To the Dean and Faculty of the University of Edinburgh

Gentlemen—

Being a Bachelor of Medicine of your University, and having been in practice in the Town of Bridlington since 1829, I beg to submit to your approval the following thesis, which I hereby certify has been composed and written by myself, with the view of, if worthy, taking the degree of Doctor of Medicine.

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Bridlington
Yorkshire

April 14th, 1832.
The frequent recurrence of epidemics in the same localities, or the more or less constant presence there, of certain forms of disease, is now pretty generally regarded as dependent upon the presence of certain physical conditions in the main, connected with the habits and customs of the people living within these affected areas; which, on the one hand, engender, and favour the development of the diseases in question, and on the other hand, by lowering the vital powers of the inhabitants, render them more susceptible to the injurious effects of those agencies, which their own habits have rendered potent.

So commonly is poverty, associated with disease, and so intensified are the features of the disease, whether as regards its effects upon individuals, or communities, when fostered by squalor and want, that observers in all ages of medicine, have remarked the connection of the outbreaks of infectious diseases, with periods of special intensity of the conditions referred to, and neglect of simple hygienic rules, such neglect arising from ignorance or carelessness, or consequent upon nasal
calamity as famine or war, or associated with some peculiarities of soil or climate.

The questions thus arise:—

How far are these phenomena to be regarded in the light of cause and effect?

Will the same cause always produce the same effect?

How far are the causes ascertainable?

As so many conditions, unfavourable to health coexist, is it possible to differentiate the causes most favourable to the development of special diseases?

Again, what are the means of propagation of infectious diseases, when they have arisen?

And why should the effects not always be present, although the same causes are apparently acting, though in varying degree?

Regarding the means by which disease is spread, various theories have been advanced.

In former times, we find—

Unknown atmospheric conditions;

Planetary phenomena, earthquakes, and other terrestrial conditions;

and finally, the theory that the poison of infectious diseases consists of low organisms, or living beings.

Early indications of this view, are met with in the assumption, that the origin of malarial fever, was due to the entrance of low organisms into the body, and the discovery of infusoria, and spermatozoa, by Leeuwenhoek in 1677 gave a wide-
spread notoriety and favour to the view, which however fell into disrepute from the imaginative accounts which theorists of the period brought forward; nor can this be wondered at, when efforts of imagination entirely took the place of scientific investigation; thus, the organisms which gave rise to the diseases were said to "fly about like a crowd of locusts,... others described the animals which were supposed to have the form of flies;... the writers distinguished the different kinds of animals, which belonged to the different diseases; they gave them names, and even drew figures of them. (Liebermeister)

