THE ECONOMIC DISPOSAL OF EXCRETA: GARDEN SANITATION.

BY

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It is to be hoped that the annotation on Dr. Hindhede's views and Dr. Macfadyen's letter (to be found respectively on pages 996 and 1070 of the *BRITISH MEDICAL JOURNAL*, vol. ii, 1923) will give rise to a real consideration of the problem of "garden city" sanitation. It seems that Dr. Hindhede, coming from Denmark to visit English "garden cities," and hoping to find them veritable examples of *urbs in rure*, was woefully disappointed. Like Triptolemus Yellowley, when he bought *Piers Ploughman's Vision* from a packman, he was charmed with the title; but now, finding no agriculture in it, he flings from him the impudent and misnamed libel. Dr. Macfadyen stands for *rus in urbe*. For him there is no problem. The methods of the town, he holds, are equally applicable in the "garden city."

The issue lies between the daily use of night-soil as manure in a highly developed system of horticulture, and the approved water-carriage sewage system ending in the destruction of what, in the other method, would have been manure, by the septic tank or some other means of biological purification. I would plead for the consideration and decision of that issue in connexion with the lay-out of entirely new building schemes amongst rural surroundings.

Dr. Macfadyen refers to the "Poore" system—tried by one or two at Letchworth, but soon given up. Since the death of Dr. George Vivian Poore no one in this country appears to have continued to investigate the practical applications of his thesis:

"That in country or semirural districts, where it is possible to give a house a decent curtilage or small garden, it is easy for a householder to make the sanitation of his dwelling quite independent of the local authority. In fact, the householder is able, if he be so minded, to make his sanitation complete, and to finish, on his own premises and to his own profit, that 'circulation of organic matter' which is a law of nature, and the only true basis upon which the science of sanitation can possibly stand firm. The householder can do piecemeal what no public authority has ever succeeded in doing wholesale, albeit that millions of money have been wasted in silly attempts." (Poore: *Rural Hygiene*, pp. 73-74.)

Dr. Poore's chief experiment was with a garden at Andover, 1½ acres of cultivated ground, low-lying, beside a river, not a favourable patch of land for such an experiment. However, he had it manured for some years (twenty-two) with the refuse (closet earth) from a population of about a hundred persons, the inhabitants of a large house used as a school and of twenty-three cottages adjacent to the garden.

"A man was engaged to act as scavenger and under-gardener, whose duty it has been to remove the pails every morning and bury their contents superficially in the garden . . . just hidden by a layer of earth. The eye sees nothing and there is absolutely no odour . . . The fertility and beauty of the garden have been enormously increased . . . Proceeding methodically it took four years to go completely over the whole ground in cultivation. The observer was usually astonished at the small amount of excremental material which has to be dealt with . . . The first crop taken off the land is always a succulent green crop of the cabbage tribe, and the plants are dibbled in on the third day after the deposit. No other crops except cabbages seem to flourish in the fresh material, but the cabbages may be followed by potatoes, these by celery (planted between the rows), the celery by peas or beans, and these again by parsnips or carrots, without any fresh manuring, and with a most abundant yield." (Pp. 324-8.)

After twenty years' experience of the practical working of Dr. Poore's methods, I remain a convinced disciple! But to make the system workable requires an organized routine which the average householder could not provide for—daily removal without nuisance or offence, immediate surface burial, and cultivation thoroughly pursued. Many men may perhaps be gardeners at heart, but their avocations permit them but rarely to exercise their instinct. On Good Friday the cottager plants his potatoes: on an August evening he digs a row: and that wellnigh comprises the year's gardening. A system of sanitation dependent on agriculture cannot be conducted on such terms.

