"TWIRLING" – A POSSIBLE SYNDROME IN GOULDIAN FINCHES (*Erythrura gouldiae)*

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INTRODUCTION

"Twirling" is a recognised syndrome in captive finches and is commonly seen in Gouldian finches (*Erythrura gouldiae*). It is initially seen as a sideways head tilt followed by rotation of the head and neck in a winding action. In severe cases, there is an inability to perch and severe ataxia, falling and rolling in an attempt to correct position and stance. There are several suggested causes and treatments for the syndrome but a paucity of scientific articles, and none containing histopathological investigative findings. This paper presents histopathological findings on several cases of twirling Gouldian finches as well as a summary of the clinical signs, possible causes and treatment modalities.

CLINICAL SIGNS

The typical signs (Figures 1 and 2) of "twirling" include:

- torticollis or severe head tilt to one side;
- rotation of the head and upper neck in a circular or winding motion;
- severe cases lose balance, are unable to perch and remain on the floor of the cage or aviary; and
- in an attempt to correct orientation and posture or even regain flight, the bird will often roll violently while on the floor.

The onset of signs can be sudden without. Some birds will appear relatively normal until stressed or excited when they will immediately exhibit severe signs. The condition is generally seen in adult finches 2-3 years or older.

Twirling is distinct from "star-gazing" in that the latter is simply a severe dorso-flexion of the neck, with the head pointing vertically and nearly touching the back. Star-gazing does not involve the more active circular movement of the head and the typical rolling on the floor of the cage. Star-gazing is reportedly only observed in some birds that are housed in small cages, the signs disappearing when the affected birds are moved to a larger aviary flight.

The condition is rarely life-threatening with some birds living months or years with often severe twirling signs. However, the bird can suffer significant trauma when trying to restore normal stance and posture.

POSSIBLE CAUSES

Possible aetiologies have been suggested for cases of twirling in Gouldian finches (Gelis, 2003). Currently no specific, single or repeatable, pathological lesion has been found in the central nervous or aural systems to account for the clinical signs seen. Consequently, any disease that causes pathology in certain areas of the central nervous or aural systems could result in "twirling" as a clinical sign. Some of the common aetiologies suggested as causes of twirling in Gouldian finches include:

Nutritional Deficiency

Vitamin E deficiency due to ingestion of rancid cod liver oil has been reported by some Gouldian finch breeders to cause twirling, with supplementation of vitamin E correcting the condition (Gelis, 2003).

Some breeders report a "heightened need for minerals" in some genetic strains of Gouldian finches as a possible cause with response to mineral supplementation. No specific mineral has been recorded in these reports (Lady Gouldian Finch Website link 1).

Genetics

To the author's knowledge, no specific genetic studies have been completed with this disease syndrome in Gouldian finches despite the fact that some breeders claim that it appears to be genetically linked, displaying a recessive genetic inheritance pattern (Lady Gouldian Finch Website link 2).

As many Gouldian finch breeders (especially those breeding colour mutations) use very limited genetic strains, birds showing twirling signs within an aviary can, consequently, be genetically linked. However, some breeders claim to have eliminated the syndrome from their aviaries by culling affected birds and avoiding the use of suspect genetic pairings for future breeding. Most of the cases of twirling investigated by the author in a large Gouldian finch breeding establishment had common genetic relationships.

As stated above, some breeders believe the genetic component is related to a "heightened need for minerals".

The author has certainly seen a genetic link to lack of vigour and disease susceptibility, particularly in relation to diseases such as polyomavirus infection.

Infectious Disease

Protozoa - atoxoplasmosis and toxoplasmosis are reported as possible causes of twirling in Gouldian finches. However, atoxoplasmosis would be expected to be restricted to younger finches and have accompanying signs of ill-thrift, weakness, diarrhoea and death (Dorrestein, 1985; Adkesson et al., 2005).