In later times, Mersoia and Lungi had been described, as the specific contagia in various diseases, these again were afterwards shown to be purely coincidentally associated with the diseases. They were supposed to be the cause of, or merely the constant companions of organic life and decay. As methods of conducting inquiry improved, the results became more definite and the labourous researches of the last twenty years have advanced the contagium noum theory of disease, to its present prominent position amongst medical facts, by affording the means of explaining, or even demonstrating the apparently anomalous causes of epidemic diseases, clearing up these apparent mysteries, and showing a definite and ascertainable cause producing its certain effect until
The removal or diversion of this cause takes place.
The term "contagium Verrucum" implies that whenever a contagious disease is communicated, no matter in what way, that conveyance takes place by specifically endowed organisms which stand in the same relation to the disease, that the seed does to the grain.
The proofs that these diseases are the results of organisms, are judged of, by their effects, which afford means of distinguishing, between these and other poisons. The poisons of infectious diseases can reproduce themselves, and to an unlimited extent, in their own appropriate media, and, according to Cuvier, it is in virtue of this property that a certain time elapses after their entry into the body, before they are sufficiently numerous to produce their symptoms. Typhus, Scarlet Fever, Smallpox, etc. can be multiplied to an endless extent. In face of this fact, we (this power of multiplying all hypotheses which refer these phenomena to simple chemical action) must be abandoned and moreover, in some diseases, certain organisms have been found (scarlet fever, relapsing fever; Bacillus in Syphilis; and the fungus (Bacillus anthracis) in Anthrax, which are constantly related to those diseases and therefore must be considered to be either the contagia of such diseases, or the carriers of such
Contagia, until further knowledge can assign to them their function with more accuracy, than it is at present able. Analyses to the poisons of infectious diseases can be found in a high degree in living organisms. Animals and plants multiply indefinitely, as long as conditions suited to their existence are maintained, and the more slowly the organism, and the less the duration of individual life, the more rapid is its propagation and increase. Among chemical actions also, the fermentive processes show the most striking analogy to the contagious diseases, by their capacity for extension and the course of the processes, hence the name zymotic or fermentive has been applied to them. These processes undergo the various transformations which organic substances experience, under the influence of a small quantity of organized matter, which is itself in a state of active alteration, termed a ferment. This ferment neither imports anything to, nor receives anything from, the substance undergoing fermentation, but these processes associated as they are with the presence of multiplicities of living plants, or animals, are chemical only in the sense that changes in any other living body are chemical. I have no similarity with the ordinary decomposition of inorganic matter, so that the fermentative theory is thus closely associated with the contagious virus theory, viz., one that
Hecules states the presence of an organism, whose increase and diffusion produce the disease.
Leubig draws an analogy between the process of brewing and that which takes place in the human body affected by zymotic disease.
1. Zymotic disease there is:
   (1) An organic fluid (blood) susceptible of change;
   (2) This fluid may be fermented by the introduction of disease germs which act as ferment;
   (3) The fermentive process causes a rise of temperature;
   (4) The kind of fermentation will depend on the kind of ferment, or germ introduced; just as the quality of yeast will govern the speed of fermentation in the brewery.
   (5) The act of fermentation being accomplished, the mature form of the ferment disappears, but in so doing gives rise to a fresh crop of spores, which after an intervalature, redevelops the mature form of ferment, and with it the fermentive process and a further rise of temperature.
(6) This sequence may be checked, by the application of cold, or by the administration of sarsaparilla, which acts as an antifermant, as the hop in beer, or guinine medicinally.
Intervals between attacks of ague, which is not properly "contagious" in the sense of being transmissible from one individual to another may be thus explained, and also the benefit arising from the administration of guinine.
Before the next fermentive act, the periodicity of afage seems clearly to mark distinct recurrent processes of fermentation; Kehle and Dr. Salisbury attribute it to the action of a minute vegetable organism in the blood, it is asserted that the afage poison can be collected & concentrated, being a minute alga (Bacillus malanae).

With regard to the question, as to how far these organisms are to be considered as distinct and independent & capable of transmission from one body to another, and capable of reproduction with the original characteristics, modified within certain limits, the fermentive theory furnishes analogues in reply:

The fact that in many cases, an individual having once been subjected to a zymotic disease, which has run its course, may be no more susceptible to the influence of that particular disease, than an already fermented leporin is susceptible to the influence of its ferment, seems to show, that each such contagium, operates with a chemical action, on some special ingredient of the body; and that exhaustion of this particular material is the bodily change which the contagium "specifically" performs. Moreover, inscriptions in character are abundantly exemplified in animal and plant life; as Mr. Simon says, "the uniformity of the operation of each of the specific contagia determines their identity."
Each disease propagates itself, and in each repetition of the disease, there is a multiplication of material, which has the same infective property, evidence seen constantly in smallpox, scarletina, measles, etc., each of which can produce itself, but can form no one of the other hundred diseases named. Similar cases are explained in which the organism lies latent for a prolonged period, and the apparent spontaneous origin of the disease, being merely the development under favourable conditions of immature forms, which like other higher organisms can only reach the perfection of maturity and strength to which they are capable of attaining by suitable and appropriate conditions. This apparent spontaneity of development may be exemplified under such circumstances as the following described by Dr. Thorne in the "Practitioner" for June 1896.

