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Chlamydial respiratory infections

Common but difficult to diagnose

The identification in 1986 of a new species of chlamydia, *Chlamydia pneumoniae,* as an important respiratory pathogen has led to a reappraisal of our concept of chlamydial respiratory infections.[1-3] Doctors familiar with *C psittaci* infection in patients who have contact with birds[4] and *C trachomatis* infection in neonates[5,6] must now consider *C pneumoniae* infection in the differential diagnosis of a wider spectrum of respiratory tract infections. The clinical recognition of the role of *C pneumoniae* is, however, hampered by the lack of a widely available diagnostic test that can distinguish between the three species of chlamydia.

Although *C pneumoniae* was isolated from the conjunctiva of a child in Taiwan in 1965, and in Iran in 1967, not until 1986 was it confirmed as a respiratory pathogen, when it was isolated from throat swabs of students with acute respiratory symptoms at the University of Washington, Seattle.[1,2] Since then seroepidemiological studies have suggested that *C pneumoniae* is the commonest chlamydial infection in humans worldwide, with antibodies to this organism found in 59% of adults in Pittsburgh, 75% in Taiwan, 63% in Spain, and 15% in the Solomon Islands.[7]

Even before that, in 1980, Darougar *et al* reported antibody prevalences in male and female blood donors in London of 24% and 14% respectively,[8] and Forsey *et al* noted an annual increase in the prevalence of antibodies to *C pneumoniae* from 1979 to 1984 in the United Kingdom.[9] Recently high prevalences have been found in two predominantly male populations in the United Kingdom, with 47% of farmers and 73% of pigeon fanciers found to have IgG antibodies to *C pneumoniae.*[10] Outbreaks of *C pneumoniae* infection have occurred in universities, schools, military institutions, and within families, suggesting direct person to person spread of infection without any avian or animal reservoir of infection.[1-3,11,12] Most humans seem to be infected and reinfected with this organism throughout their lives.[3]

In a study of 593 patients with serological evidence of *C pneumoniae* infection 50% had a diagnosis of pneumonia, 28% bronchitis, 10% "flu like" illness, 4% upper respiratory infection, 4% pharyngitis, 2% sinusitis, and 1% otitis.[13] Infection with *C pneumoniae* often produces a biphasic illness with initial pharyngitis and hoarseness followed by symptoms of lower respiratory tract infection.[1] Twenty out of 198 patients admitted to hospital with pneumonia in Seattle had serological evidence of *C pneumoniae* infection.[14] Similarly, 12% of cases of community acquired pneumonia in Sweden were attributed to *C pneumoniae.*[15] The illness produced by *C pneumoniae* is usually mild but may be severe in patients with pre-existing chronic diseases[16] or in immunocompromised patients.[17]

C trachomatis was previously regarded as the most widespread human chlamydial infection, causing trachoma, non-gonococcal urethritis, and pelvic inflammatory disease. Respiratory infections due to *C trachomatis* predominantly affect neonates who contract infection from their mother's genital tract.[5,6] Affected infants often have associated chlamydial conjunctivitis and present with tachypnoea, cough, crackles, and diffuse infiltrates on chest radiography. The illness is generally mild but respiratory failure may rarely occur,[6] and a high incidence of chronic respiratory sequelae including airways obstruction and asthma has been reported.[5] Rare cases of *C trachomatis* pneumonia in immunocompromised adults have been documented in which the organism has been isolated from the respiratory tract,[18] but in other such cases, diagnosed serologically, retesting of the serum has shown that many of the seroconversions attributed to *C trachomatis* were actually due to cross reactions with antibodies to *C pneumoniae.*[2]

Physicians have long been familiar with *C psittaci* as a respiratory pathogen, and indeed the term "chlamydial respiratory infection" has often been considered synonymous with psittacosis. Whereas *C pneumoniae* and *C trachomatis* are almost exclusively parasites of humans, *C psittaci* primarily infects birds and domestic mammals, with infection of humans occurring as a zoonosis.[4] Although direct person to person spread of infection has been described,[4] the lack of an identified avian source in many cases of apparent psittacosis has been puzzling. Retrospective studies of stored serum have now shown that many patients diagnosed as having psittacosis on the basis of a positive result on a complement fixation test were actually infected with *C pneumoniae.*[11]

At present when clinicians request "chlamydial serology" the standard test applied is a complement fixation test with the genus lipopolysaccharide antigen. Unfortunately, this test cannot differentiate between chlamydial species and also lacks sensitivity, detecting only a minority of cases of *C pneumoniae* infection.[3,16] Type specific microimmunofluorescence tests are sensitive and can differentiate between species but are technically difficult and available only in specialist laboratories. Antibody responses to chlamydial infections are complex and may be blunted by antibiotics. A first infection with *C pneumoniae,* for example, produces a rapid complement fixing antibody response, with IgM microimmunofluorescent antibody developing at about three weeks and IgG

antibody at about six to eight weeks after the onset of illness.[16] During reinfection, however, there is often no complement fixing antibody response. Cross reactions between chlamydial species—even on "type specific" microimmunofluorescent tests—may give confusing results, and detailed prolonged serological investigations may be needed to identify the causative organism.[4] Techniques such as DNA amplification by the polymerase chain reaction may prove useful,[19] but much of our current knowledge of chlamydial respiratory infection is based on microimmunofluorescent serological tests.

