Hypersensitivity pneumonitis (HP) is a respiratory disease caused by a delayed immune response to a variety of antigens, primarily consisting of bacteria, fungi and bird proteins. Symptoms include shortness of breath, cough and fever, which occur within hours of exposure to the offending antigen. Continuous contact with the antigen can lead to permanent lung damage. HP was first described in farmers >100 years ago (1), while its cause and immune mechanisms were identified in the early 1960s by Dr Jack Pepys (2).

Canadian contributions to the understanding of HP date back to the early 1970s, when Drs Peter C Warren and Freddy Hargreve, both fellows with Dr Pepys, came to Canada from the United Kingdom. While working with Dr Pepys, Dr Hargreve developed an antigen provocation test to help diagnose bird fancier’s lung (3). On arrival to Canada (McMaster University, Hamilton, Ontario), he published an extensive review on HP in the Canadian Medical Association Journal (4). He subsequently switched the focus of his research to asthma to become one of Canada’s leading experts on the subject.

Dr Peter C Warren (University of Manitoba, Winnipeg, Manitoba) published an article in 1977 that had a major impact on our understanding of the pathophysiology of HP (5). He reported that cigarette smokers exposed to farmer’s lung antigen, Saccharopolyspora rectivirgula (SR, then called Micropolyspora faeni), had significantly lower levels of serum-specific antibodies to this bacteria. This observation led to numerous questions that will be addressed later.

The majority of Canadian contribution to the understanding of HP came from Laval University in Quebec City, Quebec. Since 1982, investigators have published 84 original and review articles, and 16 book chapters on the subject.

Farmers played a major role in the prevention of farmer’s lung. When I started my practice in Quebec City in 1977, we were seeing between 20 and 30 new cases of farmer’s lung per year. Now we may see one every two or three years. The difference? Not scientific research, but farming technology. The solution was to eliminate hay and straw molding. This would prevent farmer’s lung and improve the quality of these stored foliages. Farmers could not change the wet climate in Eastern Canada, which resulted in hay being stored too wet, leading to molding. The solution was in the methods of hay making and storage. The first trials of these new methods of handling hay were not all successful. Investigators added acetic acid to the hay, but that caused corrosion of the bailers. One company sold sachets of lactobacillus, which the farmers inoculated hay with. The concept was that if the lactobacillus grew first, it would prevent SR from growing. One of my graduate students at the time, Dr Caroline Duchaine, now a highly successful aerobiologist at Laval University, challenged that concept. What she did was simple. She took samples of hay at different humidity levels and performed a double-blinded test with or without the lactobacillus. She published the results of that study (6), which, to us, confirmed the futility of the treatment. More successful approaches included crushing freshly cut hay through a type of wringer to squeeze out most of the juice; equipping barns with huge fans that act as hay dryers; and wrapping hay in plastic bags, preventing the entry of oxygen, which is essential for SR growth. The latter solution, although effective, is environmentally questionable and certainly spoils the view of the countryside.

Although farmer’s lung is related to humid summer conditions typical in Eastern Canada, Dr James Dosman’s group identified cases in the drier climates of Saskatchewan (7). Most importantly, in Saskatchewan, the disease is probably related to different antigens (penicillium species) rather than SR, which causes HP in more humid environments. This antigen was also found to be responsible for HP in a workplace in Toronto, Ontario (8).

Now that farmers have almost eliminated farmer’s lung, do we still see HP in Canada? Yes we do. HP is no longer a farmer’s issue but one of multiple workplaces and the home. The number of settings, environments and causes of HP is continually increasing. Metal workers are exposed to aerosolized metal working fluid that often contains mycobacteria that can cause HP (9). In 2004, Dr Caroline Duchaine and her team studied the microflora of metal fluid used in a major automobile manufacturer in Ontario after they had outbreaks of metal-fluid HP. She found that when mycobacteria are established in the biofilms of the fluid system, it is very difficult, if not impossible, to eradicate them (10). We also observed HP in wood transformation plants (11), peat moss packaging units (12) and in a duck abattoir (unpublished personal observation). HP can be caused by molds that grow in saxophones (13) and clothes dryer vents, or can be associated with raising pigeons, doves or love birds, or having down pillows in the home.

Dr Hubert Reynolds (Hershey, Pennsylvania, USA) was the first to describe the accumulation of large number of inflammatory lymphocytes in the lungs of patients with HP (14). The question raised by that report involved the peculiar case of asymptomatic individuals who are exposed to an environment that can cause HP who have serum antibodies (precipitins) to the antigen. In the early 1980s, we studied several asymptomatic dairy farmers with serum antibodies to the SR antigen and found that most of them also had an increased number of lymphocytes in their lungs (15). Although they exhibited an inflammatory reaction in their lungs, they remained asymptomatic, with no lung damage over the 20 years they were followed-up (16).

Returning to Dr Warren’s article on cigarette smoking, we tested a model of HP in guinea pigs. A group of animals was exposed to cigarette smoke (provided by Rothman, British American Tobacco, USA) while a control group was not. Cigarette smoke decreased the inflammatory response to the antigen challenge (17). Nicotine was considered to be the likely substance that protected against HP (18), as it does for other diseases such as ulcerative colitis (19).

It has often been observed that at the beginning of an HP attack, subjects report flu-like symptoms. We found that a viral infection could destabilize the immune response and trigger HP (20). We also reported the presence of viral antigen in lungs of HP patients (21).

In 1990, Dr Marc Lalancette, a medical resident at Laval, made an important observation that was published in the American Journal of Respiratory and Critical Care Medicine (22). He found that, in farmers who experienced permanent lung damage from farmer’s lung disease, it
occurred most often in the form of emphysema, not lung fibrosis, which was the common belief at the time.

In 2003, my colleague Dr Yves Lacasse and international collaborators published the results of the ATS HP study group on diagnostic criteria for HP (23). This work is the only validated diagnostic rule for HP. Finally, Johannson and Reyerson (24) recently published a practical review article in this Journal.

The recent history of Canada's contribution to knowledge on HP began in 1973 with a review article by Dr Hargreave (1) and continues to this day with a review article (24), both published in a Canadian journal. The Laval University group has significantly contributed to our understanding of the epidemiology, clinical aspects and pathophysiology of HP.

REFERENCES
Submit your manuscripts at
http://www.hindawi.com