His investigations into the origin of outbreaks of diphtheria, lead him to suppose that cases of this disease, and by analogy cases of other contagious diseases, may arise independently of actual antecedent cases of such diseases, under special circumstances. In isolated districts, and in houses situated perhaps miles away from other habitations, in some instances lying in lonely spots among mountain ranges, where a visit to or a visit from the nearest town or village
would be a circumstance too important to be forgotten, occurred cases of what appeared to be simple inflammation of the throat, at times so trivial that it has passed all but unnoticed, and yet it has led by transmission through other persons to cases of well-marked and severe diphtheria. The first attack has occurred under circumstances which did not appear to admit of previous infection, and it has been difficult to interpret their occurrence, except on the supposition that in some way they have arisen independently of prior cases. In regard to the well-marked attacks of diphtheria to which they seemed to give rise, all other sources of infection could be excluded, with a degree of certainty rarely to be met with. It may be inferred that the early cases were merely mild attacks of the disease the poison of which had been received in some unascertained way, and during the same investigation numerous cases of sore throat were noticed to exist in the district, in which diphtheria was prevailing, similar to the early case before referred to, yet which gave no indication of being infectious. Thorne goes on — and I have hardly been able to refrain from drawing the conclusion, that conditions very similar to those under which genuine diphtheria
was epidemic in a limited district, obtained and had obtained, before general diphtheria was anywhere seen) over a wide area around the immediately infected locality, and that these conditions leading to a somewhat generalised predisposition to simple and apparently non-infectious inflammatory sore throat, had further under somewhat modified circumstances, tended at certain points, to produce an affection capable of putting on the property of infectiveness, which thus led to the transmission of the disease in a distinctly communicable form to others. This would indicate the progressive development of the property of infectiveness and there are its reasons for believing that organisms capable of producing a minor and incommunicable disease at one stage of their growth, may not in subsequent stages of their development become capable of producing a major disease communicable from person to person, the question being one of soil and vigour of constitution, so to say, of the race of the infective agent. As Dr. Thorne says, "This is not at all a question of the development of the antecedent life, but merely the production, by means of a process of evolution, of that which gives to an already existing organism, that property by which it becomes infective, a property which is may perhaps lose directly it is deprived of the circumstances which favoured its
development, in much the same way as special characteristics may be developed in higher life, and be as easily lost again.

Dr. Bardow Sanderson in his Lecture on the Infective Process of Disease,” says:—

That certain organized, and living particles of extreme minuteness, which are always suspended in the atmosphere, stand in the same relation to the causes of the changes which interfere with the healing of a wound, as the seed does to the plant. So far as experience has yet taught us, there is no case in which these organisms come into existence, otherwise than as the progeny of previously existing Bacteria. Wherever Bacteria have been developing for some time in moisture, containing the material for their growth (as in wounds), there, infective virus is being elaborated; consequently, ordinary filth of wounds; (of which the only scientific definition is that it consists of the products of bacterial evolution;) is more or less virulent or infective according to its development. Hence the importance of cleanliness in wounds, and the use of such disinfectants as are known to be the most efficient purifiers.

The peptic poison is an exclusive product of Bacterial development, capable of being manufactured from inorganic and harmless material, its effects depending on the
quantity injected.
If the injection of a simple peritonitis be
injected into the peritoneum of another animal
the disease assumes a more intense form
in the second, than in the first; if, in
this way the disease be communicated
to several animals, the effects will
differ in different cases, if by artificial
selection the most severe case be
picked out, and the exudation from
that case be used for further communi-
sation, a still more intense inflammation
will be the result, until at last a virus
is obtained of which the virulence resembles
that of the specific virus of malignant
peritonitis in man, where accidental
takes the place of intentional selection
the process being a pathological one,
I.e. a process which can only go on in
the living tissues and which is necessarily
associated with a certain definite
succession of structural and physiological
changes in the affected part.
These experiments show how by a gradual
evolution, we may rise from common
traumatic infectivity, to the intense
virulence of malignant septicemia.
It would appear as if this view of
increasing virulence with advancing
stages of development, was one that
would suggest itself to many
practitioners, by cases in epidemics
which must have come under their
notice, in which early cases have
been characterized by the mildness of their symptoms, and later on by their severity, and in which it would appear that the virus becomes more and more potent by transmission through a succession of individuals until it attains its maximum of intensity or from altered conditions wanes and subsides. This last view may or may not be correct, but facts coming under my own notice have caused me to incline towards it.