What could not be done by each householder could be carried out by the landlord, or co-operatively, for a group of houses, with one garden, or, at any rate, one gardener, common to the lot. Dr. Poore proved his thesis on his

Andover property: but a systematic test in connexion with one of the housing schemes of to-day is much to be desired. For the method is clearly economical; and may even prove profitable. All that has hitherto inhibited its adoption has been—

(1) Custom and inertia; the tendency of architects to regard the "sanitary" devices which have made possible or tolerable the highly artificial conditions of "the Wen" (as Cobbett called London) as the products of a heaven-sent hygienic gospel for general application to town and country alike;

(2) And a genuine doubt amongst the few who have really contemplated the experiment whether Dr. Poore's system is as safe as he thought; whether it is really possible to conduct it with convenience, cleanliness, and comfort; and last, but not least, whether, even when solids have been dealt with by earth burial, the disposal of putrescible slop-water does not still require the full paraphernalia of a water-carriage system?

As regards (1) the time is overdue for our profession to resume the habit of original thought on housing, and to advise the public thereon. There was not a single doctor on the Tudor Walters Committee! The late Mr. Teale set an example which calls for followers. We give lip service to the gospels of air, sunlight, and fresh food; but we leave it to building experts to orientate our dwellings; we acquiesce in their exaggerated value of road "frontage," and care nothing for frontage to the sun, which alone should be our concern—"where the sun does not enter the doctor does"; we accept their dictum that the window area should be a tenth of the floor space; and we send our sanitary inspectors to smile approval at their careful arrangements for the drainage of cowhouses and stables, not to speak of human habitations, so that the urine of the livestock, "the most valuable constituent of manure," containing the nitrogen and potash which the farmer has bought and paid for in the animals' food, is actually conveyed to sewer and septic tank, to be "scientifically" got rid of at the expense of the "sanitary" rate. Thus we turn assets into liabilities, and allow custom and convenience to paralyse our common sense.

As regards (2) the genuine doubts as to the safety of earth burial and the disposal of slop-water should be settled by competent bacteriological investigation and practical tests. But it should not be forgotten that thirty years ago, when Dr. Poore wrote his book, he was able to point to a vast array of observed facts which appeared to prove his contention that earth burial, properly conducted, is not only as safe as water carriage, but far safer. The textbook of to-day begs the question by stating that 12 tons of slop-water are about as foul as 10 tons of mixed sewage—that is to say, that keeping faecal matter out of the slop-water makes only a comparatively slight difference to its foulness; and that therefore, on the principle "in for a penny, in for a pound," water carriage is the only sane policy. But the unqualified suggestion that slop-water is necessarily as foul, or almost as foul, as sewage is untrue. After a daily experience of the removal of the slop-water of a good-sized house (three sinks, three washing basins, a much used bath, and a laundry) during eighteen years, by means of an open channel running fifty yards through the grounds, I can testify to the entire absence of offence. The textbooks should distinguish between slop-water running in the open and slop-water consigned to an underground drain. The purification of the latter needs all the apparatus of a modern "sewage scheme"—admitted!—but of the former merely downward filtration, or agricultural employment, which is a form of the same thing. Cultivated soil will remove from water any organic substances it may carry, and, if they have not putrefied, will in some circumstances, when tillage, weather, and crop are in favourable conjunction, even profit by them. Similarly when solid putrescible matter, fresh and not yet putrefied, is buried in the surface layers of garden soil, "it undergoes decomposition without the occurrence of putrefaction—the process which is at once offensive to the senses and dangerous to health. This is effected by means of fungi which produce oxidation" and the formation of nitrates. "The vegetable living mould on the surface of the earth is a sort of filter of the most perfect kind. It is very rich in saprophytic bacteria, whereas the subsoil at a depth varying from

3 to 6 feet is barren of bacteria." It is this fact of the bacterial sterility of the subsoil, beneath richly manured but well cultivated land, that seems to me to prove the safety of proper conservancy or earth-burial methods of night-soil disposal.

