleaning.

Table 9 demonstrates that the most effective means of cleaning and disinfecting floors is by use of the wet-vacuum pick-up machine, used both wet and dry, and is the method of choice for the Operating Room, Delivery Room, and Nursery. However, the disinfectant-detergent used with this method must be effective.

The floor counts ranged from 0-10 colonies per Rodac plate when effective dust removal was accomplished, followed by the one-bucket/one sterile cotton wet mophead system containing five gallons of the use-dilution of an effective disinfectant-detergent and used to scrub three

rooms. The counts ranged from 1 to 16 colonies per Rodac plate when effective dust removal was accomplished, and followed by scrubbing using six gallons of the use-dilution of an effective disinfectant-detergent in each of the two-bucket/two freshly laundered nonsterile rayon mophead system which was used to scrub five rooms. The counts averaged 0 colonies per Rodac plate when the wet-vacuum pick-up machine was used both wet and dry.

The use of the one-bucket/one-mop system for scrubbing three rooms yielded acceptable counts in this study when dust removal was effective and an effective disinfectant-detergent was used. The two-bucket/two-mop system, designed for scrubbing five rooms, did not give an acceptable count on the floor of the fifth room in this study. It should be emphasized that it is not feasible to predict the maximum number of rooms that could be cleaned and disinfected with a definite quantity of bucket solution for all hospitals, due to the variation in the size of the rooms and the amount of soil from one environment to another. Each hospital should carry out the designated experiments in order to accurately determine the number of rooms that could be cleaned and disinfected effectively in the particular environment.

Since low counts are possible, it is not unreasonable to suggest that floor counts in patient areas ten minutes after cleaning range from 0-10 colonies per Rodac plate and 0-5 colonies per Rodac plate in the Operating Room, Delivery Room, and Nursery.

The data further emphasize the need for evaluating a disinfectant-detergent employing realistic laboratory and in-use procedures. The results demonstrate the inhibitory effects of tap water, the mop, and the soil deposited in the bucket solution during the cleaning and disinfecting process.

Summary

It is possible to obtain low floor counts when effective disinfectant-detergents are used in conjunction with effective housekeeping technics.

Effective dust removal before scrubbing proved to be an important part of the cleaning and disinfecting process of floors and the use of a freshly machine-laundered wet mop, preferably sterile, is also essential. The need and frequency of changing the dust mophead, the wet mophead, and the bucket solution must be recognized and vigorously controlled.

Dust removal procedures can be ranked in order of their effectiveness as: dry vacuum pick-up, chemically treated disposable dust mopheads, and freshly machine-laundered dry dust mopheads.

Disinfectant-detergents must be evaluated in the laboratory and again under the in-use conditions of the particular hospital environment when selecting products for routine use.

Hospitals should periodically evaluate their housekeeping and disinfecting procedures for maximum patient protection.

REFERENCES

1. Gable, Tom. Bactericidal Effectiveness of Floor Cleaning Methods. Hospitals 40:107–111 (Feb. 16), 1966.
2. Official Methods of Analysis of the Association of Official Agricultural Chemists-Use-Dilution Method-Official.
3. Yanis, Bertha. The Role of the Environmental Bacteriology Laboratory. Hospital Management 97:109 (Apr.), 1964.
4. ————. The Role of Infection-Control Chemicals in Hospital Sanitation. Ibid. 99:102 (Apr.), 1965.
5. Litsky, Bertha Yanis. Use of Sterile Mops Reduces Contamination. Ibid. 100:46 (Dec.), 1965.

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