

- Amblyomma sparsum* ticks found on tortoises imported into Florida. *Journal of Parasitology* **86**, 1135-1136
- COMPANION ANIMAL WELFARE COUNCIL (2003) Report on the welfare of non-domesticated animals kept for companionship. Sidmouth, Companion Animal Welfare Council
- NATIONAL CENTER FOR BIOTECHNOLOGY INFORMATION (2003) www.ncbi.nlm.nih.gov/BLAST/. Accessed July 25, 2003
- PAROLA, P., INOKUMA, H., CAMICAS, J. L., BROUQUI, P. & RAOULT, D. (2001) Detection and identification of spotted fever group *Rickettsiae* and *Ehrlichiae* in African ticks. *Journal of Emerging Infectious Diseases* **7**, 1014-1017
- REDROBE, S. (2002) Reptiles and disease – keeping the risks to a minimum. *Journal of Small Animal Practice* **43**, 471-472
- WARNER, C. K. & DAWSON, J. E. (1996) Genus- and species-level identification of *Ehrlichia* species by PCR and sequencing. In PCR Protocols for Emerging Infectious Diseases. Ed D. H. Persing. Washington DC, ASM Press. pp 100-111
- WOODWARD, D. L., KHAKHRIA, R. & JOHNSON, W. M. (1997) Human salmonellosis associated with exotic pets. *Journal of Clinical Microbiology* **25**, 2786-2790

## Interferon treatment of circovirus infection in grey parrots (*Psittacus e erithacus*)

M. STANFORD

PSITTACINE beak and feather disease (Pbfd) is an important fatal disease of parrots caused by a circovirus (Ritchie and others 1989). Pbfd virus is a small (15 to 17 nm) DNA virus spread through feather dust, faeces or crop fluids (Ritchie and others 1991a) and it is very resistant in the environment. It attacks rapidly growing cells and clinically can cause a chronic progressive feather dystrophy or an acute immunosuppressive disease depending on the age of the host when infected, due to its effects on bone marrow. The immunocompromised birds develop fatal secondary infections, the most common of which is severe pulmonary aspergillosis. Diagnosis is by PCR using a viral-specific DNA probe for Pbfd virus from blood or feather pulp samples (Niagro 1990). There is no known treatment and control involves euthanasia of infected birds combined with disinfection of aviaries. The majority of adult birds can eliminate the virus, but this appears to be uncommon in young grey parrots (Ritchie and others 1991b).

Grey parrots (*Psittacus e erithacus*) infected with circovirus before involution of the bursa of Fabricius show a profound leucopenia and rapidly succumb to secondary infections, reflecting their inability to mount an immune response. Circovirus inclusions can usually be observed in the bursa of Fabricius (Pass and Perry 1984). In 2001, 137 grey parrots were presented to the author's clinic with circovirus infection confirmed by PCR. All of these birds died despite supportive treatment.

The interferons are a group of small protein and glycoprotein cytokines naturally produced by the immune system following natural infection or vaccination (Hudson and Hay 1989, Theze 1999). They protect a bird from biological attack by suppressing cell proliferation, inhibiting viral replication and augmenting the activity of macrophages and T lymphocytes. Initially, the use of interferon was limited because of the difficulty of manufacturing the protein in large enough quantities, but the recent development of recombinant DNA technologies has made interferon economic and easy to produce

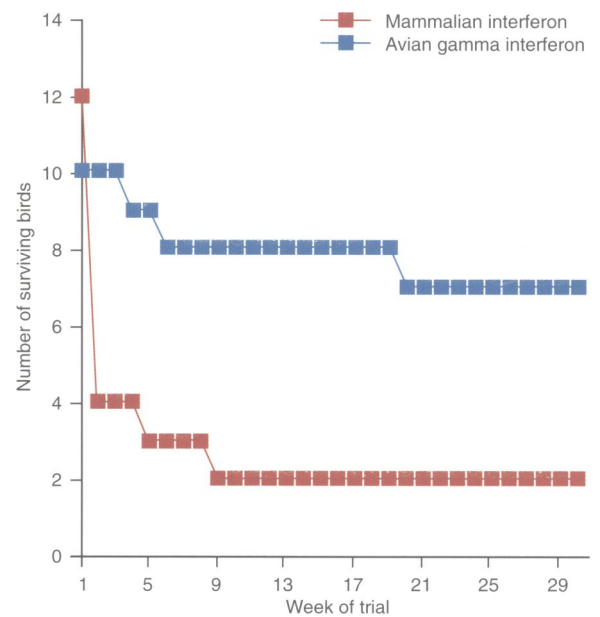


FIG 1: Comparison of survival rates of grey parrots after treatment with avian gamma interferon or a mammalian interferon of feline origin

