13 A number of bacterial diseases

Tuberculosis (tbc; cough- and sneeze hygiene/ crowding)

Although not related to water and also not directly suppressed by civil or environmental engineering, is tbc yet important enough to spend more than a page. The incidence in the world is 9 million cases per year; most of them occurring in developing countries (95 percent). At least 3 million of the 52 million registered deaths per year in the world are due to tbc (6 percent!) However this also still was the case more than a century ago in The Netherlands: at least one third of the dead persons were killed from infection diseases, of which tbc was a leading component.

One third of the world population (1.7 milliard people) are exposed to the danger of infection of tbc; a big part of them are indeed infected; especially people who are underfed and patients infected with HIV (see chapter about STD). The WHO expected around 2000 an incidence of manifested tuberculosis of approximately 12 million per year (and possibly 4 million deaths). This infection disease causes many methodological problems: often the disease passes sub clinical (non-visual) and the people that recover usually still have slumbering bacteria, which later on in life can ‘inflame’ making the term recovery relative.

In The Netherlands the incidence at the moment is more than 1500 cases per year. More than half of the patients concern people from foreign origin, which is logical enough seeing that much higher incidences are elsewhere (table).

Tuberculosis is a disease that can occur in all organs and symptoms are therefore numerous. The most well known is lung tuberculosis, which the first symptoms often are fever and nightly sweating; later on cachexy (consumption) and blood vomiting follow. The patient can be contagious to his environment via for example coughing. In the beginning of the last century in The Netherlands tuberculosis quite frequently occurred in the ‘envelopes’ (meninges) around the brains.

Therapy mainly exists out of antibiotics. This has to be a combination of 3 or sometimes 4 different compounds, because *Mycobacterium tuberculosis* easily becomes resistant to antibiotics. At the moment the so-called multi resistant tubercle bacterium (MRTB) is forming a great problem, especially in America; mainly people with AIDS are often the victim (and not the cause as sometimes is implied).

In The Netherlands MRTB has turned up a few times as import tribe; local distribution does fortunately not exist (yet). Vaccination is possible, but the result is rather disappointing.

When a case becomes known, then immediately an extremely arranged action plan gets going. This not only involves the care of the patient, but also involves tracing down the contacts. They not only get a tuberculin test for existing antibodies, but everyone, who has been in close contact, gets prophylactic anti tbc measures as well (ring protection).

Leprosy (Hansen's disease)

Leprosy is caused by *Mycobacterium leprae*, a sister of the *Mycobacterium tuberculosis*. Leprosy was an endemic disease nearly over the whole world. In our country many so-called 'leprosy colonies' are known, which are little mediaeval hospitals where patients were isolated. However the diagnostic was often so bad that many non-lepers were thought to have leprosy. The disease is now driven back strongly. In 1990 nearly 4 million cases (incidence 0.5 million) were registered. Southeast Asia knows most of the cases.

Medicinal treatment is constantly improving. A vaccine however is still far ahead. The reducing number of patients are not contributing to the development of that vaccine, apart from the fact that the similar problems exist for developing a leprosy vaccine as there are in the case of tuberculosis; a disease with a much higher incidence.

Cholera (water borne)

(See there)

Legionellosis (veterans' disease)

In the summer of 1976 4400 war veterans (legionnaires) came together in a big hotel in Philadelphia. 149 of them got ill (morbidity 3.4 %) with symptoms unclear of belonging to a well-known disease; serious lung infection (pneumonia) was one of the main symptoms. This happened usually when they got home making it difficult to realize the scale of the epidemic.

Epidemiological research gave out that another 72 people, who had gone near to the hotel of the legionnaires, had symptoms as well. Eventually 34 people of the 221 patients died (CFR 15.4 %). Of the 123 examined patients 111 had proven pneumonia (90.2%).

During 1977 the cause was (still quite quickly) found: a bacterial disorder with as pathogen a gram-negative rod formed bacterium, which can live in water and air-conditioning systems. Because the organism was yet unknown, it was named, *Legionella pneumophila* (philos = friend) after the legionnaires and the affinity with the lungs. The bacterium is thermopile and obligate aerobe. It can be found in all sorts of watery environments as well as in buildings.

West-Friese Flora!

The plague (hygiene/ rodents)

In the nineteenth century the plague was proved to be caused by a bacterium: *Yersinia pestis* (before that it was called *Pasteurella pestis*). Yersin, student of Pasteur, was able to proof in Vietnam of a micro-organism causing the disease. This was a triumph in a long history of fear, desperation and guessing of the cause of this flagellum (and companion) of the human race. Humans are not the most important target of the carrier of the bacterium the flea (Pulex). In the first place all sorts of rodents are hosts to this blood-sucking flea. An infected animal transmits through his blood the plague bacterium to the flea. The bacterium stays in the beginning of the flea's stomach and blocks most of the entry towards the stomach. No matter how many times the flea bites it will stay hungry. With every bite bacteria can be transmitted into the victim. When many rodent hosts die, fleas also can attack humans. Firstly humans will develop bubonic plague; dark coloured swellings in the skin. Sepsis can then occur with the plague bacteria. People can infect each other, because pneumonia (lung infection) occurs from this blood poisoning: the so-called lung plague.