2.2 Bio-Aerosols and Organic Dusts

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A bio-aerosol is a suspension in gas of solid or soluble particles of biological origin. Airborne and settled particles of biological origin are often referred to collectively, in the field of occupational hygiene, as organic dust. Bio-aerosol and organic dust exposures may vary qualitatively as well as quantitatively from one occupation or one environment to another. In some bio-aerosol or organic dust exposures, the exposure is primarily biological in origin, but a sig-
nificant portion may also be inorganic or mineral in origin, i.e., field dust exposure in farming. In certain types of farming, such dust may contain biologically active material such as silica (Lee et al. 2004), but this chapter is focusing on the potential health effects caused by the organic portion in bio-aerosols and organic dusts.

### 2.2.1 Spectrum of Respiratory Effect

Respiratory health effects are well-recognized problems after exposure to bio-aerosols and organic dusts. A number of different symptoms and diseases sometimes overlapping each other may affect subject after such exposure. In this chapter, the following illnesses are described:

- Extrinsic allergic alveolitis, also known as hypersensitivity pneumonitis (HP)
- Organic dust toxic syndrome
- Asthma
- Chronic obstructive pulmonary disease (COPD)

### Historical Notes

The hazardous effects of inhalation of organic dust has already been reported, in 1555, in Olaus Magnus’ masterpiece *Historia de gentibus septentrionalibus*, a history of the northern peoples (Olaus et al. 1996). In the chapter entitled “Threshing during the winter time,” Olaus Magnus described how the dust may damage the vital organs of the threshers. Olaus Magnus emphasized that the dust is so fine that it will almost unnoticeably penetrate into the mouth and accumulate into the throat. If this is not quickly dealt with by drinking fresh ale, the thrasher may never again or only for a short period eat what he had threshed, according to Olaus Magnus.

Bernardino Ramazzini reported symptoms from the respiratory tract in flax and hemp carders as well as in sifters and measurers of grain (Ramazzini 1700). This reference is often cited incorrectly in terms of date since the second edition of 1713 was translated into English in 1940. In this second edition, Ramazzini added some chapters, but the chapters on organic-dust-induced symptoms were included already in the first edition of *De morbis artificum* published in 1700.

In Iceland, reports appeared during the 18th and 19th centuries concerning a disease called “heysótt” caused by moldy hay (Eliasson 1982). Despite all knowledge from different countries, however, the danger of exposure to moldy material in farming was forgotten, until it was rediscovered and described by Campbell in 1931 (Campbell 1932). Pepys introduced the name extrinsic allergic alveolitis in 1967 (Pepys 1967). In the US, the term “extrinsic hypersensitivity pneumonitis” is preferred, since the disease is not only restricted to the alveoli and the parenchyma of the lung, but also affects the small airways. During the 1980s, researchers started to realize that mold dust exposure could also cause benign short-term febrile attacks that could be mistaken for allergic alveolitis, which is a severe lung disease with risk of sequelae. In 1985, it was decided to call these benign febrile attacks caused by inhalation of organic dust the Organic dust toxic syndrome (ODTS) (doPico 1986).

Asthma is one work-related respiratory tract disease that may affect farmers and was described for the first time in 1924 (Cadham 1924). In an analysis of data from the European Community Respiratory Health Survey (ECRHS), the highest risk of asthma attributed to occupation was found for farmers (Kogevinas et al. 1999). Other organic dust exposure are also well known risk factors for asthma development (Sigsgaard and Schlunssen 2004). A higher prevalence of chronic bronchitis and chronic airflow obstruction has been documented among certain farming populations, such as grain and animal feed workers, than in control subjects.

### 2.2.2 Extrinsic Allergic Alveolitis

Extrinsic allergic alveolitis or HP is an immunologically mediated inflammatory lung disease in the lung parenchyma induced by the inhalation of either organic or inorganic antigens and characterized by hypersensitivity to the antigens (Bourke et al. 2001). The prototype for the disease and the most widespread form of allergic alveolitis in the world is farmer’s lung disease, caused by inhalation of mold dust from hay, straw or grain. However, allergic alveolitis may be associated with a variety of occupations and exposures (Schatz and Patterson 1983). The disease is usually named colorfully after the environment in which it occurs and has been reported after over 30 different occupations and environments (Ando and Suga 1997). Dust of moldy bagasse thus gives rise to bagassosis, moldy redwood dust to sequeosis (after *Sequoia sempervirens*),