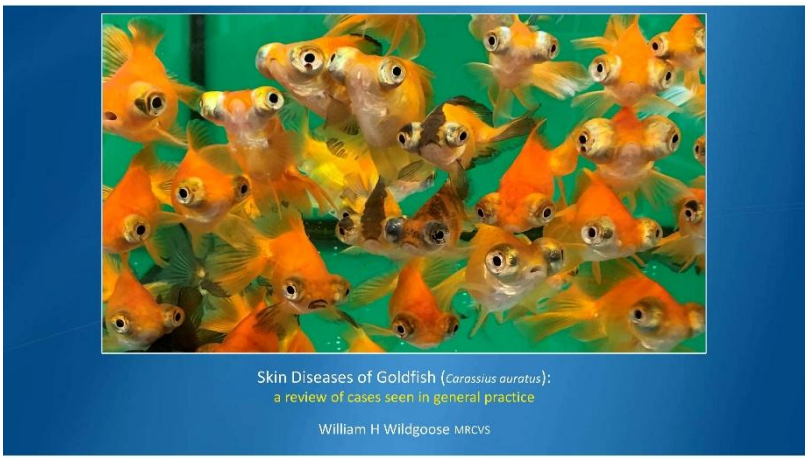
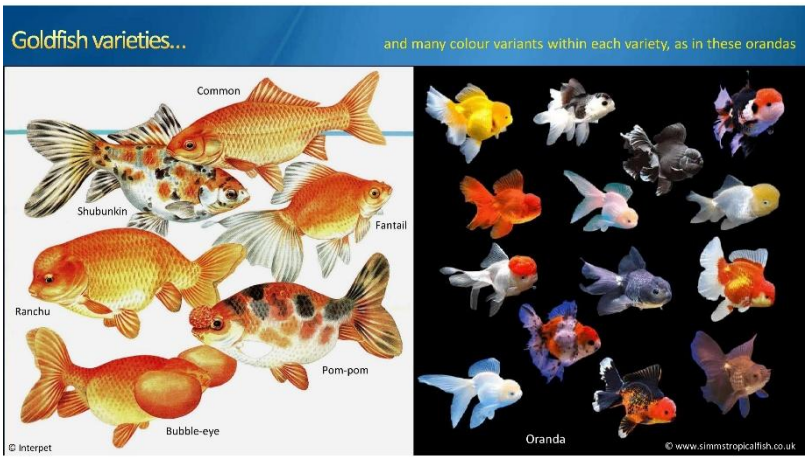
Skin Diseases of Goldfish (*Carassius auratus*): a review of cases seen in general practice

WH Wildgoose, London E11 2ST



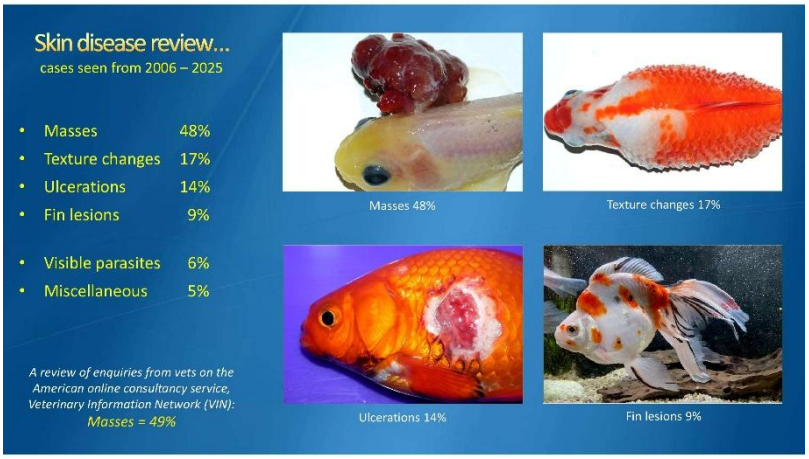
This is a review of my cases seen in practice over the last twenty years. It is a selective sample of goldfish skin diseases, because my review is limited to owners who were willing to seek veterinary attention and willing to pay for it. That is because owners still consider the pet shop to be their first point of contact for any disease affecting their fish. The investigations carried out by the pet shop will often involve water quality testing and occasionally examination of skin scrapes. Usually, owners will then be sold various over-the-counter products, many of which are used to treat ectoparasites and fungal infections. The efficacy of these products varies, and depending on the underlying cause, the skin disease may or may not clear up. As a result, the cases I see are those that fail to respond to these proprietary medicines. These are telescope-eyed goldfish in a pet shop.



Goldfish have been selectively bred for centuries. Having originated as an olive-brown version of the common goldfish, its drab colour provided natural camouflage and helped it survive in the wild. The fancy varieties evolved over the years, producing many different shapes and resulting in over 100 varieties. Some have single or double tail fins, some with or without a dorsal fin, some with normal or bulbous eyes, and some with additional fleshy growths. Within many of these fancy varieties, you will now find many different colour variants, as seen in these orandas. Some particular varieties have unique skin problems, but you should know what is 'normal' for your patient.

