

Microbiological Contamination in Office Buildings

by John Dean, C5 Plus

Modern energy efficient buildings recycle indoor air. This activity has a tendency to concentrate contaminants. Microbiological contamination is no exception. In high concentrations, these organisms, depending on their identity, can cause illness among building occupants.

Biological contaminants include bacteria, fungi, viruses, algae, insect parts, and dust that may result in allergenic or pathogenic reactions. There are many sources for these pollutants: pollens from outdoors, viruses and bacteria from humans, hair and skin flakes from household pets, etc.

An indoor moisture level of 30 to 50 percent relative humidity in tenant office space is recommended to maintain good health and comfort. However, it is important to recognize that moisture reservoirs have the ability to act as a breeding ground for the growth of fungi, bacteria and mites. Many biological pollutants can multiply in standing water, in cooling towers, in water-damaged ceilings, walls, and carpets, and on outer wall surfaces where moisture in the air may condense. These pollutants may then be distributed through the building's HVAC systems.

A wide range of disease, both infectious and non-infectious, may be caused by biological contaminants. These include allergic reactions, which show up as coughing, watery eyes and breathing problems, bronchitis and other long-term respiratory illnesses. For example, widely publicized cases involving Legionnaire's Disease and Pontiac Fever occurred when improperly maintained HVAC systems within large office buildings incubated and then distributed disease-causing micro organisms.

Fungal spores are a broad class of biological organisms that can function as potential allergenic agents and may be found in air conditioning systems. They can also originate outdoors, where their numbers are subject to seasonal variations.

Existing guidelines, by the American Conference of Governmental Industrial Hygienists (ACGIH), recommend concentration limits for unidentified fungal species, in the indoor environment, of 500 colony-forming units (CFU) per m³ of air.

Typical outdoor bacteria levels in Alberta have been reported to be as high as 2000 CFU/m³. Since the air entering an office building is filtered, the typical guideline for airborne bacteria in the indoor environment should be lower, and is taken to be between 100 and 200 CFU/m³.

Accepted guidelines, in Alberta, for surface microbiological contamination in the indoor environment are 10,000 CFU per 100 cm² for both bacteria and fungi.