

# Bronchiolitis obliterans and wood-burning stoves

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## Résumé

L'AUTEUR PASSE EN REVUE LES CARACTÉRISTIQUES de la bronchiolite oblitérante, affection qui peut être mortelle et qui a été décrite pour la première fois en 1901. Il y a deux principales formes de la maladie. Dans la forme «classique», des polypes de tissu de granulation se forment dans la lumière bronchiolaire, habituellement après une exposition massive à des vapeurs toxiques. Dans la forme «péribronchiolaire», une réaction inflammatoire comprime la lumière mais laisse les muqueuses intactes. Ce type, habituellement associé à une exposition chronique, évolue plus lentement que le type classique. L'auteur commente l'étude de cas que le D<sup>r</sup> David T. Janigan et ses collègues présentent dans ce numéro (page 1171) au sujet d'une bronchiolite oblitérante classique chez un homme qui a fait brûler des matériaux de construction dans un poêle à bois.

Air is transported from the atmosphere to the gas-exchanging surface of the lungs through a complex system of airways. These airways can be divided into the trachea and bronchi, which have mucus-secreting glands and cartilage in their walls; the bronchioles, which do not; and the respiratory bronchioles, where alveoli first appear. The distance between the smaller bronchi and the distal respiratory bronchioles is measured in millimetres, and the increasing number of airways created by the rapidly branching system accordingly increases the total cross-sectional area of airway lumen. This allows rapid diffusion of oxygen and carbon dioxide to and from the alveolar surface.<sup>1</sup>

Holt<sup>2</sup> distinguished bronchiolitis from bronchitis and bronchopneumonia in the last century and showed that bronchiolitis caused the trapping of gas as a result of disease in the smaller airways. The term "bronchiolitis obliterans" was introduced in 1901 to describe a severe idiopathic respiratory illness in which autopsy revealed the lungs to be studded with small nodules produced by lesions in the terminal bronchioles.<sup>3,4</sup> It was noted that the lumen of the bronchioles was obliterated by a plug of granulation tissue that extended from the bronchiolar wall. The fact that the inhalation of acrid fumes could cause similar lesions was reported in 1917,<sup>5</sup> and the term "bronchiolitis obliterans" was used to describe the pathologic features of the lungs of a person exposed to fumes containing nitrogen dioxide.<sup>6</sup> This was followed by a report that showed that nitrogen dioxide was responsible for the lesions observed in the lungs of patients with silo-filler's disease.<sup>7</sup> Since then, the term "bronchiolitis obliterans" has been widely applied to pathologic changes in the lungs associated with drug reactions, diseases of connective tissue, and bone-marrow and lung transplants.<sup>8</sup>

Colby<sup>9</sup> has described the pathology of airway obliteration under 2 separate categories. In classic bronchiolitis obliterans the lesions involve the airway wall and lumen and are characterized by intraluminal polyps of connective tissue. In the second, peribronchiolar, type an inflammatory process constricts the lumen but leaves the mucosa relatively intact. These different forms are probably determined by the location of the microvascular bed that responds to the inflammatory stimulus. The intraluminal polyps in classic bronchiolitis obliterans probably arise from an inflammatory reaction that is based in the submucosal microvessels, whereas the constrictive form involves an inflammatory response of the adventitial microvessels outside the muscle layer.<sup>10</sup> The histologic features of these 2