One in particular recurs to my mind. During the Typhoid Epidemic which occurred in Bridlington during the Autumn of 1880 a girl named Humphrey took the disease, her symptoms were mild, and she was convalescent in five weeks. A sister younger than herself then commenced, and after three months, during which one relapse occurred, she slowly recovered, hardly had she been able to leave her bed, when an elder sister, who had only once seen her, or been in the house, became ill, and delirious. The third day although she ultimately recovered Mrs. Humphrey (the mother) then commenced and died on the fifth day. Jane H——y, the eldest daughter then came from service to nurse her mother, and died a few days after. The only person who was not attacked
Being the husband, who escaped altogether, perhaps through having had it a few years before.

To also during epidemics of scarlet fever, apparent examples of the same thing are furnished, individuals first attacked frequently having symptoms of less severity than those attacked at a later period of the epidemic.

Accounts of the appearance of typhoid in isolated districts appear from time to time in the journals, and are adduced as proofs of the virulence of this disease. But it is necessary to remember that in these cases, the conditions with which typhoid fever is commonly associated are invariably present. Take for instance the case of the Dewsbury Registration District, an account of which is given in the "Returns" of the Registrar General from the report of the Local G. Board Inspector.

The grounds of the inquiry were the prevalence in the district generally of large general and infantile mortality. Excessive mortality from infectious diseases notably typhoid and scarlet fever; fever and diarrhoea endemic in the District. The result of the inquiry showed that many houses were unfit for human habitation. The house accommodation for the labouring classes generally
defective houses so constructed as to prevent through ventilation, the wagon being built back to back, water supply for some districts liable to contamination at its source (wells gathering ground and periodically fouled in the delivery, drains by sections of girth into the mains during interruptions in the service. Means of sewerage & drainage very defective, causing the pollution of streams and fouling of air in and about dwellings. In some districts house drains were so constructed as to admit foul air into dwellings, sewers insufficiently ventilated in others. (Burke's law).

No proper system of sewerage & drainage here. The entire mortality was excessive. Midden privies everywhere, a source of nuisance and injury to health. In some localities, nuisance from defective scavenging or neglect in the removal of filth. Special nuisances from the storing of wine in close proximity to houses, for the purposes of the cloth trade. General absence of any hospital provision for the isolation of cases of infectious diseases and of efficient means of disinfecting. (8th Report to G.B.) Contagious diseases, existing over an extensive area, with such gross sanitary neglect, as the above extract shows, would not be a cause of surprise to anyone, nor does it seem to be more
wonderful, that contagious disease should arise in the most isolated districts, if a habitat be prepared as favourable to the nurture and development of the organisms which produce them, and such condition appears to me to fully account for any isolated case (say of enteric fever) as clearly as though the actual entry of specific enteric virus into the alimentary canal of the sufferer could be demonstrated. In one case, there is the fully grown adult organism vigorously developed; in the other, the seed is by careful nurture matured into the fully developed organism, acquirig all its powers and properties.

"Murchison says: "As judged by the symptoms and results and conditions under which they are generated and spread, the specific poisons are widely different; Syphilis being due to the prodigiously concentrated exhalations from living human bodies (emanations from decomposing animal matters would be an additional factor). Relapsing fever making its appearance in that peculiar condition of the constitution induced by starvation, while the poison of enteric is a product of certain forms of organic matter." The matter discharged from the alimentary canal by vomiting or purging. Thereupon they manifestly differ in the case with which they are destroyed.
The poison of Typhus is very readily got rid of by free ventilation, as also with the poison of oriental plague (Parke). While on the other hand, the poisons of smallpox and scarlet fever will spread in spite of every ventilation and retain their power of causing the same disease for a long time.