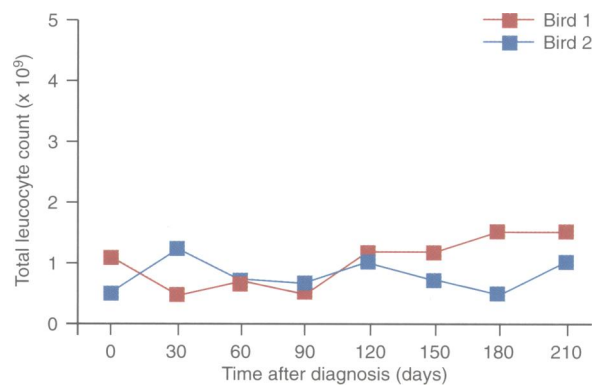


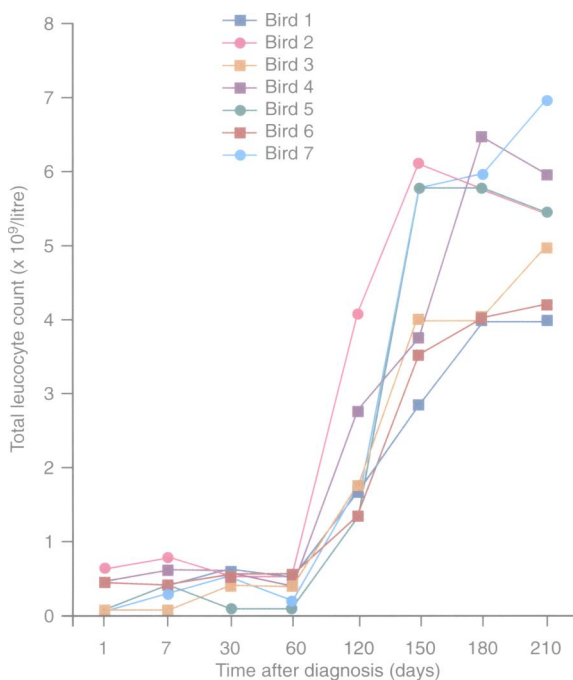
FIG 2: Total leucocyte counts in two surviving birds treated with an alpha type 1 mammalian interferon of feline origin

(Tossing 2001). An alpha type 1 interferon of feline origin has recently been produced commercially for the treatment of canine parvovirus in Europe (Minagawa and others 1999). The use of interferons and other cytokines has also been researched in the poultry industry in a bid to reduce the use of vaccines and in-feed antibiotics, with significant success (Lowenthal and others 1999, Bedford 2000). The aim of the present study was to evaluate the use of interferons for the treatment of circovirus infection.

Twelve grey parrots, which presented to the practice with clinical signs of circovirus infection, were subsequently confirmed by positive viral-specific DNA probe PCR tests (Georgia method) on both blood and feather pulp samples. All 12 birds exhibited profound leucopenia with total leucocyte counts, obtained by a direct method using a Neubauer counting chamber (Campbell 1995), of less than  $1 \times 10^9$ /litre (normal range  $3 \times 10^9$  to  $15 \times 10^9$ /litre) in all cases. Each bird was injected daily with 1 million iu of an alpha type 1 interferon of feline origin (Virbagen Omega; Virbac Animal Health) intramuscularly for 90 days. Additional measures involved fogging the birds for 15 minutes twice daily with F10 Super Concentrate disinfectant (F10SC) (Health and Hygiene) at a dilution of 1:125 to reduce the potential risk of secondary infections. The fogger produced a droplet size of 6  $\mu$ m. F10SC is a quaternary ammonia disinfectant used in commercial

*Veterinary Record* (2004)  
**154**, 435-436

M. Stanford, BVSc,  
MRCVS,  
Birch Heath Veterinary  
Clinic, Birch Heath Road,  
Tarpорley, Cheshire  
CW6 9UU



**FIG 3: Total leucocyte counts in seven surviving birds treated with avian gamma interferon**

poultry units to reduce aspergillus spore counts (Temperley and others 2003). It has also been administered by nebuliser to psittacine birds for the treatment and prevention of respiratory disease (Chitty 2002). The birds were monitored by determination of serial total leucocyte cell counts at 30-day intervals. Only two birds were still alive at week 30 (Fig 1). Both surviving birds were still leucopenic (Fig 2) and were found to be PCR positive for circovirus on samples obtained in week 30. The birds were euthanased.

A second group consisting of 10 grey parrots had presented with clinical signs of circovirus and were confirmed by PCR. All 10 birds were severely leucopenic. These birds were treated using an avian gamma interferon derived from poultry cell cultures (Lowenthal and others 1995). The birds were injected once daily with 1 million iu of avian gamma interferon intramuscularly for 90 days. The birds were fogged with F10SC as previously described. Seven of the 10 birds were still alive at week 30 (Fig 1) and the increase in total leucocyte counts in these birds over the time period is shown in Fig 3. By day 180, all seven birds exhibited normal total white blood cell counts. Using a t2 comparisons of means test, the difference between the total leucocyte count in the same birds between day 210 and day 1 was found to be statistically significant (with 95 per cent confidence limits). Samples of blood and feather pulp taken in week 30 were negative for circovirus by PCR in all seven birds. Nine months after the initial diagnosis the birds were still alive and had not exhibited any clinical signs of circovirus infection.

