

- R., SACRISTAN, C., DE LAS HERAS, A., FERRO, A. & LATIMER, K. S. (1997) First report of post-weaning multisystemic wasting syndrome in pigs in Spain. *Veterinary Record* **141**, 600-601
- SZEREDI, L., SCHILLER, I., SYDER, T., GUSCETTI, F., HEINEN, E., CORBOZ, L., EGGENBERGER, E., JONES, G. E. & POSPISCHIL, A. (1996) Intestinal chlamydia in finishing pigs. *Veterinary Pathology* **33**, 369-374
- ZAHN, I., SZEREDI, L., SCHILLER, I., STRAUMANN KUNZ, U., BÜRGI, E., GUSCETTI, F., HEINEN, E., CORBOZ, L., SYDLER, T. & POSPISCHIL, A. (1995) Immunohistologischer nachweis von *Chlamydia psittaci/pecorum* und *C. trachomatis* im ferkel-darm. *Journal of Veterinary Medicine B* **42**, 266-276

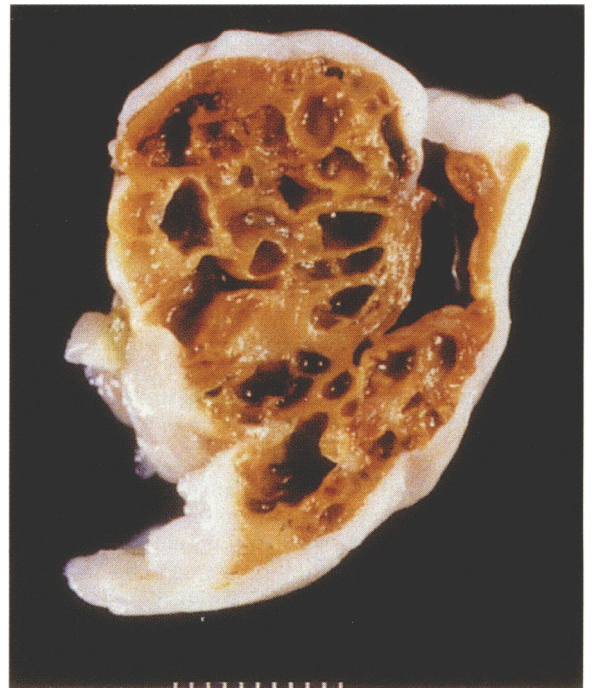
## Hepatic sinusoidal dilatation in a Pearsei cichlid (*Cichlasoma pearsei*)

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A VARIETY of liver lesions have been described in multiple species of fish attributable to infectious, neoplastic, toxic, nutritional and idiopathic causes (Ferguson 1989, Noga 1996). Although numerous hepatic lesions have been documented in the literature, clinical liver disease in fish is uncommon. This short communication describes the clinical and pathological features of a hepatic lesion in a Pearsei cichlid (*Cichlasoma [Herichthys] pearsei*; Hubbs 1936) (Conkel 1993).

A 1821 g, four-year-old, female Pearsei cichlid was presented to the College of Veterinary Medicine, North Carolina State University, USA. The fish had been obtained as a fry and maintained individually in a private collection. This fish presented with a 10-day history of progressive anorexia, lack of defecation and a transient increase in the respiratory rate. The gross appearance of the fish was unremarkable. Other fish in the collection, including closely related South American cichlids, were free of similar clinical signs. Tricaine methane sulphonate (Finquel; Argent Chemical) (100 mg/litre) was used to anaesthetise the fish for further clinical procedures and diagnostics. Gill and fin biopsies as well as whole body radiographs were unremarkable, and abdominal ultrasonography was performed, but individual organs were difficult to identify. A dilated portion of the intestinal tract that appeared to be looped back on itself suggested the possibility of an intestinal obstruction.