Viruses - paramyxovirus III has been known to cause sudden death and head twirling in finches. Some of these finches had paramyxovirus infection of the inner ear with no accompanying encephalitis. Other viruses such as avian polyomavirus have been seen as a cause of central nervous system disease in psittacine and passerine birds, without other obvious clinical signs (Schmidt, R., personal

communication). Avian polyomavirus is a common infection of Gouldian finches and can result in immunodeficiency and increased disease susceptibility (Gelis, 2003; Marshall, 2003).

Bacteria - Any bacterial infection that localises in the middle or inner ear or the central nervous system might result in clinical signs consistent with twirling. Anecdotal reports suggest that some early cases of twirling in Gouldian finches are responsive to treatment with trimethoprim-sulpha, suggesting that a bacterial cause may be involved in such cases (Torschmidt, 1993; Lady Gouldian Finch Website links 1 and 2).

Mycobacteria – avian tuberculosis has been shown to be the cause of death in a bird that was euthanased and autopsied by the author after displaying weakness and twirling. Some moderate central nervous system lesions were found on histopathology but a significant multifocal hepatitis due to a mycobacterium was diagnosed. The suggestion of a secondary hepatoencephalopathy was made to account for the neurological signs.

Yeasts – Again, there have been no scientific articles showing yeasts as a specific cause of twirling in finches, but some breeders have suggested that the use of nystatin has successfully treated cases of twirling in Gouldian finches (Torschmidt, 1993; Lady Gouldian Finch Website links 1 and 2).

Trauma

Cranial trauma such as resulting from flight injuries could potentially cause neurological signs similar to twirling.

Toxicoses

It is possible that some toxicoses such as lead could lead to signs similar to twirling. It is expected that such cases would have other signs referable to the toxicosis such as diarrhoea, polyuria, lethargy and even death accompanying the neurological signs.

Other causes such as neoplasia could potentially cause signs similar to twirling although no articles have been written confirming such cases.

INVESTIGATION OF CASES

Over the past three years, six cases of twirling as the primary clinical sign in colour mutation Gouldian finches have been investigated by the author, with a view to finding a consistent pathological lesion. Most of these birds had few, if any, other clinical signs. They were located in a breeding establishment with excellent management and fastidious hygiene procedures, excellent nutrition and breeding performance results. Over this time there had been very few other health problems seen in the establishment. Some of these cases were previously treated with trimethoprim/sulpha, nystatin or doxycycline prior to presentation but, if treated, the treatment had generally been ceased at least 2 weeks prior to presentation. All birds were euthanased on presentation using inhaled Halothane® and autopsied shortly afterwards. No significant gross autopsy lesions were found apart from visible hepatopathy in one case (later proven to be due to mycobacteriosis). In all cases tissues from a large range of organ systems including the brain were taken and fixed in 10% formaldehyde for histopathology. The entire skull including the ears was not included for histopathology in all cases. In some cases, freshly prepared smears and swabs from several sites were taken for cytology and bacterial culture/sensitivity testing but no significant bacterial infections were found.

Histopathological Findings

Case 1: 3 year old male Gouldian finch

Histopathological findings – Multifocal hepatocellular necrosis with infiltration by lymphocytes, plasma cells, macrophages and heterophils. In the brain, moderate cerebrocortical astrocytosis frequently including neuronal satellitosis. Ziehl-Neelsen staining confirmed the presence of acid-fast bacilli within the hepatic granulomas

Diagnosis – Multifocal mycobacterial hepatitis and hepatoencephalopathy.

Case 2 : 2 year old female Gouldian finch

Histopathological findings – In the brain there was focal to diffuse gliosis and periventricular infiltrations with mononuclear inflammatory cells. In the liver there were several focal areas of inflammation composed predominantly of mononuclear cells, mainly macrophages and activated reticuloendothelial cells. There was also a focal area of hepatic necrosis. There were occasional intranuclear basophilic inclusions with karyomegaly in renal tubular epithelial cells, consistent with persistent polyomavirus infection. Similar inclusions were also seen in the salivary gland. Other organs including retina, intestine, pancreas, stomach, heart and lung appeared normal.