On the basis of this study, gamma interferon of poultry origin would appear to have a potential use in the treatment of circovirus infection in young grey parrots. Despite the costs involved in daily injections and quarantine of the birds, this treatment was considered cost effective in relation to the high cost of baby psittaciforms. Mammalian interferon was not satisfactory. Interferons are considered to be species specific and a mammalian interferon would not be expected to have a significant action in avian patients, even though cross-species reactivity has been reported in birds (Kaiser and others 1998). No side effects were seen from the repeated interferon injections in any bird. The results are encouraging and a double-blind, placebo trial is now required.

## ACKNOWLEDGEMENTS

The author thanks Virbac Animal Health for advice on the use of Virbagen Omega, Dr Peter Kaiser for the supply of the avian gamma interferon and John Temperley for advice on the use of F10SC. The author also thanks Medlab Laboratories for financial assistance with the blood assays and colleagues at the Birch Heath Veterinary Clinic for their assistance with this study.

## References

- BEDFORD, M. (2000) Removal of antibiotic growth promoters from poultry diets: implications and strategies to minimise subsequent problems. *World Poultry Science Journal* **56**, 347-365
- CAMPBELL, T. W. (1995) Avian haematology. In *Avian Haematology and Cytology*, 2nd edn. Iowa, Iowa State University Press. pp 10-12
- CHITTY, J. (2002) A novel disinfectant in psittacine respiratory disease. Proceedings of the Association of Avian Veterinarians. Monterey, USA, August 26 to 30, 2002. pp 25-27
- HUDSON, L. & HAY, F. C. (1989) *Practical Immunology*. Cambridge, Blackwell Scientific Publications
- KAISER, P., SONNEMANS, D. & SMITH, L. M. (1998) Avian interferon-gamma genes: sequence analysis indicates probable cross species reactivity amongst galliformes. *Journal of Interferon Cytokine Research* **18**, 711-719
- LOWENTHAL, J. W., DIGBY, M. R. & YORK, J. J. (1995) Production of interferon-gamma by chicken T cells. *Journal of Interferon Cytokine Research* **15**, 933-938
- LOWENTHAL, J. W., O'NEIL, T. E., STROM, A. D. G. & ANDREW, M. E. (1999) Cytokine therapy: a natural alternative for disease control. *Veterinary Immunology and Immunopathology* **72**, 183-188
- MINAGAWA, T., ISHIWATA, K. & KAJIMOTO, T. (1999) Feline interferon-omega treatment on canine parvovirus infection. *Veterinary Microbiology* **69**, 51-53
- NIAGRO, F. D. (1990) Polymerase chain reaction detection of PBFD and BFD virus in suspect birds. Proceedings of the Association of Avian Pathology. Phoenix, USA, September 1 to 3, 1990. pp 25-37
- PASS, D. A. & PERRY, R. A. (1984) The pathology of psittacine beak and feather disease. *Australian Veterinary Journal* **61**, 69-74
- RITCHIE, B. W., NIAGRO, F. D. & LUKERT, P. D. (1989) A review of psittacine beak and feather disease. Characteristics of the PBFD virus. *Journal of the Association of Avian Veterinarians* **3**, 143-149
- RITCHIE, B. W., NIAGRO, F. D., LATIMER, K. S., STEFFENS, W. L., PESTI, D., ANCONA, J. & LUKERT, P. D. (1991a) Routes and prevalence of shedding of psittacine beak and feather virus. *American Journal of Veterinary Research* **52**, 1804-1809
- RITCHIE, B. W., NIAGRO, F. D., LATIMER, K. S., STEFFENS, W. L., PESTI, D. & LUKERT, P. D. (1991b) Haemagglutination by psittacine beak and feather virus and the use of haemagglutination inhibition for the detection of antibodies against the virus. *American Journal of Veterinary Research* **52**, 1810-1815
- TEMPERLEY, J. P., LIMPER, L., HORNER, R. F., ODENHALL, M. & VERWOERD, D. J. (2003) Novel disinfectant for *Aspergillus* control. *International Hatchery Practice* **17**, no 6
- THEZE, J. (1999) *The Cytokine Network and Immune Functions*. Ed J. Theze. Oxford, Oxford University Press. pp 256-260
- TOSSING, G. (2001) New developments in interferon therapy. *European Journal of Medical Research* **6**, 47-65

## In Practice binders

BINDERS for a year's supply of *In Practice* issues are available from McMillan-Scott Subscriber Services, 6 Bourne Enterprise Centre, Wrotham Road, Borough Green, Kent TN15 8DG. Each binder costs £7.50 (inc VAT and postage). Payment with order please.