One week later, a contrast study of the gastrointestinal tract and a fish haematology profile were performed. The contrast medium enhanced the proximal small intestine and remained localised to that portion of the intestinal tract for approximately one-and-a-half hours. Given the lack of dilatation of the small intestine and the eventual passing of the contrast media, small intestinal stasis was the primary differential diagnosis with obstruction considered less likely. Parameters of the haematology profile were compared with haematology parameters obtained from other closely related South American cichlids (G. A. Lewbart, unpublished observations). Abnormalities included anaemia (packed cell volume [PCV] 15 per cent) and a plasma protein of 4.1 g/dl. White blood cell parameters were unremarkable. Supportive care was given, including feeding an enriched canine diet through a tube, and injections of iron dextran and B-vitamins.



**FIG 1: Gross photomicrograph of the liver showing numerous variably dilated sinusoids and prominent capsular adipose tissue. Formalin fixed. Scale = 10.0 mm**

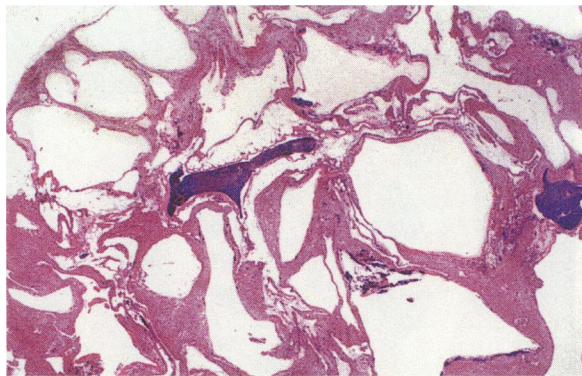
Over the next three weeks the fish's condition remained unchanged. The supportive care, including tube feeding and injections of B-vitamins and iron dextran, was continued. Subsequent to initiation of tube feeding, the fish began to defecate faeces in normal amounts and consistency but the PCV remained low, being between 10 and 15 per cent. Approximately four weeks after the initial presentation, the abdomen of the fish appeared slightly distended, and this distention increased over the next few days. An abdominocentesis was performed and 137 ml of a thin, clear, light yellow fluid was removed from the coelomic cavity. The fluid was a transudate containing 15 nucleated cells/ $\mu$ l and 1.4 g/dl protein, and had a specific gravity of 1.012. On this day, the fish's PCV was 17 per cent while the total protein had decreased to less than 3.0 g/dl. Fluid accumulation and abdominal distention continued over the following days, so the fish was once again anaesthetised for abdominocentesis, but it did not recover from the procedure.

At necropsy there was a small amount of thin, clear, light yellow fluid and an abundant amount of adipose tissue in the coelomic cavity. The capsular surface of the liver was irregular with variably sized cystic spaces protruding above the capsular surface. Surrounding the liver and underlying the hepatic capsule was an abundant amount of adipose tissue. Variably sized cystic spaces diffusely effaced the hepatic parenchyma (Fig 1). The cystic spaces were filled with a thin, clear, light yellow fluid which was similar to that removed from the coelomic cavity. Variable thin bands of soft and pale hepatic parenchyma separated the cystic spaces.

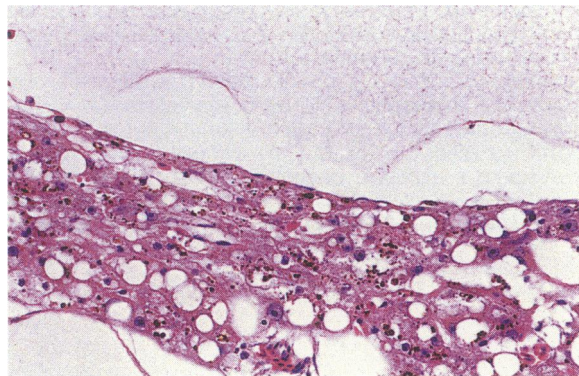
Liver, head kidney (with inter-renal and chromaffin cells), trunk kidney, heart, spleen, gastrointestinal tract, gills and skin with underlying musculature were fixed in 10 per cent neutral phosphate-buffered formalin. Representative sections from all of these tissues except the skin (stomach and intestine from the gastrointestinal tract) were routinely processed, sectioned at 5  $\mu$ m and stained with haematoxylin and eosin. Sections of the liver were also stained with Hall's bilirubin (bile), Gomori's iron reaction (iron), periodic acid-Schiff (PAS), PAS with diastase digestion, Gordon-Sweet reticulin

