exceptional incidence, in whichever direction the exception may be.

We might continue these extracts at much greater length did space suffice. There is scarcely a sanitary measure of recent years which does not appear to have been in some measure indicated in these early years by Dr. Buchanan. In his first report, speaking of private slaughter-houses, he says: "I consider a system to be radically vicious that permits of no examination of the health of the animals killed, or of the quality of the meat, and which must always be inadequate to prevent the occurrence of nuisances." In 1860, he further remarks: "What is wanted is . . . a system of inspection by which animals should be condemned if they are found affected with diseases known to give an injurious quality to their meat. . . . But no such inspection can be got under the present plan of slaughtering. It can only be obtained at central abattoirs under the control of the Sanitary

dition; hence the need that his hands should be strengthened by the Board for which he works, and hence the immense value of that cordiality which I for myself would gratefully acknowledge."

His example will stimulate many health officers throughout the country to renewed efforts on behalf of their communities, and will enable them, like him, to feel that their chief reward (and to his mind the satisfying reward) lies in the work itself, and the benefits which accrue from it to humanity.

ON THE CONNECTION BETWEEN OVERCROWDING AND DISEASE.

By the late SIR GEORGE BUCHANAN, F.R.S.*

IN the obscurity which surrounds the early origin of every disease, no prudent physician would think of making a positive statement that any one condition was the cause of the malady evolved; but

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Authorities. This is only one, though a chief, ground for desiring such establishments."

Strangely enough, the first and the last reports written by Buchanan deal with the inspection of meat. For the chief moral of the report of the Royal Commission on Tuberculosis, in the preparation and revisal of which the last few months of Buchanan's life were spent, is the necessity for public abattoirs, and the refusal to allow any animals to be slaughtered for food except under the most complete and efficient supervision.

Our imperfect review of the work of Sir George Buchanan as a health officer cannot be more appropriately concluded than by the following remarks with which he concludes his first annual report to the St. Giles's Board:—

"The possessor of this office can never become popular—his functions bring him into constant collision with the apparent interests of many influential persons, and he is gratefully welcomed only by the poor, who from ignorance or subservience, cannot raise their own voices to improve their con-

dition when the question is asked—given that these diseases (zymotic diseases, consumptive diseases, inflammation of the lungs, convulsions, and other diseases of children), as being those unduly fatal in a community—are there any sanitary defects which you can indicate as being likely to exist in that community?—experience then does justify us in giving an answer. Within the limits of this report I am not able to debate the grounds on which my opinions rest, but my conclusions are briefly as follows:—

To contagion a subordinate part is to be assigned, as many of the above diseases are not communicable. . . .

To impure water I have already charged a certain proportion of disease. . . .

But it is to the impurities in the atmosphere that we must attribute the main part of the mortality from the diseases named. I shall not here consider emanations from cowsheds, and effluvia from

* Extracted from his Report to the St. Giles's Board of Works for the year 1857.

burial vaults, as their influence must be small and localised, and I have a larger subject to dwell on. I cannot go into the accumulated evidence of the connection between imperfect drainage, cess-pools, and foul privies, and the direct production of zymotic disease, though my own experience only is sufficient to establish such connection; but I wish to point out that we have the great cure for all these evils in the constant action of the atmosphere. It is only when this open atmosphere is excluded, as when people live in close and crowded rooms, that such emanations ordinarily become injurious.

And this brings me to the chief cause of those diseases which are in excess in St. Giles's.

If one were asked to name a single condition which shall produce at once an excess of zymotic disease, an excess of consumption and lung disease, and a large infantile mortality, the answer is ready and inevitable. You may produce all these diseases with most certainty, and you may rely on it that they shall be extremely fatal, if you will only crowd your population together so that they shall breathe sufficiently impure air. . . .

In overcrowding, considered as a cause of disease, must be included dirty rooms, filthy yards and privies, and the misuse of sanitary appliances, all of which result immediately and inevitably from the moral depravation and the loss of self-respect and responsibility created by overcrowding. . . .