Is it not desirable, in the public interest, at this time when so many housing schemes are being undertaken in open and semi-rural neighbourhoods, that the sanitary principles appropriate for these should be re-examined, and the essential antagonism between the two systems, water carriage and conservancy or dry methods, freshly considered? They both depend on biological purification; but in the one case *putrefaction* is the basis of the process, and in the other *nitrification*. Putrefaction is encouraged by (1) water, (2) darkness, (3) the absence of air—all the circumstances of drains and septic tanks; and the end-product is "a satisfactory effluent"—that is, the dissolved relics of squandered manurial wealth (1 part per 100,000), always useless, often laden with bacteria. "... Such processes can in no sense be regarded as effectual in preventing danger. . . ." (Parkes and Kenwood's *Hygiene and Public Health*, sixth edition, p. 142.) "Such processes" have resulted in the sewer-like state of our rivers. Trentham abandoned because of the stench! The

"silver-sliding Thames"

of Spenser: contrast it with the Thames to-day! Nitrification is encouraged by (1) a moderate amount of moisture in the soil (33 per cent. is the optimum); (2) exposure to air—hence the need for surface burial, and for the cultivation of the soil so that the air shall gain access; (3) as for sunlight, the third factor favourable to nitrification, its warmth in "fine growing weather" awakens the nitrifying bacteria of the soil to activity. The end-product of *this* system of sanitation is garden produce. In cold weather manure consigned to the soil lies dormant and harmless.

The water-carriage system is modern and Western. Indeed, at its best it is Victorian and English. It has been officially blessed since the Public Health Act of 1848. Since then our rivers have been fouled, our wells poisoned, and we have had to look farther and farther afield for water. The conservancy system is ancient, natural, instinctive—witness the dog. I understand it plays an important part in the civilization of the Far East; that in China and Japan, where population is both dense and self-supporting in the matter of food, the constant return of the night-soil to the land is the secret of this enviable agricultural wealth.

Can the repulsive details of "conservancy" (or the dry method) which are so familiar, we understand, to the otherwise fastidious Japanese that he seems to ignore them (see Professor Morse's account of the "chōdzu-ba," *Japanese Homes*, p. 232), be so obviated as to make the system workable in an English "garden city"? We ought not to march further on our sanitary road till we have put the question to the test.

A plot of 4 acres should be taken on the outskirts of a town, and twenty-four houses built upon it. Suppose the plot roughly square, and the road to skirt one corner of it. Then this corner alone will possess that valuable commodity, "frontage." Sacrifice this scrap of frontage by making a short gravelled drive through it, to end blindly in a "turn-round" in the middle of the plot. The houses should all face south—that is to say, all their living-rooms should face south. They must therefore be oblong, with their long

axes east and west. The larder, the lobby, lavatory, staircase, and landing will occupy the north side of each house. The earth-closet is best detached but approached under cover—a cross-ventilated passage or short verandah, or, if upstairs, a covered bridge, giving access to it. The houses should be set upon the plot in a diamond-shaped pattern, or, in other words, a square with its corners to north, south, east, and west. Thus one house will occupy the northernmost point of the plot, and from it, to the south-east and south-west, will run a row of some five or six houses a side, arranged in echelon. Just as platoons in echelon do not block each other's line of fire, so houses thus arranged will not block each other's sunlight. A dozen more houses echeloned in a V with its apex to the south will complete the diamond-shaped lay-out. The whole plot would be treated as one garden, and one whole-time head gardener, with the help he needed, would be responsible for its cultivation. The daily removal of the closet earth and its use as manure—its immediate committal to the surface soil and its light covering therewith—would naturally be amongst his duties. A gardener using manure of great value, not a scavenger removing refuse; a "garden rate" paid by each householder, an investment productive of fresh vegetables to be had at his door, and in one way or another repaying him his outlay, not to speak of the amenity added to his surroundings, instead of a "sanitary rate" paid to be rid of rubbish—such are the bases of this scheme.