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**FIG 2: Variably dilated sinusoids disrupting the hepatic parenchyma. Haematoxylin and eosin. x 2.5**



**FIG 3: Edge of a dilated sinusoid with flattened endothelial lining. Note the fibrillar material in the sinusoidal space, the lack of hepatic cords, the swollen, vacuolated hepatocytes and the abundant intracellular pigment. Haematoxylin and eosin. x 100**

(reticulin), Schmorl's (lipofuscin) and Gomori's trichrome (collagen) stains. Immunohistochemical antibodies applied to the liver sections were cytokeratin (AE1 and AE3), factor VIII-related antigen and vimentin (BioGenex; San Ramon).

Histologically, the normal hepatic architecture was disrupted by numerous variably dilated sinusoids (Fig 2). The dilated sinusoids were occasionally lined by flat cells with oval to elongate nuclei and were generally empty or contained amorphous to fibrillar, lightly eosinophilic material and small numbers of erythrocytes (Fig 3). Sinusoids adjacent to those that were noticeably dilated, were also slightly dilated, and the hepatocytes lining both types of dilated sinusoids were atrophic. Diffusely, the remaining hepatocytes were variably swollen and markedly vacuolated by clear spaces with indistinct margins. Most of the hepatocytes contained moderate to abundant amounts of a finely granular, light brown material. Small numbers of individual necrotic hepatocytes were scattered throughout the parenchyma. The arteries and veins of the remaining portal triads were generally separated and surrounded by amounts of adipose tissue and small numbers of pancreatic exocrine cells. Most of the triads lacked bile ducts, although small numbers of normal ducts were present. Below the capsular surface, there was an abundant amount of adipose tissue.

The finely granular, light brown material seen in many of the hepatocytes stained predominantly dark blue with the iron stain (positive). Small amounts stained magenta with the PAS (carbohydrate) and were diastase sensitive. Relatively increased amounts of reticulin-positive collagen were seen adjacent to the dilated sinusoids, consistent with hepatocellular atrophy and parenchymal collapse. Bile was not appreciated in the sections examined.

Immunohistochemistry is a technique using specific antibodies to detect cellular proteins in tissue sections (Bunton 1993). Immunohistochemistry against factor VIII-related antigen and cytokeratin was used to try to determine if the cells lining the cystic spaces were endothelium or flattened epithelium, respectively. With each antibody the technique failed to recognise the cyst lining cells and thus provided little additional information. It is believed that the cells lining the cystic spaces were endothelium on the basis of their nuclear features and the continuity of the dilated spaces with small numbers of sinusoids.

The hepatic lesion described in this cichlid was morphologically dissimilar from any infectious, toxic, or nutritionally induced hepatic lesion described in the literature for fish or any other species. The main feature of the lesion was sinusoidal dilatation, with occasional endothelial lining. Sinusoidal dilatation is described in the toxicological literature in the rat as peliosis hepatis or angiectasis (Eustis and others 1990). This lesion is described in several other species including human beings (Kelly 1993), but is dissimilar from

the lesion seen in this fish in that it is described as locally extensive versus diffuse involvement. In addition, the dilated sinusoids in peliosis hepatis are described as containing numerous erythrocytes. The dilated sinusoids in this study contained minimal numbers of erythrocytes and frequently contained pale, granular, eosinophilic material. A similar lesion described in rats, spongiosis hepatis (cystic degeneration), is also locally extensive, but is not lined by endothelium and the cystic spaces do not communicate with the sinusoids (Eustis and others 1990). Cysts or cyst-like lesions in fish are described in the literature, but none is morphologically similar to the lesions described in this cichlid. Multiple hepatic cysts were described in several farmed Atlantic salmon, but in this case, many smaller cysts were described (100 µm in diameter) along with larger cysts (Bruno and Ellis 1986). In addition, the cysts were surrounded by loose fibrous connective tissue and contained a rim of adipose tissue below the surrounding hepatocytes. Other polycystic lesions of different aquatic species are also referenced in the paper.

