

TRICHOMONAS VAGINALIS INFECTION FROM SPLASHING IN WATER CLOSETS*

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Probably most venereologists would agree that, in men, trichomoniasis is always a venereal disease, but in women the infestation is sometimes acquired other than by sexual contact. The mode of asexual transmission is not known. Trussell (1947) stated that douche nozzles, enema tubes, towels, physicians' gloves, and instruments had all been incriminated but never proved to spread the protozoa. McCullagh (1953) claimed that the main cause of *Trichomonas vaginalis* infection was the ordinary lavatory seat. Some support for this contention was given by Whittington (1957), who showed that the protozoa will live, at room temperature, in a drop of urine on a toilet seat, for 30 to 45 minutes.

Manufacturers of sanitary ware and others have known for a long time that "splashing" often occurs during defaecation in water closets. For example, specially designed privies have been made in Great Britain for many years and exported to India, where Hindus have religious scruples against splashing. The term "splashing" means that, during defaecation, droplets of liquid from the water closet pan splash as far as the level of the upper surface of the seat (in the down position); or, alternatively, come in contact with the user's thighs, buttocks or genitalia. The present study was undertaken to investigate the possibility of women acquiring the infestation from splashing of infected urine.

Present Study

Although there are many different designs of water closets, there are, for all practical purposes, only two types in Great Britain at the present time. They are the "wash-down" and the "siphonic". Of these, the vast majority in women's public

lavatories are of the former type†, because they are simple, almost fool-proof, and cost less than the latter. Both types are so designed that, when one sits on the seat in the normal manner the anus is over the approximate mid-point of the water in the pan. This, of course, is to reduce the chances of faeces soiling the inner glazed surfaces of the bowl. Health authorities in Great Britain do not specify any optimum distance between the level of the top of the seat and the water, and the distance of the anus from the water varies from one lavatory to another. It also varies according to whether the user is slim or obese, or whether she sits on the seat or squats over the pan.

Experiments

To find out about splashing during defaecation, experiments were carried out with a wash-down closet of the usual type. In the initial experiments faeces were used; but, for obvious reasons, a substitute had to be devised, and a mixture of glitter-wax and plasticine (G.W.P.) in a proportion of 3 to 2 by weight was found to have about the same consistency and specific gravity as normal faeces at 37°C. A sheet of plain dry glass was fixed horizontally above the water-closet, so that the posterior edge was over the mid-point of the water in the pan. Lumps of G.W.P. faeces substitute of varying sizes and shapes were then placed in contact with the under surface of the glass and dropped into the water. The sheet of glass was then examined carefully for droplets of water visible to the naked eye.

Results

It was evident that shape, weight, and height of drop of lumps of G.W.P. were all relevant factors in

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† V.D. Social Workers who visited, at random, women's public lavatories in 25 Yorkshire towns found only the wash-down type and measured the vertical distance from the level of the upper surface of the seat to that of the water in the pan. The greatest distance was 28 cm. and the least 21 cm. (average 24.8). They also operated the flush and noted the time taken for the cistern to refill. The longest time was 210 seconds and the shortest 30 seconds (average 68).

the occurrence of splashing (Table). From 22.5 cm., which is about the average anus-to-water distance in wash-down closets, there was some splashing with lumps of intermediate sizes. There was more splashing from a height of 36 cm. but none from 11 cm. Other factors were found to be the consistency of the stool, the angle at which cylindrical lumps struck the water, the force with which the motion was ejected (for example during diarrhoea), and whether lumps fell directly into the water or not.

TABLE
SPLASHING WITH FAECES SUBSTITUTE (G.W.P.) AT 37°C.