Correct detail is vital to acceptance. The townsman, accustomed to urbanities, will not tolerate the slightest unsightliness, the most transient offence. He is right, and his requirements must be accepted. The essence of conservancy or the "dry" methods is that they *should* be dry. Either Poore's "dry catch"—though that may be thought hardly so happy as most of his suggestions—or some other device for separating the solid from the liquid manure and for instant deodorization must be used. A strainer and light bucket answers well.*

The strainer is shaped like a

milking can, with wide mouth, and narrow bottom perforated with holes the size of a shilling. The back of it is vertical, the front sloping. A handful of straw is put in the bottom, to facilitate emptying and to aerate the manure when that is buried later on in the soil. The dejecta fall upon the straw. The user of the closet throws upon them a little black garden soil. The base of the bucket-like strainer being narrow, a small amount of soil, a coal-box shovelful, suffices to cover all the contents. The soil is stored in a bin, the lid of which is in one piece with the closet seat. The latter is therefore lifted for the purpose of throwing in the deodorizing soil, and so escapes any chance contamination. The woodwork is of polished mahogany. The trowel or shovel fits in a slot devised in the front edge of the earth box, the handle, which is of porcelain or polished wood, projecting. The earth is black garden soil from the top layer, and, so, replete with nitrifying organisms. It should be got on a dry day, and a reserve stored under cover till needed. Dry earth is a better deodorizer than sodden earth and lighter to handle. Moule's earth-closet needs ash or "poudrette" or earth dried over a stove to work in its automatic hopper. Both those materials, being barren of nitrifying organisms, are less suitable. Nor are they such efficient deodorizers as sun-dried earth. Peat is better than

* M.O.H.'s Health Report for Winsford, 1919.

they, but its resin is too antiseptic and militates against nitrification; simple earth is both first and cheapest. Of course, no antiseptic must be used.

The urine runs through the strainer and is received in a large wide-based bucket into the narrowed top of which the strainer fits. The strainer, charged with deodorant soil, plugs the orifice of the urine-containing bucket, and no smell escapes. This part of the system needs revision. It would be better for the urine to be conducted at once to a filter in the open air. On the filtration of urine Dr. Poore has recorded many experiments. If filtered through sawdust, he found that the bulk of the liquid was evaporated, and the effluent absolutely inoffensive even when heated to dryness. Earth as a filtering medium, though it will kill any seeds planted in it, becomes as rich a manure as Peruvian guano or as hen manure—but it requires as careful use.

The closet should have top light as well as a side window. A cupola of wood and glass gives not only that, but height and air space as well.

Whatever the receptacle used, the gardener would daily substitute an empty for a full one; and convey the latter on a low truck to the garden bed he was in process of manuring. The stuff, covered with earth, and neither odoriferous nor unsightly, would leave the vicinity of the dwelling before it was disturbed. The hand-grips on the strainer are arranged to be out of reach of fouling. With a stroke of a hoe a trench is made, with another the stuff is covered and all offence is at an end. In "good growing weather" the stuff will itself have been all converted into soil, humus, in some three or four weeks—"earth to earth," the normal fate of dead organic matter, accomplished without loss and without offence, and not only that but with great profit to the garden. Rothamsted and all farmers' experience have shown that artificial manure can never replace dung as a fertilizer to stand the test of a series of years; and the rarity of horse manure in these motoring days makes an additional source of the natural class of manures a consideration. Straw or chaff stacked in narrow columns and, so retained, treated by repeated soakage with urine should make a manure of great value.

Turning from the question of the closet earth to the disposal of slop-water, one is not so happy, yet much happier: there is no one way to deal with it, so much depends on the lie of the land; but it should run away in open channels and requires no human portage. Poore used to urge that to give the water fall enough it should leave the dwelling at the highest possible point (not the lowest as in a cellar scullery). Should the slop-water be concentrated to one point or dealt with separately for each house? Should the garden beds be irrigated? Should the lawns be watered by an automatic sprinkler, gravity-fed? These are questions for detailed consideration in each case. One thing I feel sure of, that it will seldom if ever be wise to let the urine run with the slops. Poore himself did not invariably reject that plan; but grave objections lie. For one thing, his principle that, if you wish to preserve water-courses pure and sparkling, you should foul as little water as possible seems to me sound. For another, except for rice culture (not a crop we are concerned with in England), ammonia, into which urea is converted when it is long in water, is a manure of less value than the nitrates into which soil will convert it. Even old Bakewell, in the eighteenth century, found that when he "floated" his meadows with water mixed with urine his results were no better than when he used water alone. The skilful application by hand of urine diluted, 1 in 20, with water to the soil around certain kinds of plants at certain stages of their growth is a very different matter and may be invaluable. In the case of carrots, urine in that dilution has a special use as a prophylactic against one of their chief pests.