In the case of Malaria the poison can be carried many hundred yards. Certainly in the case of the Derbsbury District just quoted are to be found conditions most favourable to the development, and spread, of any of the infectious diseases and in such circumstances it is not easy to differentiate the cause of any one of them. But the numerous instances of the occurrence of an epidemic, of a given disease, following upon some special condition, enable us not only to assign to the disease its especial cause, but to predict with every probability of accuracy, the kind of disease which may be expected to arise when sanitary measures are neglected. For example, in a town with no proper system of drainage, or in one in which sewers otherwise well constructed are without proper means of ventilation, i.e. ventilated only by the water closets into the houses, and are, it may be, liable to backing up of water at high tide, or to other periodicical derangement.
In such a case even though no special severity or overcrowding exist yet, an outbreak of typhoid would certainly not be matter for surprise; again in foul marshes, where the putrefaction of animal and vegetable matter is incessant, malarial fevers will be epidemic, or rather endemic, similarly if people are allowed to overcrowd the filthy houses to be found in the poor districts of most large towns; the association of foul air, with bad food, deficient clothing, and damp and dirty dwellings, by this may be looked for, and infectious disease of any kind may be expected to rage with greater virulence than elsewhere. Proofs of this are furnished by outbreaks of typhus and smallpox in London, during which the diseases ravaged the densely populated alleys and courts, and entirely passed over the newly built well constructed model houses in the immediate vicinity, and books on hygiene furnish numbers of analogous instances. Again the systematic neglect or evasion of vaccination (re-vaccination), are cause of a high death-rate, when as has lately been the case an epidemic arises. All statistics from fever hospitals show that the well vaccinated and revaccinated rarely die. The insanitary conditions mentioned also render individuals more susceptible (by lowering the constitution) to the
Influence of the Previous. In one case mentioned by Dr. Parke (Physiol. 11 Aug., 1842) Page 122. Ny.

That of the public house of industry, where scrofula was formerly so common as to be thought contagious, there were in one ward 60 ft. by 10 feet (height not given) 38 beds, each containing four children, the atmosphere was so bad, that in the morning the air of the ward was unpensurable. That overcrowding and deficient ventilation, lowers the system by inducing a pathological condition, is proved by the prevalence of the disease among soldiers in the most barren stations of the army, and in the most beautiful climates, in all places where the only common condition was the vitiated atmosphere which barrack systems everywhere produced (Parke). The following is an extract from Dr. Gardner's table on the relation of density of population and mortality.

<table>
<thead>
<tr>
<th>Population per square mile</th>
<th>Death Rate per 1000</th>
</tr>
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<tbody>
<tr>
<td>56</td>
<td>15</td>
</tr>
<tr>
<td>149</td>
<td>18</td>
</tr>
<tr>
<td>32.4</td>
<td>22</td>
</tr>
<tr>
<td>12.62</td>
<td>22.5</td>
</tr>
<tr>
<td>29.00</td>
<td>27.4 upward</td>
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</tbody>
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Dr. Murchison remarks that "it is necessary to remember the existence of different species of continued fevers in studying their causes from a sanitary point of view, as it has been contended as
The one hand, that fevers arise from putrid emanations only, or the other hand, that the great source is destitution and overcrowding, different parties draw their conclusions from different theories. Recent researches have rendered it probable that whether or not these diseases be necessarily in every instance traceable to contagion, their prevalence is to a great extent under human control. The country surrounding London was in Cromwell's time as marshy as the fens of Lincoln are now, and at the present day owing to drainage and cultivation, the fens have almost vanished from the country, and it would not be difficult to shew that the disappearance of the Oriental Plague, formerly so prevalent in London is due to an improved construction of the dwellings. It is not unreasonable to hope with confidence for a like extermination of the whole class of continued fevers.

