Was the Bishop Right?

In 1555, Danish Bishop Olaus Magnus recommended drinking fresh ale to treat the accumulation of threshing dust in the throat. Otherwise, he said “the thrasher may never again or only for a short period eat what he has threshed.” Since then, the potential inflammatory effects of grain dust have been demonstrated indirectly by many cross-sectional and short- and long-term longitudinal epidemiologic studies as well as by inhalation challenges with grain dusts or grain dust extracts.1,3 In this issue of CHEST (see page 1425), Von Essen and colleagues have shown via direct endoscopic visualization and bronchoalveolar lavage cell analysis that grain sorghum dust extract causes respiratory tract inflammation in healthy, nonsmoking volunteers. They propose this inhalation challenge model as a simple, safe method to study occupational respiratory tract inflammation and the efficacy of pharmacologic interventions to block symptoms, influx of neutrophils, and mediators. This study adds to the overwhelming evidence that grain dusts are biologically active and not just merely benign irritants.

Grain dust exposure can induce specific and nonspecific, early and late asthmatic reactions and nonspecific airways hyperresponsiveness as well as eye, nasopharyngeal, and skin irritation. Acute respiratory symptoms appear to be dose-related, and recurrent exposure can lead to chronic bronchitis with airflow obstruction. Most studies have shown that the effects of smoking and grain dust exposure are at least additive if not synergistic.1,2 Temporarily disabling febrile reactions with leukocytosis, called grain fever or organic dust toxic syndrome, occur often after high-level exposures.4 Hypersensitivity pneumonitis from inhalation of moldy grain differs from grain fever in that it is rare, requires sensitization, and causes lymphocytic rather than neutrophilic alveolitis. The cause and clinical significance of the restrictive ventilatory pattern detected in some studies require clarification.

Grain dusts are complex mixtures of plant-derived particles, natural contaminants, and human additives, and include bacteria, fungi, Thermacotinomyces, endotoxin, glucans, mycotoxins, proteases, animal hair, insect and mite particles, ammonia, pesticide residues, and silica. The potential harmful effects of grain dust depend not only on the amount inhaled and the pre-disposing factors of the hosts (smoking, atopy) but also on the composition, which varies with the region, weather, source of the product, type of grain, state of decomposition, temperature, etc. Subjective reports by grain handlers2 and in vitro studies5 have shown that various grains differ in their inflammatory potential. Several studies have identified specific allergens responsible for grain dust asthma, eg, storage mites, durum wheat, grain weevil. However, most grain handlers respiratory tract disorders are most likely nonspecific inflammatory reactions to one or more components of the dust.1,2 It is very likely that endotoxin plays an important role.6,7 The nonspecific mechanism is suggested by the high prevalence of work-related symptoms and the development of asthma-like syndrome in previously nonsensitized individuals and supported by the ability of grain dust to directly effect release histamine and leukotrienes from human lung tissue,8 activate complement,9 and stimulate cells in the immune system in a nonspecific manner.”

Those who risk exposure to grain dust include farmers, grain elevator operators, truckers, longshoremen, grain inspectors, and those who work in feed mills, breweries, or food manufacturing. Outbreaks of asthma have resulted from contamination of city air from soybean dust released from harbor elevators.10

The dust control engineering improvements in grain elevators have resulted in better working environments and reduced risk of explosions. Avoidance of smoking and reducing dust exposure when feasible to less than 4 to 5 mg/m³, or personal respiratory protection are likely to reduce respiratory morbidity more than drinking ale, but, the bishop was right: grain dust can be harmful to susceptible individuals under certain working conditions.

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REFERENCES
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