One cannot often analyse the causes which operate to produce disease in a community. It is only occasionally that one can get evidence of a single condition, operating in one locality and not in another, with all circumstances else being fairly similar.

I happen, by a piece of good fortune, to have obtained an illustration of this sort, regarding the particular condition of overcrowding. (Here follows a tabular comparison of Dudley Street with Little Coram Street, in which, among other things, is shown a total death rate of 38.0 as compared with 29.7 per 1,000 inhabitants, a zymotic death rate of 11.6 as compared with 0, a death rate from phthisis of 9.3 per 1,000, which is 24.6 per cent. of total mortality, as compared with 9.1 per cent., and so on).

I cannot conceive anything more absolute and startling than this comparison, though it is made for one year only. This enormous death rate, this amount of zymotic disease, and this frightful mortality among children, which are exhibited to us in the one street and not in the other, appear to own as their cause solely the existence of overcrowding with its attendant evils.

Since this investigation was instituted, a return has been made by the district surveyor, showing how far the kitchens of Dudley Street are legally habitable. It appears that there is scarcely one which, even in a majority of particulars, conforms to the requirements of the Act of Parliament.

Other sanitary defects, many of them the immediate results of the overcrowded state of dwellings, have received ample attention from the Board and its officers; but hitherto the condition of overcrowding itself, I believe the most important sin against health of our district, has practically remained unnoticed.

To diminish overcrowding is not only to ensure purer air to be inhaled, but it gives a possibility of cleanliness and of decent self-respect which would prevent the neglect and misuse of other appliances for health. In a street with 1,700 inhabitants, in a house with 36 inmates, with the front door and staircase at every man's command, one certainly finds the water taps stolen, the privies broken, the dustbin lids burnt, and the sanitary inspector must be unremittingly at work to get remedies for the causes of disease which are thus newly generated.

It would be very advisable to begin at the other end, if it were possible, and try to diminish the crowded state of the houses.

To effect this object, we have two clauses in existing statutes (the Metropolitan Local Management Act, sec. 103; and Nuisances Removal Act, sec. 29), and the tendency of legislation is to increase the powers of the local authority in this direction. Measures have actually been taken in many districts to diminish the number of inmates of a house in extreme instances. The same could be applied in the more flagrant cases of St. Giles's, with even greater certainty of success.

Although I believe that such measures could be successfully taken, and that they ought to be taken in some prominent instances, I am not unmindful of the very, very serious difficulties which are in the way of any extended scheme of operations of this sort. We might, indeed, turn some hundreds of persons from their houses; but if there be no place ready for their reception, I fear we shall have done as much harm as good. To empty the cellars, and to thin the residents of the other rooms of Dudley Street alone, so as to allow each person the very minimum of space required for moderate health, this single proceeding—which might be done to-morrow if you so willed it—would turn out some three or four hundred persons to choose between the streets, the workhouse, or some neighbouring region, which they would overcrowd to a double degree. The question is one of extreme complexity and delicacy, but its importance demands that it shall be considered in spite of its difficulties.

Something must be done by frequent inspection as to cleanliness, and by insisting on the efficient ventilation of rooms—a point which has scarcely yet been thought of in this district, but which had the attention of some officers of health, and which has been enforced by magistrates on their representations. Thus a large number of persons might be accommodated without disease, who now suffer from the effects of the close crowded atmosphere. Still, under hardly any circumstances of ventilation

should more than two adults and three children occupy together a room of ordinary size; each might then get nearly what is permitted as a minimum in common lodging-houses, or about one-half the allowance of a criminal in our model prisons. Less than this we should, I think, try to prevent.