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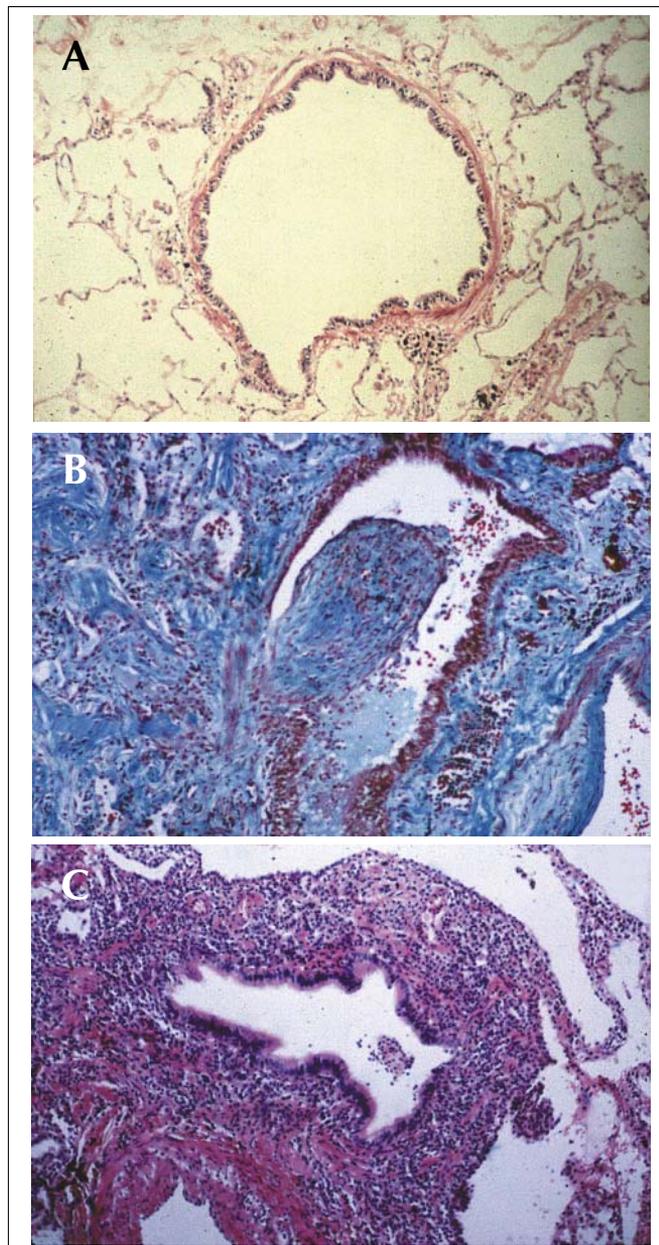
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types of bronchiolitis obliterans (and of asthma) are illustrated in Fig. 1.

The illness associated with classic bronchiolitis obliterans has 3 stages. Immediately after a massive exposure to toxic fumes, cough and dyspnea usually develop and the sputum becomes rust-coloured. This phase can last for several days. An interval of approximately 1 week then follows in which symptoms diminish but fever gradually de-



**Fig. 1: Comparative histology of bronchiolitis obliterans: (A) normal airway; (B) classic form of disease with intraluminal polyp; (C) peribronchiolar form with clear lumen. In classic bronchiolitis obliterans the inflammatory process involves mainly the submucosal vessels. In the peribronchiolar form it involves primarily the vessels in the outer wall. All photos are by the author.**

velops. By the third week, cough and dyspnea return and worsen in association with a deterioration in lung function. This stage can end in death. With lesser degrees of injury, symptoms are less severe and the patient gradually recovers. Chest radiographs show a diffuse nodular pattern, and (if the patient dies) autopsy reveals that nearly all the bronchioles have intraluminal polyps of granulation tissue.

The syndrome associated with constrictive bronchiolitis is quite different in that it is usually associated with more prolonged and persistent respiratory injury and a gradual reduction in airway function.<sup>11</sup> This peribronchiolar form of the disease progresses more slowly than the classic type and may result in bronchiectasis. It is extremely important to establish whether there has been a history of chronic exposure to toxic fumes and to rule out the possibility that the bronchiolitis and bronchiectasis are the result of infection.

In this issue (page 1171) Dr. David T. Janigan and colleagues describe an interesting case of classic bronchiolitis obliterans. Their report should alert us to the danger of burning inappropriate materials in wood-burning stoves: in this case, particle-board panelling and polystyrene insulation. The patient's symptoms developed within hours of his exposure to fumes from these materials in a small, poorly ventilated room. There was little if any smoke to warn the patient of the danger. His symptoms progressed over 11 days before he sought medical attention. The results of chest radiography, pulmonary function tests and open lung biopsy were consistent with classic bronchiolitis obliterans with intraluminal polyps; fortunately, the patient gradually recovered. Janigan and colleagues point out that the use of wood-burning stoves for home heating has increased substantially since 1970. The danger they describe should be taken seriously. Bronchiolitis obliterans is a life-threatening condition that is far easier to prevent than to cure.

## References

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