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DROPLET INFECTION AND ITS PREVENTION BY THE FACE MASK

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In recent years the spread of contagious diseases has been combated largely by measures calculated to limit the more or less direct passage or carriage of infectious materials from the sick to others. The term contact infection has often been employed to designate all such instances of direct passage or carriage, although actual contact did not always occur. Aerial transfer of infectious materials has been applied to a wide distribution of disease agents through air at considerable distances, and especially to dissemination through dust. This form of transfer has been shown to play so small a part in the spread of contagious diseases as to be practically negligible. The part played in the transfer of infections by mouth droplets driven out in forced expiratory efforts has not usually received sufficient attention. The tendency of those who have insisted on the almost exclusive rôle of contact infection in the spread of contagious diseases has been to include droplet infection among the forms of contact infection, but to assign it a minor part. The factor of distance which is a most important one has been largely ignored.

Recent experiences have served to emphasize the ease with which infections may be transferred through mouth droplets when people are brought into intimate association in military establishments. The danger of transfer in this way of secondary infecting organisms which cause most complications in cases of contagious diseases has long been appreciated by physicians who have dealt with these diseases in institutions, and they have insisted on the isolation of individuals who have active secondary infections from others who have the uncomplicated disease. Secondary infections are transferred in the same manner as the primary disease in most instances. Our recent army experiences have emphasized the fact that carriers and droplet infections are two factors which must receive a large share of attention in the management of contagious diseases.

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Intimate contact of individuals is essential in order that droplet infection may occur, and this applies equally to single persons and to larger numbers in camps, crowded cars or public gatherings within doors.

That crossed infections among patients with contagious diseases can be almost eliminated if the individuals are separated sufficiently to eliminate droplet infection and measures are taken to avoid direct carriage of infectious materials was first practically appreciated by French physicians and incorporated by them in practice in hospitals. Similar methods were soon adopted by British isolation hospitals and in this country aseptic methods in the management of contagious diseases has come into general use, largely through the consistent advocacy of Chapin and his pupils.

The droplets of mouth spray consist largely of saliva, and they are carriers of infectious materials in proportion as such are present in the mouth. Tubercle bacilli have been found in the saliva and on the tongue in a considerable proportion of cases of pulmonary tuberculosis. Diphtheria bacilli have been found on articles contaminated by saliva from persons with diphtheria. Teague[1] found diphtheria bacilli in the saliva in 77% of cases in which tonsillar cultures were positive. We have examined cultures from the tip and sides of the tongue of individuals with diphtheria and have frequently found the bacillus in this location. In any cases in which pathogenic organisms are present in pharynx, nasopharynx and in sputum from the deeper respiratory passages, it is likely that the mouth will be more or less contaminated by them and that they will be in the saliva. Many pathogenic bacteria have been found in mouth spray. Tubercle bacilli in mouth spray have been demonstrated by numerous observers, and guinea-pigs have been infected by exposure to the mouth spray of tuberculous patients.[2] In a recent study of tubercle bacilli isolated from sputum, Corper[3] says that "there is only one conclusion to be drawn from these findings as viewed from a practical standpoint, and that is that the tubercle bacilli discharged by droplet or by expectoration from open cases of pulmonary tuberculosis are a danger to mankind on direct transmission at least."

Teague[1] found that over one-half of diphtheria patients emitted diphtheria bacilli in talking and coughing, the plates being exposed for

[1] Jour. Infect. Dis., 1912, 12, p. 398.
[2] Heymann: Ztschr. f. Hyg. u. Infektionskrankh., 30, p. 139.
[3] Tr. Chicago Path. Soc., 1918, 10, p. 227.

a very short time. Hamilton,[4] in 1905, found that scarlet fever patients frequently threw out streptococci in invisible sputum. We have repeated her experiments and have found that hemolytic streptococci are often emitted in considerable numbers from the mouth of scarlet fever patients during coughing.

The occurrence of infection after exposure to mouth spray depends on several factors, especially the immunity of the individual and the number of bacteria taken in. The latter factor will vary much, and single bacteria carried to a distance would be relatively less dangerous than clumps of bacteria in heavier droplets which settle from the air before passing far from the patient. Immune individuals may, nevertheless, become carriers without exhibiting any evidence of infection. The distance to which mouth droplets are carried in the air depends principally on the force with which they are driven. Small droplets may pass some distance, especially when carried by currents of air. The observations of Doust and Lyon[5] show that the distance to which droplets are projected in quiet air is much greater than usually supposed; the "danger zone about a coughing patient has at least a 10 foot radius." Our experience would indicate that relatively few bacteria pass more than a few feet from the patient in ordinary coughing in the absence of currents of air.