As this merely, however, is at the best very partial, and does not touch several important vices in the present system of overcrowding, I should like to raise the practical issue whether or not it would be advisable to adopt the provisions of the Labouring Classes Lodging Houses Act in this district. I can see many theoretical and not a few practical difficulties in the way of a scheme which shall make the parochial authorities the landlords and supervisors of a large number of tenements; but when I look what the effect would be of erecting such institutions on a sufficient scale, adapted to the wants of all classes, and becoming popular even among the lowest; when I am convinced that the houses might be made to pay well, and that disease and pauperism would decline with their prosperity; when I know that the laws against overcrowding could then be exercised without scruple, and that from that moment some hundreds of lives would be annually preserved—with all these convictions I feel it my duty to raise the question, at whatever risk of being thought wild and Utopian.

THE PRESENT STATE OF OUR KNOWLEDGE AS TO THE SIGNIFICANCE OF THE COMMA-BACILLUS IN CHOLERA.

By R. THORNE THORNE, M.B., F.R.S., Medical Officer of the Local Government Board.*

THE discovery by Koch in 1883, during the cholera epidemic in Egypt, of his comma-bacillus gave a new impetus to the study of the intimate pathology of disease exhibiting the symptoms of cholera. In the course of the next few years, cholera being meanwhile prevalent in certain countries bordering the Mediterranean, a number of different observers made independent announcement that in true (Asiatic) cholera *alone* is the vibrio in question found inhabiting the intestine of the human subject. Antecedent therefore to the most recent extension of cholera to Europe, the presence of Koch's commas in the dejecta of a person suffering choleraic attack had become generally accepted by etiologists as identifying such illness with true cholera. Further, bacteriologists—whether they belonged to that larger section of observers accepting Koch's comma as the *vera causa* of cholera, or were among the few who inclined to regard this vibrio as rather a consequence than the cause of that malady—had also become agreed as to the

importance, for diagnostic purposes, of detecting in the dejecta of persons suffering attacks of cholera-like nature the presence of Koch's comma-bacillus. But, in 1892, when cholera again invaded Europe, differentiation of Koch's vibrio from other microbes that can inhabit the human intestine was neither easily nor quickly attainable. Morphologically this vibrio could not with certainty be distinguished from other and similarly-shaped bacteria. Only by its behaviour on artificial culture in solid media—as for instance gelatine—could it be satisfactorily differentiated from other vibrios. And, as is well known, on artificial culture in media of this class the characteristic features of Koch's vibrio are not manifested until after lapse of a considerable interval of time. The desideratum therefore in 1892 was—some means whereby this vibrio that is held to be associated with true cholera, but with no other disease, could not only be easily identified in the dejecta of persons attacked, but identified with a promptitude allowing of proper precautions being at once taken in regard of each cholera case as soon as it arose.

Accordingly in 1892 bacteriologists generally, and particularly those of the German nation, to whom the cholera outbreak at Hamburg in August of that year afforded exceptional facilities for such study, set themselves to discover means of promptly identifying in the bowel contents of cholera cases the vibrio in question. And in this direction a considerable amount of success was ere long obtained.

It was matter of general observation in the course of the 1892 epidemic in Western Europe that not only was Koch's vibrio present in the bowel contents of sufferers, often to the almost complete exclusion of other micro-organisms, but that it tended to distribute itself in very definite arrangement in the débris of their intestinal mucous membrane. Thus, in the shreds of epithelium which abounded in the rice-water dejecta of the Hamburg cases, numerous comma-bacilli could, in microscopic specimens from nearly one-half of the cases examined, be seen arranged in very peculiar grouping. The vibrios in such microscopic specimens were observed to lie with their long axes in the same direction; so that a group of them resembled a shoal of fish in the act of stemming a slowly flowing stream. In no other disease except cholera, Professor Koch affirmed, is this appearance witnessed; and thus he came to regard such grouping of commas in the intestinal flakes as absolutely diagnostic of true cholera. As to cases, indeed, responding in this way to microscopic test, Dr. Koch further insists that entirely trustworthy evidence of their being true cholera can be obtained within a few minutes only of submission of material from them to the procedures of the skilled bacteriologist; for, as he points out, the positive evidence thus obtained in Hamburg cases had never been called in question

* From the Introduction to Reports and Papers on Cholera in England in 1893, by the Medical Officer of the Local Government Board.