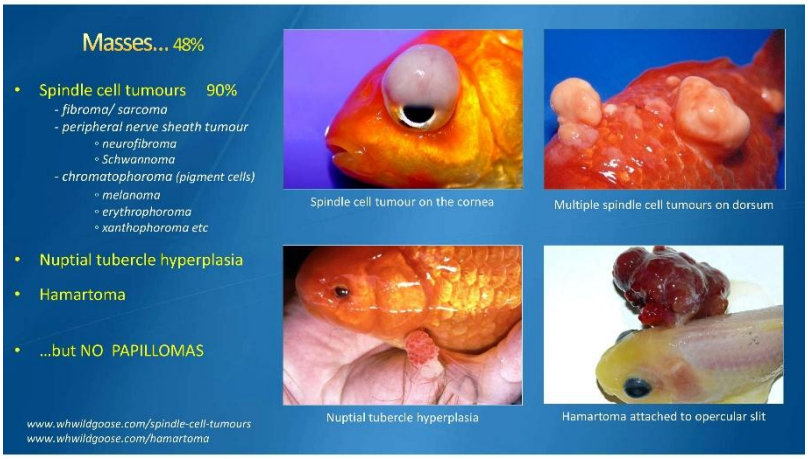
This is an important starting point due to the varied appearance of many fancy goldfish, all of which belong to the same species, *Carassius auratus*. Most skin diseases become visible through colour changes or alterations to the skin's surface, such as spots, lumps, or ulcerations. Most owners will have identified these changes, but in some cases, skin disease is secondary to other internal problems.

This is an oranda, a common and popular variety of goldfish. The red lumpy bit on its head is called the 'wen' or 'cap'. It is a proliferation of gelatinous dermal tissue covered with epidermis. It can vary in size and distribution, probably due to genetic differences, and may take up to 2 years to reach its final size. In extreme cases, it can grow excessively and cause various problems, including restricted vision, impaired respiration, and even buoyancy disorders. In those cases, it often requires surgical trimming under anaesthetic, but you can see plenty of YouTube videos online with owners performing this on their own pets. Another 'normal' feature in male goldfish is the presence of nuptial tubercles on the operculum and leading edge of the pectoral fins, particularly in the breeding season. These are multicellular keratinous nodules that are easily mistaken for parasitic white spot trophonts, and in a few cases, they can become abnormally enlarged on the pectoral fins. Equally, the pom-pom variety has loose fleshy growths that are abnormal enlargements of the nasal septa, which should not be confused with skin tumours that commonly appear on the head of some goldfish.

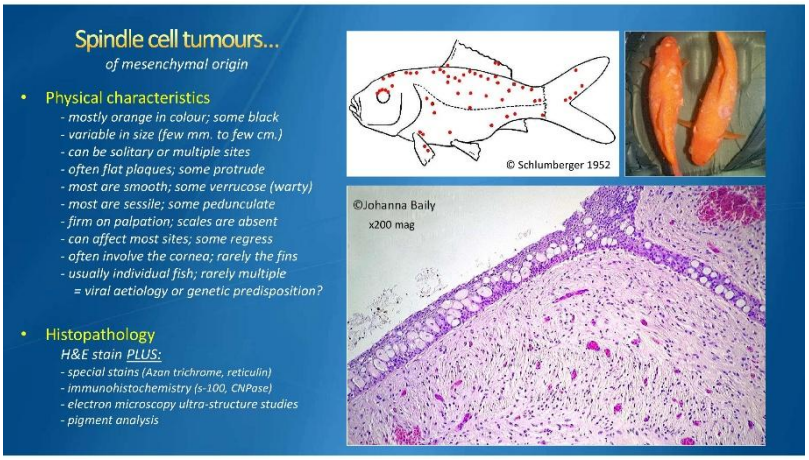


I have been treating fish for over thirty years, and in the old days, I got the impression that most sick fish suffered from ectoparasites and poor water quality. However, the reality was very different. The pet shop medicines appeared to clear up many parasites, and owners were also told how to improve their water quality… which was a relief to me because it spared me from all that tedious stuff. Instead, I had all the interesting and challenging cases that required real professional investigation, such as histopath, surgery and diagnostic imaging. I

must admit I was surprised by the distribution of my skin cases here. Almost half of them had external lumps and bumps, and it was no surprise that these did not respond to the over-the-counter products. And it is not only goldfish in East London that have a high incidence of skin tumours; there was a similar percentage of cases posted on the American Veterinary Information Network over the last 8 years while I have been a consultant.