Those who have studied the bacterial content of mouth spray have remarked on the great variation in the number of colonies developing after coughing toward exposed plates. This variation is partly explained by the manner of coughing. Coughing efforts which force the expired air through a relatively narrow opening produce many more colonies than do those made with the lips more widely separated. Forcible expiratory efforts carried out with the lips only slightly opened produce the most abundant droplet spray. The relative number of colonies developing after various expiratory efforts are shown in Table 1.

When the Durand Hospital of this institute was opened, rigid aseptic methods were adopted, and the nurses were specially instructed in measures calculated to protect them from infections. From March 12, 1913, to Nov. 1, 1914, nine out of 69 nurses, or 13%, acquired clinical diphtheria. From this time on, all nurses giving a positive Schick test were immunized with diphtheria antitoxin. This practically

[4] Jour. Am. Med. Assn., 1905, 44, p. 1108.
[5] Jour. Am. Med. Assn., 1918, 71, p. 1216.

eliminated active diphtheria, but from Nov. 1, 1914, to June 1, 1916, weekly throat cultures disclosed 10 diphtheria bacillus carriers among 43 nurses, or 23.25%. Up to June 1, 1916, nine cases of scarlet fever occurred among 112 nurses on duty, or in 8%.

TABLE 1

COLONIES AFTER VARIOUS EXPIRATORY EFFORTS

Showing number of colonies of Streptococcus viridans developing on blood-agar plates exposed at a distance of 1 foot during various expiratory efforts. The figures are the average of several experiments made with the same person as was employed in the experiments shown in the following tables.

Expiratory Efforts Employed	Number of Colonies
Talking (15 seconds)	1
Coughing with lips widely open (twice)	1
Whistling (15 seconds)	2
Whispering faintly (15 seconds)	4
Whispering loudly (15 seconds)	5
Blowing (twice)	50
Stuttering in a whisper (15 seconds)	55
Hawking (once)	100
Stuttering loudly (15 seconds)	100
Coughing with lips slightly parted (twice)	200
Sneezing (once)	300
Lips forced slightly apart with a puff (twice)	670

Being unable to explain so many instances of infection through faulty technic, an effort was made to eliminate a possible factor of danger which had previously been largely ignored, namely, infection through mouth spray. Since June 1, 1916,[6] gauze masks have been used by the nurses, and up to Oct. 1, 1918, 6 diphtheria bacillus carriers have been detected among 73 nurses, or in 5.2%. No case of scarlet fever has occurred since masks have been worn. The nurses are instructed to change the mask as soon as it has been known to be grossly contaminated and never to put the hands to the mask to adjust it, etc., until they have been thoroughly washed.

Early in 1918 bacteriologic tests showed that the masks we were using did not remove all the bacteria thrown out in mouth spray. The masks consisted of 2 layers of gauze, 28 by 24 mesh, but as they were worn but once before washing and resterilizing, shrinkage soon made the opening in the gauze much closer than they were in the new masks. Studies were instituted, to learn how the masks could be made most efficient.

It was assumed that the power of various gauzes to filter moist spray from air would increase with closeness of mesh and with the number of layers employed. In the first tests a spray of carbolfuchsin

[6] Our experiences up to Dec. 1, 1917, were reported in January, 1918, in the Jour. Am. Med. Assn., 1918, 70, p. 76.

was employed, the dye being susceptible of fairly accurate measurements.

A piece of cardboard 20 inches square was placed vertically on a table and an opening 4 inches square cut in it, the bottom of the opening being 4 inches from the table, and the sides equidistant from the sides of the cardboard. Back of the cardboard and opposite the opening uncovered petri dishes were placed vertically on a rack, the open side of the dish toward the opening. Toward the opening in the cardboard, with and without the interposition of gauze over the opening, a spray of carbolfuchsin was thrown by a hand atomizer. Two compressions of the bulb were used in each test and care was taken to make the compressions uniform in force. The amount of fuchsin lodging on the bottom of the dishes was determined by adding to each dish 5 c c of alcohol and pouring the alcohol with the dissolved dye into test tubes with a lumen of 1 cm. The tubes were then compared with similar tubes containing definite amounts of fuchsin dissolved in 5 c c of alcohol. In preparing the standard tubes the fuchsin lodging on a dish 6 inches from the spray with no gauze interposed was dissolved in 5 c c of alcohol and taken as 100%. The other units were made by diluting the 100% solution with alcohol. In dilutions of less than 0.1% color could not be detected.