The lesion in this study was considered neither infectious nor neoplastic, and a nutritional or toxic cause could not be ruled out. The fish was on a standard diet given to cichlids and there was no reported illness in other cichlids in the collection. The possibility that this was a congenital lesion that did not manifest clinical signs until later in life is also possible. The cysts may have gradually enlarged causing the hepatocellular atrophy and finally the loss of functional hepatic mass leading to hepatic failure. A congenital form of polycystic liver, commonly associated with polycystic kidney disease, was considered and has been described in pigs, lambs, calves, puppies, kittens, foals and human beings (Maxie 1993). In this congenital disease, the cystic spaces in the liver are interconnected, lined by biliary epithelium and often contain bile. In the fish in this study, the dilated spaces were lined by endothelium and did not contain bile. In addition, there were no cystic spaces in the kidney.

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#### References

- BRUNO, D. W. & ELLIS, A. E. (1986) Multiple hepatic cysts in farmed Atlantic salmon, *Salmo salar* L. *Journal of Fish Diseases* **9**, 79-81
- BUNTON, T. E. (1993) The immunocytochemistry of cytokeratin in fish tissues. *Veterinary Pathology* **30**, 418-425

- CONKEL, D. (1993) Systematic write-ups of the subgenera 'Cichlasoma'. In Cichlids of North and Central America. Neptune City, THF Publications. p 112
- EUSTIS, S. L., BOORMAN, G. A., HARADA, T. & POPP, J. A. (1990) Liver. In Pathology of the Fischer Rat. Eds G. A. Boorman, C. A. Montgomery, W. F. MacKenzie. San Diego, Academic Press. pp 76-77
- FERGUSON, H. W. (1989) Liver. In Systemic Pathology of Fish: a Text and Atlas of Comparative Tissue Responses in Diseases of Teleosts. Ames, Iowa State University Press. pp 146-157
- KELLY, W. J. (1993) Vascular factors in liver injury. In Pathology of Domestic Animals. Eds K. V. F. Jubb, P. C. Kennedy, N. Palmer. San Diego, Academic Press. pp 358-359
- MAXIE, M. G. (1993) The urinary system. In Pathology of Domestic Animals. Eds K. V. F. Jubb, P. C. Kennedy, N. Palmer. San Diego, Academic Press. pp 323, 464
- NOGA, E. J. (1996) Fish Diseases: Diagnosis and Treatment. St. Louis, Mosby-Year Book

## Comparison of two intrauterine treatments for bovine endometritis

G. BROOKS

SHELDON and Noakes (1998) showed that oxytetracycline hydrochloride (Metrijet 1500; Intervet) was a successful means of treating bovine endometritis, with a 73 per cent success rate. Brooks (1994) showed that there was no significant difference between the efficacy of treatment with the antiseptic clorpactin (Clorbac; Deosan) when compared with an antibiotic. Recently, there has been much public debate about the use of antibiotics in animals (Anon 1998, British Veterinary Association 1998, House of Lords Select Committee on Science and Technology 1998).

A comparison between oxytetracycline hydrochloride and polycresulen was carried out using cows with clinical signs of endometritis, over a six-month period, when examining dairy herds which had routine visits for monitoring fertility. Cows were selected if they were calved over 18 days and had a vaginal discharge. Any cow with vaginal tears, or suffering concurrent disease, was excluded from the trial. Each cow's identity was recorded and an examination of the reproductive tract was made by both vaginal and rectal examination. The severity of the endometritis was recorded using the protocol devised by Murray and others (1990) (Table 1). Scores of 7 to 9 were classified as severe, 3 to 6 were classified as moderate, 1 to 2 were classified as mild, and score 0 was normal. A cure was defined as any cow having a score of 0 when re-examined, or clear vaginal mucus and a partially enlarged uterus.