Density of population of course implies poverty with its attendant diseases, and the conditions implied by the term may be seen at a glance in the table subjoined. For although the habit of the well to itsincy occasionally be as opposed to the precepts of morality & health as those of the poor, yet there can be no doubt as to which class from obvious causes pays the heavier penalties.
for its deviation from nature's laws.

Conditions accompanying distribution of population:

- Deme
  - Usually occupying the least palatable localities
  - Poverty & overcrowding

- Pearce
  - Localities generally well chosen
  - Inhabitants usually in easy circumstances
  - Well cared for in sanitary measures

1. Deficient food and clothing.
2. Damp and ill constructed houses.
3. Ignorance of sanitary laws and waste matter
4. Unhealthy occupations (dust, etc.)
5. Personal habits, intemperance, filth etc.

With regard to (4) as Dr. Ballard points out, the danger from infective matter that arises in the case of trades dealing with old wearing apparel. With gold house refuse must not be overlooked.

"So again, manipulation of horse hair infected with the contaminants of anthrax has been found to be attended with serious and specific risks, conveyance delivery and storage making them operative beyond the immediate area of the trade premises."
The direct bearing upon the pathology of infectious diseases of the results of recent investigations into the development of low organisms make it desirable to epitomize the result of these researches.

1. "Low organisms and their germs exist in the air and are capable of destruction. TYNDALL'S electric beam illuminates these among other minute particles, and when any air capable of rendering the beam luminous is brought into contact with any nutrient organic fluid, well-known organic forms will appear in that fluid, but if the air be not capable of rendering the beam luminous (the particles having been burnt or removed by filtration), such an air will not develop any living organisms when brought into contact with a nutrient fluid, and is what is technically called "sterile" (Pasteur).

2. The complete organisms may be destroyed at temperatures which their germs may resist. Pasteur has proved that the forms are more resisting than the fully grown organisms, just as one of much higher animals may live under conditions impracticable to the adult. TYNDALL (Lectures on the Germ Theory) found that the degree of purity of the atmosphere was an element to be taken into consideration when comparing the destructibility of germs.
He found that five minutes boiling in a pure atmosphere was sufficient to sterilise solutions which had withstood 200 minutes boiling in a less pure atmosphere. Sterilised infusions may again be made putrefactive by the introduction of fresh germs (in ordinary air). He showed also that heat boiling destroyed the adult organisms but not the germs, and hence suggests the application of discontinuous heat as in disinfection. Dallinger again demonstrated that while living monads are killed by a heat of 140°F, the spores of one variety which are 20 minutes, that they cannot be killed except in mass, by the highest powers of the microscope, are capable of germinating after being subjected to a temperature of 360°F. for 10 minutes. Similarly we may infer that other spores are capable of resisting heat.

A poisonous septic fluid may be prepared by infusing animal tissue in water, and when this becomes putrid boiling it with alcohol, removing the alcohol by evaporation, extracting with water. This fluid may not contain bacteria but the virulent poison would appear according to Dr. B. Sanderson to be the product of fermentation in the infusion. Subsequent generations of Bacterial forms are not more virulent than those which first appear in organic infusions.
The organisms which according to Cohn appear in decomposing animal fluids are various, spherical bacteria. They are cells colourless or not, multiplying into filaments and forming chains. These cells may be aggregated in balls, colonies, or masses (coco-gloca), usually motionless. B Rodlike Bacteria
C Filamentous Bacteria

In any cultivation of Bacteria in a nutritious solution, the first crop is always inert, and the sporaneous propogae are developed later. The first Bacteria are mobile rods, the latter are spherical, held together with a transparent substance (the gloca of Cohn) in masses. Lister's experiments prove that in order to produce a fermentation in an organic fluid, it is necessary that the impregnating particles in the atmosphere, which Randles' electric beam renders visible, should gain access to it, and moreover the kind of fermentation produced depends upon the nature of the impregnating particles, which gain access to it. An organic liquid placed under perfectly pure glass (i.e. pure of any living) in such a way as to prevent the dust of the atmosphere reaching the fluid, though the atmosphere itself has free access to it, will not develop organisms.