Approximate			Height dropped from (cm.)		
Shape of Lump	Size (cm.)	Weight (g.)	36	22.5	11
Spherical	Dia- meter 1.5	1.75	None	None	None
	2.0	3.5	Some	None	None
	2.5	7.0	Many	Some	None
Cylindrical	Length 3.5	11.0	Some	Some	None
	5.0	28.0	Some	Few	None
	10.5	71.0	Few	None	None

In the final series of experiments, urine from a female patient with acute urethral trichomoniasis was poured into the water closet pan. A sheet of glass was laid over the seat and lumps of G.W.P. were dropped from the under surface of the glass into the pan. The glass was then turned over and droplets of liquid near the edge of the glass were covered with microscope slips. The sheet of glass was placed under the microscope and each covered droplet was examined under the 16 and 4 mm. objectives. In a few of the droplets living *Trichomonas vaginalis* were seen.

Discussion

There are a number of circumstances which may result in urine remaining unflushed in the water closet pan: the chain or lever mechanism of the flush may be broken, a woman may forget, or be in too great a hurry, to operate the flush, the flush may not operate because the cistern is less than three-quarters full. The latter occurrence often arises when there is a queue of women waiting to use a lavatory. Flushing cisterns in Great Britain hold 2, 2½, or 3 gallons (approximately 9, 11.25, or 13.5 litres) of water, and few can be induced to empty before they are more than three-quarters full. Many cisterns take a minute or more to refill to this level, but it is not unusual for a woman to enter a water closet compartment, urinate, operate or attempt to operate the flush, and leave in less than 45 seconds. Hence, conditions develop daily in which women

use public lavatories for the purpose of defaecation, when urine from previous users is still present in unflushed pans. Sometimes living *Trichomonas vaginalis* will be present in the urine.

It is known that many women, when using public lavatories, do not sit on the water-closet seat, and the experiments described above suggest that there will be more splashing from a squatting than from a sitting position.

The problem of splashing is so far unsolved. The laying of sheets of toilet paper on the surface of the water has been recommended. This is not always successful in the prevention of splashing, but women should be advised to use this method until a better technique is found.

With regard to trichomoniasis, it has been suggested, as a preventive measure, that every closet should carry a notice advising that the apparatus should always be flushed before use. Flushing before use would remove the possibility of *Trichomonas vaginalis* infection from splashing; but it would be an unpopular proposal with some water authorities.

The type of water closet with the water area concealed, which is exported to India would probably not be approved in Great Britain, even if it were modified so that sitting on the seat opened a valve to allow water to flow over the inner glazed surfaces of the bowl.

Further research is required so that an acceptable, inexpensive wash-down closet with little risk of splashing can be manufactured. For example, it might be possible, by altering the design, to reduce the distance between the level of the upper surface of the seat and the water in the pan. It should be noted in the siphonic type this distance is usually several centimetres less than in the wash-down closet.

Meanwhile, every water closet cistern in public lavatories for women should be adjusted so that it refills in less than 45 seconds after being flushed.

Summary

The hypothesis is advanced that in women, infection with *Trichomonas vaginalis* may be acquired asexually from infected urine in the water-closet pan splashing upwards during defaecation. Water-closet splashing experiments with faeces and a plastic substitute are described. The results show that, in wash-down water closets, droplets of liquid from the pan sometimes splash upwards during defaecation as high as the level of the upper surface of the seat. If the lavatory pan contains infected urine, the trichomonas organism may be found in some of these droplets. The problem of splashing is discussed and some possible remedies considered.

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Infection par *Trichomonas vaginalis* due aux éclaboussures de l'eau des cabinets d'aisance.

RÉSUMÉ

L'auteur suggère que l'infection par *T. vaginalis* chez la

femme n'est pas forcément due aux relations sexuelles mais peut être transmise par des éclaboussures d'urine infectée présente dans la cuvette des w.c. pendant la défécation. On laissa tomber des fèces et des morceaux de matière plastique pour étudier les éclaboussures de l'eau. On constata que quand la chasse d'eau est dirigée vers le fond de la cuvette, les éclaboussures pendant la défécation atteignent parfois la surface supérieure de la lunette. Si la cuvette contient de l'urine infectée, les gouttelettes peuvent contenir des trichomonas. On discute le problème des éclaboussures et considère les remèdes possibles.