

media. The majority of these substances have been found to have a "toxic activity", demonstrated by damaging cells or tissues in some laboratory artificial system (experimental animals, their isolated tissues and cells etc.); their concrete role in causing the disease in man remains, however, uncertain. This is specifically true for some bacterial species, which -- before the BW treaty was concluded -- had belonged to the most important candidates as biological warfare agents (such as the agents of anthrax or plague). Hence it is very difficult (at present time largely impossible) to make a clear borderline between infection and intoxication.

There is also an increasing evidence indicating that only a few toxins are "simple toxins" -- as are for instance tetanus or botulinum toxins, both being homogeneous proteins, synthesized by bacterial cells as a fully active molecule. More often, the toxins are actually mixtures of substances of different chemical nature, and with different functions. The final "toxic activity" is thus often a sum of different discrete metabolic and other changes, and no one specific substance can be identified as the main one responsible for the "toxicity".

It should be also understood that toxins are not produced by a micro-organism just to be toxic. For the microb they serve as tools necessary mainly for active accommodation of the microenvironment, to create conditions needed for metabolism, growth and proliferation of microbial cells. They have been developed during the long evolutionary process of adaptation of the micro-organisms to their hosts. Accordingly, the "toxic mechanism" might be rather complex and subtle.

A lethal infectious disease such as cholera may be used as an example. Cholera is a typical intoxication localized in the small intestine. The toxin (cholera enterotoxin) is able to cause damage to some isolated tissues of experimental animals, so it was believed that some kind of injury of the small intestine mucous membrane is the reason for the disease in man. In the last years the "intoxication process" has been analysed in more detail. It appeared than in man, there is no injury to the mucous membrane cells at all. The toxin has only learnt the mechanism regulation secretion of fluid into the small intestine (something that the science itself has not yet sufficiently understood), is able to recognize and to react with the necessary receptors in the cell membrane and to give them false signal for secreting the fluid. Nothing more is needed for the cholera bacterium for which alkaline fluid, pumped into the intestine in an amount of 20-30 litres, is the most satisfactory living medium.