Diagnosis a) Granulomatous encephalitis and hepatitis
b) Avian Polyomavirus infection

Case 3: 3 year old male Gouldian finch

Histopathological findings – Several focal areas of the trachea and bronchi had a mild infiltration and exocytosis of the mucosa with heterophils. In the proventriculus there were a myriad of cryptosporidia attached to the apical surfaces of the glandular and surface epithelial cells. In the kidney there were occasional scattered renal tubular epithelial cells with basophilic intranuclear inclusions consistent with avian polyomavirus infection. In the brain there were occasional disorganised Purkinje cells with the cerebellum but this could have been a plane of sectioning artefact. All other tissues appeared normal. Ear canal not included.

Diagnosis – a) Proventricular cryptosporidiosis
b) Avian Polyomavirus infection
c) Mild acute tracheitis

Case 4: 3 year old male Gouldian finch with proven fertility and high productivity. (Note: A video was taken of the clinical signs of this bird and will be presented at the Hobart Conference).

Histopathological Findings - Sections of heart, intestines, liver, testis, pancreas, lung and spleen failed had no histological lesions. Serial sections of the head, eye, ears and brain revealed abnormalities confined to the craniopterygoquadratus muscle on one side. In this muscle there was extensive degeneration of muscle fibres accompanied by fibroplasia and multinucleate cells likely to be regenerating

Diagnosis: Chronic localised myositis (Fig. 3). (Pathologist Comment : The muscle lesion is unlikely to have been the cause of this bird's central nervous system signs although this affected area is anatomically very close to the inner ear and cranial nerves.)

Case 5: A five year old male Gouldian finch – father of Case No. 3, vague clinical signs that worsened significantly with stress.

Histopathological Findings - In the liver there were mild multifocal nodular infiltrations with lymphocytes, plasma cells and macrophages indicative of sites of embolic bacterial infection. Other visceral organs including testes and intestines appeared histologically normal. In the kidney there were occasional renal tubular epithelial cells that contained intracytoplasmic brownish pigment granules. Extending throughout the brain stem in the *area pretectalis*, *commisura tectalis* and *griseum centrale* were many neurons that contained intracytoplasmic brownish pigment granules that failed to auto-fluoresce under UV light and therefore unlikely to be lipofuscin. These cells and others also had intracytoplasmic micro-acicular clefts (Fig 4). Other parts of the brain, eye and inner ear appeared normal. In the middle ear on one side there was a focal area of infiltrating lymphocytes, and heterophils (Fig. 5).

Diagnosis: a) Mild chronic hepatitis
b) Mild focal chronic otitis media
c) Focal neuronal degeneration, midbrain

Pathologist's comment: "In my opinion the significance of each of these findings in relation to the presenting clinical signs in this bird and the two others is uncertain. The liver lesion is consistent with chronic bacterial invasion from the portal system and could be due to opportunistic spread of *E. coli, Salmonella* spp or other enteric bacteria which may have also spread to other organs. The focal area of inflammation in the middle ear is unlikely on its own to have explained the head tilt or other central nervous signs but it may represent a more widespread multifocal disease. The pigment storage changes in the brain stem may be significant but could also represent non-disruptive changes associated with aging."

Case 6: 2 year old male Gouldian finch – not displaying classical twirling signs but seen to be moving head from side to side and appeared partially blind and had unilateral cataract-like lesion visible grossly. This bird also had a genetic relationship to other birds.

Histopathological Findings - The visceral organs including liver, kidney, proventriculus, heart appeared histologically normal. In the brain there were occasional neurons in the brain stem that contained brownish pigment granules but otherwise the brain appeared histologically normal. The middle and inner ear also appeared normal although there was a focal area of scattered lymphocytes present within the latter.

Diagnosis: Inconclusive

CONCLUSION

The clinical syndrome of "twirling" in Gouldian finches is a well-recognised syndrome by Gouldian finch breeders in Australia and overseas, particularly in the United States of America. Currently there is no known specific cause or consistent pathological lesion. Investigation by the author has revealed a number of possible central nervous and aural system lesions that might have caused the "twirling",

but at this stage there is no proof to suggest that a common pathological lesion exists. Response to treatment modalities is variable and again indicates no single specific cause of the syndrome.

