

PULMONARY EFFECTS OF ACUTE EXPOSURE TO NITROUS FUMES — A CASE REPORT

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SYNOPSIS

A 42 year old male with no previous history of respiratory disease was exposed for 3 hours to nitrous fumes from a leaking nitric acid drum. 12 hours later he developed acute dyspnoea. There were crepitations all over the lungs. Investigations showed leucocytosis, hypoxemia and reduced transfere factor for carbon monoxide. The chest X ray was compatible with pulmonary oedema. He was treated with high concentrations of oxygen, intravenous hydrocortisone and ampicillin. Progress was satisfactory and there was complete recovery.

INTRODUCTION

It is well known that inhalation of nitrous fumes give rise to pulmonary disease. There are few case reports of acute exposure to nitrous fumes (1,2,3). There are no local case reports.

CASE REPORT

A 42 year old Chinese male, an assistant manager of a Hardware and Chemical store, with no previous history of respiratory disease was exposed for 3 hours to nitrous fumes from a leaking nitric acid drum. 12 hours later he developed a dry cough and experienced acute dyspnoea. He was hospitalised for management. On admission he was very dyspoeic and cyanosed. Respiratory rate was 38/minute, pulse 100/min. Bp 120/80. There were crepitations in both lungs. Blood gases showed hypoxemia PaO₂ 53mmHg see table I. Total white cell count was 24,000/mm³. (80% polymorph.) Chext X ray showed opacities through out both lung fields more marked in the mid and lower zones, compatible with pulmonary oedema. ECG showed sinus tachycardia. He was treated with 50% oxygen, Intra-venous hydrocortisone, ampicillin and prednisolone. On the 2nd day he was worse and required intubation and I.P.P.B. Progress was satisfactory. Lung function tests on the 12th and 75th day showed reduced transfere factor for carbon monoxide. The tests were not repeated as he made a full clinical recovery. Crepitations disappeared on the 10th day. Total white cell count returned to normal on the 18th day. The chest X ray showed clearing on the 5th day and was completely clear after 3 months. The effort tolerance was normal after 3 months. Prednisolone was stopped after 7 weeks.

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Table 1 Results of investigations.

	Predicted	Days of exposure					
		1	2	7	8	12	75
FEV ₁ (1.,BTPS)	2.92					2.7	2.9
VC (1.,BTPS)	3.35					3.0	3.5
FEV ₁ FVC%	70					89	86
TLC (1.,BTPS)	4.9					4.3	4.6
FRC (1.,BTPS)	2.86					2.5	2.3
RV (1.,BTPS)	1.7					1.7	1.12
MMFR (1.,BTPS)	3.62					4.08	4.5
DCO						7.8	8
ml/min/mmHg	17.2						
PaO ₂ (mm Hg)		53	30	136	92		
Sa O ₂ %		83	83	99	98		
Pa CO ₂ (mm Hg)		39	35	35	38		

DISCUSSION

Nitrous fumes comprise varying concentrations of the 5 oxides of nitrogen, the most toxic of which is nitrogen dioxide (4.5). There are 5 distinct situations in which man may be exposed to the dioxides of nitrogen. These are (a) leakage during transport and storage of nitric acid as in this case, (b) arc welding in a close space (3), (c) combustion of nitrocellulose containing substances e.g. X ray (1), (d) in mining where short guns are used (2), (e) in silo-filler's disease (6). Unlike exposure to chlorine, there was absence of upper respiratory tract irritation. This is because nitrogen dioxide is a poorly soluble gas. The onset of pulmonary oedema after exposure may be delayed for 36 hours. In this case there was complete recovery from pulmonary oedema which followed 12 hours after exposure. On the other hand, bronchiolitis obliterans (3,7) developed 2-6 weeks after recovery from pulmonary oedema. Bronchiolitis obliterans may clear completely or be followed by diffuse interstitial fibrosis (5). The immediate effect of acute exposure may not be prominent, and bronchiolitis obliterans may be the first presentation (3). Leucocytosis has been observed in all cases (8). There was hypoxemia with out hyperventilation which is variable. Lung function tests showed reduced transfere factor for carbon monoxide. A restrictive pattern and air way obstruction has

been observed (3). Response to high doses of corticosteroids was remarkable and life saving. Recent publications (9, 10) mentioned exposure to nitrous fumes as a cause of Adult Respiratory Distress Syndrome.

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