The cows were randomly assigned to one of the following treatments: tetracycline – an intrauterine infusion of 1500 mg oxytetracycline hydrochloride solution supplied in 15 ml disposable syringes with disposable transcervical catheters (Metrijet 1500; Intervet); or polycresulen – an intrauterine infusion of 4 per cent solution supplied in 150 ml disposable bellows with disposable transcervical catheters (Novugen 4 per cent; Chassot).

The cows were re-examined 14 days later and the endometritis was re-evaluated. Any cows which still showed endometritis were reassigned to the protocol. For each treatment, the success rate was calculated and any difference was compared using the chi square test (Parker 1973); a value of  $P < 0.05$  was considered statistically significant.

One hundred and seven cows were included in the trial from seven farms. Eight cows were removed from the trial

TABLE 1: Assessment of endometritis score based on clinical signs

Examination	Score
Vaginal discharge	
Foul smell	3
No smell	0
Bloody	3
Purulent	2
>50 per cent clear mucus	1
Clear mucus	0
Size of uterus	
Large, not all palpable per rectum	3
Moderate size, not all in pelvis but palpable per rectum	2
Small, all in pelvis	0

TABLE 2: Effect of severity of endometritis on response to a single treatment

Number of cases treated with	Endometritis score at time of initial treatment		
	Mild	Moderate	Severe
Polycresulen	15 (11)	44 (18)*	10 (3)
Tetracycline	17 (13)	44 (29)*	12 (4)

\*Significant difference between results  $P < 0.05$   
Figures in brackets represent successful treatments

after their initial treatment as a result of them developing another disease or condition before the re-examination. One hundred and forty-two treatments were analysed, comprising 69 treatments with polycresulen and 73 treatments with tetracycline. Overall, 78 treatments (54 per cent) were successful; 32 of the 69 treatments (46 per cent) with polycresulen were successful, and 46 of the 73 treatments (63 per cent) with tetracycline were successful. The difference was statistically significant ( $P < 0.05$ ). The results of the two treatments when analysed by severity of the initial score are shown in Table 2.

Although it has been shown that some antiseptics are as effective as antibiotics for the treatment of endometritis in bovines, in this trial polycresulen was significantly poorer than the only licensed antibiotic treatment in the UK. The results with polycresulen were not a great improvement on reported self-cure rates of 33.3 per cent (Sutton and others 1996) and 33 per cent (Steffan and others 1984). Practitioners wishing to change their treatment for endometritis away from intrauterine antibiotics should ensure that any product chosen is suitable for the purpose.

### References

- ANON (1998) Prudent use of antimicrobials. *Veterinary Record* 143, 541
- BRITISH VETERINARY ASSOCIATION (1998) BVA Code of Practice on Medicines. London, British Veterinary Association
- BROOKS, G. (1994) Chronic bovine endometritis: comparative efficacy of amoxicillin and clorpactin therapy. Diploma in Bovine Reproduction dissertation, University of Liverpool
- HOUSE OF LORDS SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY (1998) Resistance to antibiotics and other microbial agents, 7th report. London, The Stationery Office
- MURRAY, R. D., ALLISON, J. D. & GARD, R. P. (1990) Bovine endometritis: comparative efficacy of alfaprostol and intrauterine therapies, and other factors influencing clinical success. *Veterinary Record* 127, 86-90
- PARKER, R. E. (1973) Use of  $\chi^2$  double classification. In *Introductory Statistics for Biology*. London, Arnold. pp 35-38
- SHELDON, I. M. & NOAKES, D. E. (1998) Comparison of three treatments for bovine endometritis. *Veterinary Record* 142, 575-579
- STEFFAN, J., ADRIAMANGA, S. & THIBIER, M. (1984) Treatment of metritis with antibiotics or prostaglandin  $F_{2\alpha}$  and influence of ovarian cyclicity in dairy cows. *American Journal of Veterinary Research* 45, 1090-1094
- SUTTON, D., WATSON, C. L., LOHUIS, J. A. C. M. & DOHMEN, M. J. W. (1996) Comparative clinical cure of subacute/chronic endometritis in dairy cows after intra-uterine infusion of Metrijet Super or Metrijet 1500 or after non-treatment. *Cattle Practice* 4, 321

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