

### 3. Main aims

The organs of the respiratory tract, lung and trachea, are constantly exposed to many atmospheric pollutants such as ozone, nitrogen dioxide, cigarette smoke, and many metals and metalloids present in the aerosolic particulate matter. Lung and trachea contain the largest endothelial surface area of any organs, which makes them a major target site for circulating oxidants and xenobiotics. It is therefore not surprising that they require a specific antioxidant defense system. The antioxidants detoxify oxidants, free radicals, and electrophilic compounds. In this way they can protect alveolar macrophages, pulmonary epithelial cells and pulmonary endothelial cells from oxidative stress. Trace elements such as selenium, zinc, copper and manganese seem to play an important role in this defense system against oxidants and free radicals.

The trace elements have also other important biochemical and physiological functions in the living organisms, which strongly depend on their concentrations and chemical species in the tissues. Mostly trace elements do not occur in the body in their free form, but are bound to proteins on which they depended with regard to transport, storage and function. One third of the known proteins contain metals but there may be further trace element-containing proteins not yet identified. It is therefore of the great interest:

- to determine the trace elements present in the lung and trachea,
- to obtain information on their subcellular distribution,
- their chemical form,
- their biological effect.

To achieve these goals several experiments were carried out. Using element analytical methods the concentrations of several trace elements in the lung, trachea and their subcellular fractions were determined. Speciation analysis was applied for studies on the trace element-protein binding patterns in the tissues of the respiratory tract and cultured cells. The combination of the tracer techniques and biochemical methods was used for investigations of tracer element-containing proteins, their localization, characterization and identification.