Tetracycline and erythromycin have formed the basis of antibiotic treatment of *C psittaci* and *C trachomatis*, and these antibiotics are also effective against *C pneumoniae*, although prolonged treatment for 10-14 days with doses of 2 g/day may be necessary.[1 3 20] Ofloxacin and clarithromycin may be effective alternatives, although this supposition is based on initial laboratory tests and limited clinical experience.[20]

The explosion of knowledge resulting from the discovery of *C pneumoniae* has revolutionised concepts of chlamydial respiratory infection. Research suggests that this organism may account for many cases of respiratory infection in which no pathogen is identified. Further preliminary reports suggest that *C pneumonia* also plays a part in asthma,[21] sarcoidosis,[22] and ischaemic heart disease.[23] The limitations of current diagnostic tests, however, mean that the precise role of chlamydial infections in respiratory disease in the United Kingdom remains to be defined.

S J BOURKE
Consultant physician

Chest Unit,
Newcastle General Hospital,
Newcastle upon Tyne NE4 6BE

1 Grayston JT, Kuo C, Wang SP, Altman J. A new Chlamydia psittaci strain, TWAR, isolated in acute respiratory tract infections. *N Engl J Med* 1986;**315**:161-8.
2 Schachter J. Chlamydia psittaci—"re-emergence" of a forgotten pathogen. *N Engl J Med* 1986;**315**:189-91.
3 Grayston JT. Chlamydia pneumoniae, strain TWAR. *Chest* 1989;**95**:664-9.
4 Bourke SJ, Carrington D, Frew CE, Stevenson RD, Banham SW. Serological cross-reactivity among chlamydial strains in a family outbreak of psittacosis. *J Infect* 1989;**19**:41-5.
5 Weiss SG, Newcomb RW, Beem MO. Pulmonary assessment of children after chlamydial pneumonia of infancy. *J Pediatr* 1986;**108**:659-64.
6 Wheeler WB, Kurachek SC, Lobas JG, Einzig MJ. Acute hypoxemic respiratory failure caused by Chlamydia trachomatis and diagnosed by flexible bronchoscopy. *Am Rev Respir Dis* 1990;**142**: 471-3.
7 Wang SP, Grayston JT. Population prevalence antibody to Chlamydia pneumoniae, strain TWAR. In: Bowie WR, Caldwell HD, Jones RP, Mardh PA, Ridgway GL, Schachter J, *et al*, eds. *Chlamydial infections*. Cambridge: Cambridge University Press, 1990:402-5.
8 Darougar S, Forsey T, Brewerton DA, Rogers KL. Prevalence of antichlamydial antibody in London blood donors. *Br J Vener Dis* 1980;**56**:404-7.
9 Forsey T, Darougar S, Treharne JD. Prevalence in human beings of antibodies to Chlamydia IOL-207, an atypical strain of chlamydia. *J Infect* 1986;**12**:145-52.
10 Bourke SJ, Carrington D, Frew CE, McSharry CP, Boyd G. A comparison of the seroepidemiology of chlamydial infection in pigeon fanciers and farmers in the UK. *J Infect* 1992;**25**:91-8.
11 Fryden A, Kihlstrom E, Maller R, Persson K, Romanus V, Ansehn S. A clinical and epidemiological study of "ornithosis" caused by Chlamydia psittaci and Chlamydia pneumoniae (strain TWAR). *Scand J Infect Dis* 1989;**21**:681-91.
12 Ghosh K, Frew CE, Carrington D. A family outbreak of Chlamydia pneumoniae infection. *J Infect* 1992;**25**(suppl 1):99-103.
13 Myhra W, Mordhorst CH, Wang SP, Grayston JT. Clinical features of Chlamydia pneumoniae, strain TWAR, infection in Denmark 1975-1987. In: Bowie WR, Caldwell HD, Jones RP, Mardh PA, Ridgway GL, Schachter J, *et al*, eds. *Chlamydial infections*. Cambridge: Cambridge University Press, 1990:422-5.
14 Grayston JT, Diwan VK, Cooney M, Wang SP. Community and hospital-acquired pneumonia associated with Chlamydia TWAR infection demonstrated serologically. *Arch Intern Med* 1989;**149**:169-73.
15 Sundeloef B, Gnarpe J, Gnarpe H, Darougar S. Chlamydia pneumoniae pneumonia in Sweden. In: Bowie WR, Caldwell HD, Jones RP, Mardh PA, Ridgway GL, Schachter J, *et al*, eds. *Chlamydial infections*. Cambridge: Cambridge University Press, 1990:426-8.
16 Marrie TJ, Grayston JT, Wang SP, Kuo C. Pneumonia associated with the TWAR strain of chlamydia. *Ann Intern Med* 1987;**106**:507-11.
17 Augenbraun MH, Roblin RM, Chirgwin K, Landman D, Hammerschlag MR. Isolation of chlamydia pneumoniae from the lungs of patients infected with the human immunodeficiency virus. *J Clin Microbiol* 1991;**29**:401-2.
18 Tack KJ, Rasp FL, Hanto D, Peterson PK, O'Leary M, Simmons RL, *et al*. Isolation of Chlamydia trachomatis from the lower respiratory tract of adults. *Lancet* 1980;i:116-20.
19 Gaydos CA, Quinn TC, Eiden JJ. Identification of Chlamydia pneumoniae by DNA amplification of the 16S r RNA gene. *J Clin Microbiol* 1992;**30**:796-800.
20 Fenelon LE, Mumtaz G, Ridgway GL. The in-vitro antibiotic susceptibility of Chlamydia pneumoniae. *J Antimicrob Chemother* 1990;**26**:763-7.
21 Hahn DL, Dodge RW, Golubjatnikov R. Association of Chlamydia pneumoniae (strain TWAR) infection with wheezing, asthmatic bronchitis, and adult-onset asthma. *JAMA* 1991;**266**:225-30.
22 Groenhagen-Riska C, Saikku P, Riska H, Froeseth B, Grayston JT. Antibodies to TWAR—a novel type of Chlamydia in sarcoidosis. In: Grassic C, Rizatto G, Pozzi E, eds. *Sarcoidosis and other granulomatous disorders*. Amsterdam: Elsevier Science, 1988:297-301.
23 Saikku P, Leinonen M, Tenkanen L, Linnanmaeki E, Ekman MR, Manninen V, *et al*. Chronic Chlamydia pneumoniae infection as a risk factor for coronary heart disease in the Helsinki Heart Study. *Ann Intern Med* 1992;**116**:273-8.