The results of these tests are shown in Table 2.

On dishes at a distance of 4 feet from the spray the fuchsin was barely visible when dissolved in 5 c c of alcohol. The percentage of fuchsin lodging on the dishes becomes progressively less as the distance from the spray increases. The percentage of fuchsin passing through the gauze becomes less as the mesh of the gauze becomes closer and as the number of layers of gauze is multiplied.

Experiments were next made to determine how a spray of bacterial suspension would behave under conditions similar to those employed in testing the fuchsin solution. For these tests a suspension of B. prodigiosus in NaCl solution, 1 loop to 50 c c was employed. The tests were made as in the former case, except that the petri dishes contained nutrient agar. The dishes after exposure were incubated and colonies counted. The results are shown in Table 3.

It will be noted that the number of colonies became progressively less as the distance from the plates increased and also as the mesh of the gauze became finer and as the number of layers of gauze increased. It is interesting to note that at a distance of 3-5 feet from the spray the proportion of the bacteria reaching that point which passed through the gauze barriers was greater than at shorter or greater distances. This is probably to be explained by the more rapid precipitation of the larger particles as regards the nearer distances and by the failing force at the greater distances.

TABLE 2

FUCHSIN EXPERIMENTS

Showing percentage of fuchsin passing through gauze placed 3 inches from plate when sprayed as carbolfuchsin, using 2 compressions of the bulb.
The upper figures in the squares represent percentage of fuchsin as compared with the unobstructed plate at 6 inches.
The lower figures in the squares represent percentages of fuchsin as com pared with the unobstructed plate at the same distance.

Distance from Spray to Plate	No Gauze	Mesh of Gauze																			
		20 × 14				24 × 20				28 × 24				32 × 28				44 × 40			
		Layers				Layers				Layers				Layers				Layers			
		1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8
6 inches..............	100	40 40	30 30	5 5	0.3 0.3	40 40	10 10	2 2	0 0	30 30	5 5	0.5 0.5	0 0	30 30	3 3	0.2 0.2	0 0	10 10	1 1	0 0	0 0
1 foot................	40	10 25	3 7.5	0.5 1.25	0 0	5 12.5	2 5	0.3 0.75	0 0	3 7.5	1 2.5	0 0	0 0	3 7.5	0.3 0.75	0 0	0 0	0.5 1.25	0 0	0 0	0 0
2 feet.................	5	0.5 10	0 0	0 0	0 0	0.3 6	0 0	0 0	0 0	0 0				0 0				0 0			
3 feet.................	0.5	0 0				0 0															
4 feet.................	0.1																				
5 feet.................	0.0																				

TABLE 3

B. Prodigiosus Experiments

Showing colonies developing on plates when suspension in NaCl solution of Bacillus prodigiosus is sprayed through gauze, placed 3 inches from plates, using 2 compressions of bulb.
The upper figures in the squares represent the number of colonies.
The lower figures in the squares represent the percentage of colonies as compared with the unobstructed plate at the same distance.