It is possible that a specific cause and lesion will be found to explain the "twirling" syndrome in Gouldian finches, but at this stage it appears that the twirling may be merely a sign that is seen in a number of clinical diseases of finches. This does not, however, explain the apparent increased frequency of the sign in Gouldian finches and further research and investigation is still required.

If an early case is seen in a Gouldian finch the following steps should be considered:

1. Thorough clinical examination of the affected bird with particular attention paid to the eyes, ears and nervous system;
2. Critical analysis of the nutrition provided to the birds and possible supplementation with vitamin E if indicated;
3. Treatment trial with trimethoprim-sulpha and possibly nystatin;
4. Analysis of the genetic relationship of the affected bird with others in the breeding program and adjustments made accordingly; and
5. If no response to treatment is seen, consider euthanasia of the bird and submission of tissues (including brain, eyes, skull, ears and other organs) for histopathological examination to increase our knowledge of the disease syndrome.

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Lady Gouldian Finch website link 1 (August 20, 2010)
http://www.ladygouldianfinch.com/features_twirling.mgi

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http://www.ladygouldianfinch.com/features_twirling2.mgi

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Figure 1: Torticollis

Figure 2: Rotation of the head and upper neck

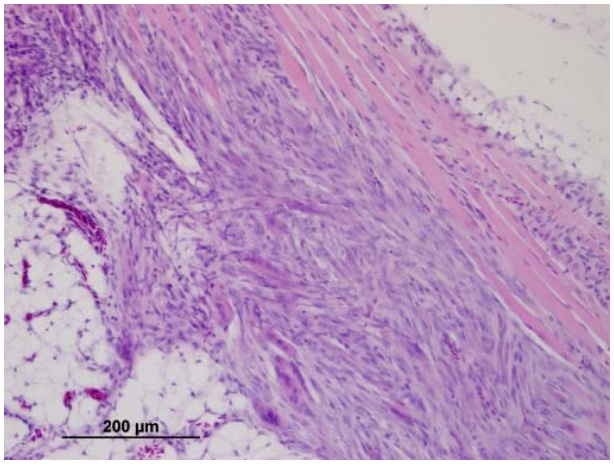

Figure 3: Chronic localised myositis. H&E x 20

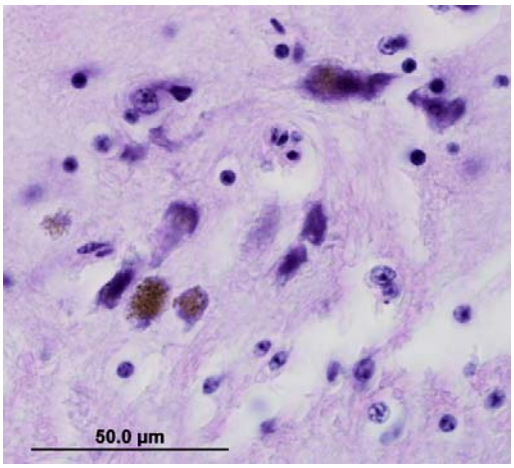

Figure 4: Brain stem neurons containing intracytoplasmic brownish pigment granules. H&E x 40

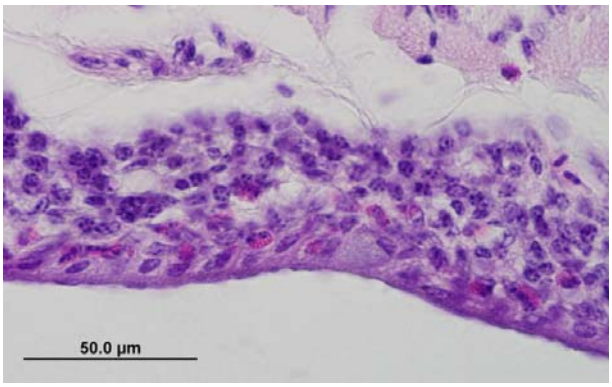

Figure 5: Mild focal chronic otitis media. H&E x40