Patients with brain injuries

A national rehabilitation service is needed to lift the burden from carers

In a regional health authority with a population of 3·5 million, each year around 140 people survive brain trauma of moderate or worse severity. These join a population in Britain of up to 70 000 disabled survivors, most of whom have a normal life expectancy.[1] These estimates exclude patients with brain damage associated with cerebral tumours, vascular accidents, metabolic disorders, and other causes; and there are many more victims of minor brain injuries. These last may be declared fit yet have undetected and disabling cognitive deficits.

Injury to the brain may be accompanied by severe physical problems that require intensive early treatment and extended rehabilitation. At first these may overshadow important cognitive sequelae such as amnesia, disorientation, and perceptual disorder.[2] The most troublesome long term morbidity, however, is caused by behavioural and emotional consequences, including sexual disinhibition, aggression, apathy, anxiety, and lability of mood.[3] Patients with these symptoms cannot participate in, and are usually excluded from, conventional rehabilitation programmes. They may languish in acute beds—we know of one patient who occupied a surgical bed for 10 years because of his physical dependency and disordered behaviour.

The development of NHS services for patients with brain injuries has so far been haphazard. Voluntary self help organisations such as Headway (the National Head Injuries Association) and Amnass (the Amnesia Association, now part of Headway) were set up—at least in part—because services were so poor. For example, Headway Houses provide continuing care in the community for some of the disabled people with brain injuries. By contrast with the NHS, the independent sector in Britain has been responsible for much innovation, research, and service development for patients with brain injuries. The main health insurers are not, however, prepared to finance years of rehabilitation, so these facilities are available only to those patients who are paid for by insurance settlements or health authorities.

These problems have been recognised for 20 years or more, and reports have been produced by the Royal College of Physicians,[4] the Medical Disability Society (now the British Society for Rehabilitation Medicine),[1] and the Royal College of Psychiatrists.[5] These have spelt out the size and complexity of the problem and the need for a properly coordinated national strategy and effective training of professional staff. Rehabilitation requires a multidisciplinary approach, incorporating nursing; psychology; occupational, speech, music, and art therapies; physiotherapy; clinical engineering; dietetics; oral hygiene; and social work. The problem for the