Distance from Spray to Plate	No Gauze	Mesh of Gauze																			
		20 × 14				24 × 20				28 × 24				32 × 28				44 × 40			
		Layers				Layers				Layers				Layers				Layers			
		1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8
6 inches.............	40,000	40,000 100	40,000 100	20,000 50	2,000 5	40,000 100	40,000 100	1,500 3.75	150 0.37	6,000 15	2,000 5	1,200 3	200 0.5	6,000 15	2,000 5	600 1.5	80 0.2	6,000 15	1,200 3	60 0.15	15 0.04
1 foot................	20,000	20,000 100	15,000 75	10,000 50	500 2.5	20,000 100	15,000 75	500 2.5	80 0.4	1,200 6	600 3	150 0.75	200 1	1,500 7.5	5,000 25	150 0.75	300 1.5	1,200 6	200 1	50 0.25	15 0.07
2 feet.................	6,000	4,000 66	1,000 16.6	500 8.3	400 6.6	900 15	1,200 20	300 5	80 1.3	300 5	200 3.3	50 0.83	150 2.5	300 5	200 3.3	150 2.5	150 2.5	200 3.3	90 1.5	60 1.0	60 1.0
3 feet.................	1,200	800 66.6	500 41.6	300 25	250 21	500 41.6	600 50	200 16	80 6.6	100 8	80 6.6	50 4.1	100 8	300 25	100 8	100 8	150 12	200 16	80 6.6	70 5.8	50 4.1
4 feet.................	400	400 100	300 75	200 50	150 37.5	400 100	200 50	150 37.5	60 15	90 22.5	20 5	40 10	50 12.5	90 22.5	40 10	50 12.5	100 25	150 37.5	50 12.5	40 10	40 10
5 feet.................	300	300 100	100 33	70 23.3	40 13.3	80 26.6	150 50	80 26.6	25 8.3	80 26.6	24 8	40 13.3	60 20	90 30	40 13.3	50 16.6	50 16.6	20 6.6	40 13.3	1 0.3	30 10
6 feet.................	250	150 60	80 32	20 8	13 5.2	40 16	50 20	13 5.2	9 3.6	8 3.2	10 4	20 8	10 4	80 32	20 8	25 10	5 2	3 1.5	4 1.6	1 0.4	1 0.4
7 feet.................	200	150 75	100 50	20 10	7 3.5	15 7.5	20 10	6 3	1 0.5	1 0.5	2 1.0	8 4.0	4 2.0	40 20	15 7.5	3 1.5	4 2.0	0 0	3 1.5	1 0.5	1 0.5
8 feet.................	80	80 100	30 37.5	20 25	7 8.75	7 8.75	12 15	3 3.75	0 0	1 1.25	0 0	0 0	0 0	25 31	0 0	0 0	2 2.5	1 1.25	0 0	0 0	0 0

These results demonstrate that gauze will remove bacteria from the air when carried in a moist spray. The efficiency of the gauze as a filter is in direct ratio to the fineness of the mesh and the number of layers used.

It was now desirable to determine the efficiency of gauze of various meshes and in different number of layers as filters for mouth spray. A suitable subject for these tests was found in an adult who was the subject of a chronic antrum and ethmoid suppuration with constant purulent discharge, in whose throat and mouth abundant Streptococcus viridans were constantly present. It has been noted by those who have studied the bacteriology by mouth sprays that the number of bacteria discharged is exceedingly variable when coughing efforts are made. We found that when our subject coughed with mouth wide open few bacteria were driven out, but that an explosive cough with the lips held quite close yielded quite a rich bacterial spray. A very abundant bacterial spray was obtained by first distending the cheeks with air and then, suddenly opening the lips a little, forcing the air out with a puff. The tests were made by having the subject direct such forcible expiratory efforts toward petri dishes containing blood agar at a distance of 6 inches, the face being uncovered and covered by various gauzes in different multiples.

TABLE 4

FORCIBLE EXPIRATORY EFFORTS

Number of colonies developing on blood-agar plates which were exposed at 6 inches to two very forcible expiratory efforts in which the cheeks were first distended with air and then the lips forced slightly apart with a puff.

Number of Layers of Gauze	Mesh of Gauze									
	20 × 14		24 × 20		28 × 24		32 × 28		44 × 40	
0	2,000		2,000		2,000		2,000		2,000	
1	2,000	100%	2,000	100%	1,500	75%	1,500	75%	1,500	75%
2	1,500	75%	1,500	75%	1,500	75%	800	40%	800	40%
4	800	40%	800	40%	[illegible]	50%	500	25%	80	4%
6	500	25%	200	10%		[illegible]5%	5	0.25%	0	0.0%
8	100	5%	15	0.75%		[illegible]	1	0.05%	0	0.0%

The results shown in Table 4 were obtained on a day when the streptococci were especially abundant. The colonies developing on the plates were practically all those of Streptococcus viridans.

It will be noted that the coarser gauze allowed a large proportion of the bacteria to pass through, even when 6 layers were superimposed. On the contrary, the finer gauzes removed many more of the bacteria, and when 6 and 8 layers were used almost all the bacteria failed to pass through. This test was rather severe, as the force used was greater than that made in any spontaneous expiratory effort. Similar results were obtained when the pharynx and tongue had been smeared with a culture of B. prodigiosus shortly before the experiments were carried out. There appeared to be no appreciable difference between dry and moist gauze in filtering properties.