Though the disposal of slop-water presents difficulties in detail, still, happy the gardener and flourishing the garden with ample supplies at command!

The 4-acre plot, with its twenty-four houses, is a tempting dream. One can imagine its development near a town where female labour is in demand, a textile town, or near a chocolate factory. One house, larger than the rest, might occupy the centre of the diamond. That house would have a "common room." Also a common washhouse (for a "bag-wash" for the other twenty-three). Those rooms would be

on the ground floor. Upstairs there would be a common kitchen: a dinner for a hundred is cheaper per head than the same food bought and prepared for one family. In many a Neapolitan palazzo I have seen hot dinners distributed by the porters from a neighbouring restaurant. The courses of the dinner are placed in the three stories of a large double-jacketed tin box, marvellously carried upon the porter's head up, perhaps, a flight of more than a hundred steps! It is permissible to imagine the distribution of similarly laden and insulated tins by wire-funicular from the kitchen balcony of our central house to each of the surrounding houses in the diamond.

Though the general merits of the scheme exist quite apart from these unusual developments, yet one kind of food at least will be derived by the inhabitants from a common source—to wit, fresh vegetables from the garden. To have these fresh and unimpaired, with their full vitaminic influence, without market staleness, with all their juices in them and not crushed out by market bruising, is a very real asset to health. So is the proximity of growing plants and well tilled land to a dwelling on account of the oxygenation of the air. The recent report (interim) of the Standing Committee on Rivers Pollution to the Ministry of Agriculture and Fisheries shows that whilst tench and carp may live in polluted waters deprived of a high percentage of the dissolved oxygen, yet trout and salmon require for their existence the full saturation of the water. There is no doubt that the human race, and children especially, present a parallel; the best types flourish in the best conditions. Allotments should be *around* cottages, not twenty minutes' walk away! (In our 4-acre plot, though the gardener undertakes the responsibility for the whole, any householder with leisure and ability to cultivate a few perches should have them *allotted* to him alongside his house; that was assumed, but should be stated.) The sun and the soil are the natural and the best antiseptics of human environment. It is easy and economical to give them full play. Knowledge has reached a stage which reveals some of their methods of working; but practice lags behind, in the stage of that little knowledge which is a dangerous thing.

In short, I venture to think that Dr. Hindhede's views—and still more, seeing their fullness and originality, those of the late Dr. Vivian Poore, old though they be—deserve the serious and urgent attention of doctors, bacteriologists, and housing experts.

England and Wales.

AFTER-HISTORY OF TUBERCULOUS PATIENTS.

THE result of an inquiry into the after-history of patients who received residential treatment for tuberculosis under the London County Council's scheme was reported to the Council by its Public Health Committee on February 5th. The cases investigated were those of adult patients who received residential treatment during 1918, and of children who received such treatment during 1916-17. The number of pulmonary cases among adults treated in 1918 was 2,830; of these, 253 could not be traced. Of the remainder, 1,236 were found to have died. The cases were set out in four categories as follows: (a) sputum negative; (b) sputum positive, but only slight constitutional disturbance, if any, and obvious signs of very limited extent; (c) moderately advanced; (d) cases with profound systemic disturbance, or constitutional deterioration, or with grave complications. The cases now traceable in each of these categories were as follows:

	Cases treated in 1918.	Died before latter part of 1923.	Percentage of Deaths.
(a) Sputum negative ...	762	92	12.1
(b) Sputum positive ...	597	62	15.6
(c) Moderately advanced	770	463	60.1
(d) Profound systemic disturbance	648	619	95.5