The glasses are obtained pure by previous
prolonged heating to 312 F., which is sufficient to destroy the life of all living material. Taking milk as the organic fluid, it requires previous purifying by heating to 210 F. the flask containing it being introduced into a saucepan of boiling water; no drops of the liquid coming into contact with the upper part of the flask. To avoid drawing air into the flask with the milk, it was passed through a carbonised syphon into the flask. Boiled milk will develop the lactic fermentation only if exposed in a day exposed anywhere else it will develop any other fermentation than the lactic one would the Bacterium Lactic which is invariably present in souring milk be found in it. Samples of unboiled milk, excluded from air, remain free from Bacteria showing that unboiled milk has no ferment in it tending to organic development. Drops of water added to boiled milk do not fermentations (other than the lactic) but different fermentations in different cases, showing that the fermentative agency is not in a state of solution, but in the form of suspended particles. For were it in solution, all of the milk would be similarly affected. In no case did lactic fermentation occur, proving that the souring could
not depend on anything inherent in
the milk itself, nor on anything under
diffused in the air, but on something
which was only to be met with in

dairies.
Bacteria developed under different
conditions are shown to differ in their
physical characters.
Bacterium Lactis developed after dilution
with 1200 parts of water was of extreme
small size not nearly so large as the
Torula, their grouping alone determining
their nature.

Admitting the probability of other
organisms existing, smaller than the
Bacterium Lactis, in the same ratio
as the latter to the Torula, we could
conceive of the existence of ultra-
microscopical organisms. Therefore,
Lister holds that although we do not find
any organisms in many and bit conditions
of trypipelas (which he had repeatedly
examined to this end) yet the existence
of such may be as real, and they may
produce as potent effects although we
may not be able to see them with any
microscope that we have. The Bacteria
get smaller after 24 hours, and to
see them best inoculate a drop of
boiled milk, by dipping into it the
point of a needle just dipped into
four milk, and then examine the
drop. owing to the minuteness of the
Bacteria, he would venture to say that
because he could not see them therefore they must be absent.
Lister considers it probable that Bacteria
are not require a germ in view of the fact that
as reproductive organisms in themselves,
if there be any organisms in existence
which do not require a germ certainly
Bacteria are such organisms.
Experiments such as those prove that
organic fluids do not contain in them the
ability of undergoing change, but it is only after the absorbition of
particles from the air, that the change
takes place and if by filtration or
heat of the particles from the air are
removed or destroyed the solution
will remain sterile.
These particles or minute organisms of
one kind or another, while present in
the air everywhere yet would appear
from Lyndall's experiments to be in
greatest strength and number in
those atmospheres which are least pure
and in such an atmosphere an organic
infusion will consequently sooner be
acted upon i.e. organisms will
need the shortest interval to produce
its full development within the
infusion itself. Being already more
advanced towards the condition of full
development, and moreover particular
organisms are developed in certain
atmospheres. B.Salts in animal Jos
example, as special infectious diseases.
arise under conditions of less and concentration in an analogous manner
and may similarly be concluded to be the result of the development of fire-
exciting germs very widely or universally diffused in the atmosphere, and await
only the necessary and favourable conditions to advance them to their
most potent stage conditions, which in many cases are provided by man
neglect.

These things therefore show that in time we ought to expect infectious diseases
by the aid of good drainage, wholesome ventilation, and above all places
set aside for stamping out such a
disease on its first appearance,
to be reduced to a minimum, instead
of raising the country and destroying
thousands, as has been the case
during the last few years. The more
to be regretted when the diseases, for the
most part are preventible.

Edward de Harrew Hutchinson
Bridlington.
April 14th.