TABLE 5

STREPTOCOCCUS VIRIDANS EXPERIMENTS

Number of colonies of Streptococcus viridans developing on blood-agar plates when exposed to two explosive coughs with lips slightly parted

Distance from Mouth to Plate	No Gauze	Three Layers of Gauze 44 × 40		Colonies	Per Cent. Passing Through	Per Cent. Excluded
		Over Face	Over Plate			
6 inches	+	..	..	150		
6 inches	..	+	..	20	13.3	86.7
6 inches	..	..	+	16	10.6	89.4
1 foot	+	..	..	150		
1 foot	..	+	..	8	5.3	94.7
1 foot	..	..	+	12	8.0	92.0
2 feet	+	..	..	2		
2 feet	..	+	..	1	50.0	50.0
2 feet	..	..	+	1	50.0	50.0
3 feet	+	..	..	1		
3 feet	..	+	..	0	0.0	100.0
3 feet	..	..	+	0	0.0	100.0

Since 3 or 4 layers of gauze with a mesh of 44 by 40 removed most of the bacterial spray thrown with unusual force at a short distance, further tests were carried out to learn how efficient as filters of mouth spray 3 layers of this gauze would be when placed over the mouth of the person discharging the spray and over the exposed plate at varying distances, corresponding to the face of the person in the neighborhood. The plates were placed vertically as in the preceding experiment. The expiratory effort consisted of 2 strong coughs with the lips slightly parted. Tables 5 and 6 show the results of 2 such experiments, similar ones with slight variation being secured many times. The same person served in these tests as in the previous ones. When the gauze mask was over the face, very few colonies developed in the plates. When the gauze was over the plates the proportion of colonies as compared to unobstructed plates was also small, but slightly larger, because here the finer particles are dealt with. At a distance of 2 or 3 feet relatively more of the particles reaching that distance pass through, because here only very fine particles are projected. In the cases in which B. prodigiosus was smeared over the pharynx and tongue fewer colonies developed in plates placed behind gauze obstruction. This is probably because the bacteria were less thoroughly distributed in the saliva. If the colonies which develop on unobstructed plates near the mouth are examined under magnification it is noticed that many are compound colonies and many of those which develop from the larger particles of saliva are the result of the growth of clumps of bacteria. Thus the number of bacteria removed is greater than the number of colonies would indicate. These larger particles of saliva are probably more dangerous not only because they contain more bacteria, but also because the toxic substances contained in the projected mucus may act on the mucous membrane where they lodge so as to favor the growth and penetration of the associated bacteria.

TABLE 6

BACILLUS PRODIGIOSUS EXPERIMENTS

Number of colonies of Bacillus prodigiosus developing on agar plates when exposed to two explosive coughs with lips slightly parted, the pharynx and tongue being previously smeared with culture of the organism.

Distance from Mouth to Plate	No Gauze	Three Layers of Gauze 44 × 40		Colonies	Per Cent. Passing Through	Per Cent. Excluded
		Over Face	Over Plate			
6 inches	+	..	..	35		
6 inches	..	+	..	0	0.0	100.0
6 inches	..	..	+	1	2.9	97.1
1 foot	+	..	..	32		
1 foot	..	+	..	1	3.1	96.9
1 foot	..	..	+	1	3.1	96.9
2 feet	+	..	..	9		
2 feet	..	+	..	2	22.2	77.8
2 feet	..	..	+	1	11.1	88.9
3 feet	+	..	..	2		
3 feet	..	+	..	1	50.0	50.0
3 feet	..	..	+	1	50.0	50.0

After our studies had been completed two publications of experimental studies of face masks appeared simultaneous.[7] Our results correspond closely to theirs.

Since the completion of these studies the masks used in the Durand Hospital have been made of 3 layers of gauze with a mesh of 44 by 40. The nurses are instructed to wear 2 superimposed masks, making 6 layers of gauze, when caring for cases of virulent infections when secretions are abundant. The gauze which we have used is absorbent. It is preferable to buttercloth which is treated to make the material nonabsorbent. Particles of mucus will adhere more quickly and firmly to the absorbent material as the rapid removal of the water leaves a thicker and more sticky residue. So far we have been able to secure but 1 weave of buttercloth, about 28 by 30, and this is not as fine a

[7] Haller and Colwell, and Doust and Lyon: Jour. Am. Med. Assn., 1918, 71, pp. 1213 and 1216.

mesh as is desirable. Even this is very difficult to find, most large dealers having none in stock and usually not knowing where it can be secured. In any case the dressing is removed in washing.

When the probable importance of droplet infection in the dissemination of human tuberculosis attracted attention, gauze masks to be worn by the patient were advocated. Hamilton,[4] in 1905, advised the use of gauze masks to cover the mouth of patients who had scarlet fever when there were severe streptococcal complications and when the individual could not be properly isolated. In 1916, Meltzer[8] advocated the use of a fine mesh net over the faces of patients with infantile

Directions for making the Durand Hospital Mask. Devised by Miss Charlotte Johnson, Supt.
1. Cut (44 by 40 mesh) gauze 8 inches wide and 23 inches long.
2. Turn down sides and one end ¼ inch. Fold twice, unturned end first, making 7½ inch square.
3. Cut off opposite diagonal corners 1 inch and turn in raw edge ½ inch. Stitch firmly all around.
4. Take up a 1 inch dart 1½ inches long at middle of each side of mask. Sew 14 inch tape on opposite uncut corners.
This mask has the advantage of covering the nose and mouth and in making the traction on the chin and not drawing on the nose and lips.

paralysis and also over the faces of attendants. Various mechanical protectors of the face were formerly used by physicians when swabbing throats and doing tracheotomy on cases of diphtheria. Gauze masks have been long used by many surgeons and their assistants with the purpose of protecting wounds from infection by mouth droplets.

[8] Med. Rec., New York, 1916, 90, p. 292.

Our experience with masks has been principally confined to their use to protect attendants on the sick from infection. They have been used not only by nurses, but by physicians in their work while taking cultures from throats, doing intubations and examining chests. The mask on the face interferes with putting the hands to the mouth and nose and so indirectly becomes a source of safety to the individual whose hands are apt to be contaminated in her work and who thoughtlessly may put them to the face. We have also used masks over the faces of mothers while nursing their babies when either one has been infected by diphtheria or has been a diphtheria carrier.

The employment of gauze masks over the face to prevent the transfer of infections to others was thoroughly worked out and practically applied by Capps[9] in Camp Grant. He used masks to prevent cross infections in ambulances and in the admission rooms and wards of the hospital. Similar use of masks has since been generally adopted in army and navy camps and in many civil hospitals. The intelligent use of gauze masks and other measures may be instituted equally well in private families. Many family epidemics might be limited by such means. In all instances in which infections locate in the respiratory tract and in which the infectious agent is discharged in mouth spray it is reasonable to protect those about the patient by masks of gauze. With efficient and conscientious masking, carriers of diphtheria bacilli and other pathogenic bacteria might safely be allowed a large degree of freedom.

We have noticed a considerable reduction in cases of rhinitis, tonsillitis, and pharyngitis among our nurses since masks have been worn. Endeavors to limit droplet infections should not prevent equally energetic efforts to close other channels of spread of infectious materials. The use of face masks should not give an unwarranted feeling of security to those employing them and lead to neglect of the measures which prevent carriage of infectious materials through other agents. Emphasis must still be laid on proper sterilization of eating utensils, destruction of all infectious discharges, avoiding all contamination of foods and special care regarding the washing of the hands every time the sick are handled.

CONCLUSIONS

Droplet infection comes into play whenever an individual with pathogenic organisms in the mouth gets into close contact with another

[9] Jour. Am. Med. Assn., 1918, 71, p. 448.

individual. Sneezing and suppressed coughing are most apt to produce abundant droplet spray.

Gauze will filter bacterial spray from air. Its efficiency is in direct proportion to the fineness of mesh and number of layers employed. Three layers of gauze with a mesh of 40 threads or more will remove almost all bacteria-carrying droplets. Occasional fine droplets pass through.

Gauze masks appear from clinical data to prevent infection through mouth droplets. They are useful when worn for protection by attendants on the sick, and also when worn by the infected individual to prevent contamination of his surroundings.

The use of masks should not lead to neglect of measures calculated to prevent transfer of infectious materials by other means than by droplet spray.