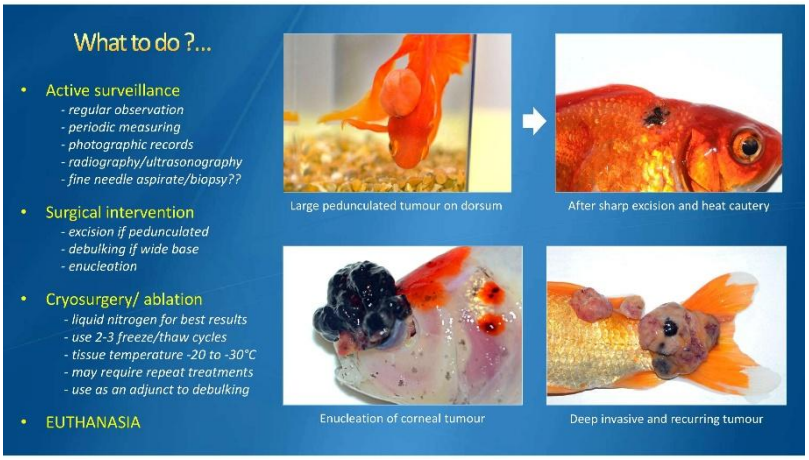
Virtually all my lumpy goldfish had spindle cell tumours. Unlike koi, where most of their skin tumours are papillomas, carcinomas and perivascular wall tumours, I can safely say I don't see these in goldfish. It is important to correctly identify skin tumours to help decide on a realistic treatment plan and give an indication of prognosis. In the past, most of my histopath reports described these as fibromas or neurofibromas, but spindle cells include many different mesenchymal cells, such as those listed here. This difference may explain some of the unpredictable nature of these tumours, particularly with aggressive melanomas. There is now a growing interest in these tumours in fish because of the similarities to human atypical neurofibromas. Hyperplastic nuptial tubercles can develop on both pectoral fins of male goldfish, but rarely cause any clinical problems. Hamartomas, which are considered non-cancerous tumour-like growths, are also found occasionally.



Spindle cell tumours are so-called because of the histological appearance of the cells, and are of dermal origin. They are often orange in colour and vary in size depending on how long the owner has ignored them in the hope that they would fall off or disappear on their own. They may be solitary or affect multiple sites, as shown in this early research paper from 1952, and for some reason, the cornea is commonly affected. They can be very unpredictable, and many remain the same size for months or years, whilst others may suddenly grow. In a few separate

cases, I have seen fish of different ages, from different sources, develop the same tumour in the same tank. Although that may suggest an environmental factor, it may also imply an infectious agent is involved, such as a virus, as suggested in some papers.

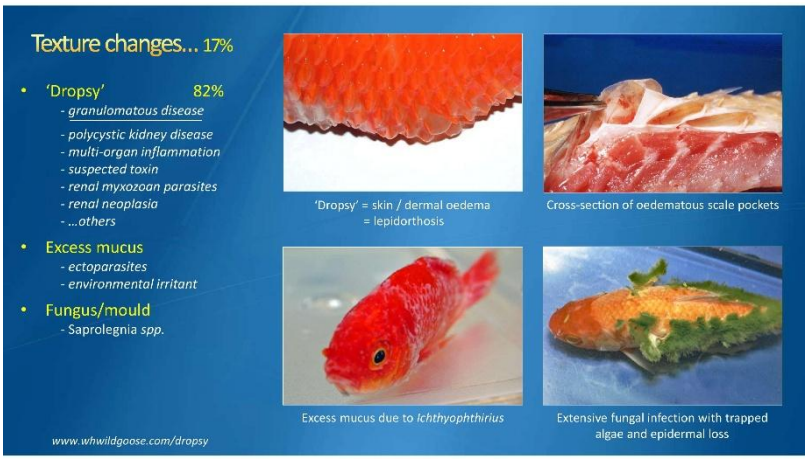
Correct identification of these tumours requires not only H&E staining, but also the use of special stains, immunohistochemistry, electron microscopy and pigment analysis in some cases. However, my clients with lumpy goldfish are rarely willing to pay for histopath, let alone anything more advanced, so the majority are simply classified as spindle cell tumours.



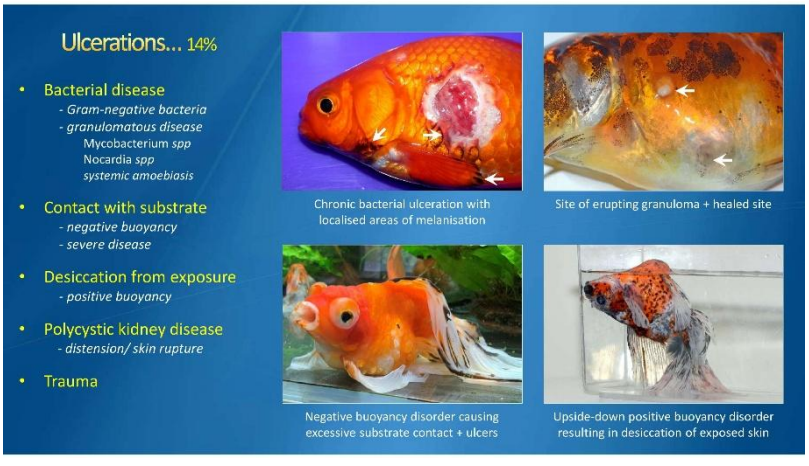
Small tumours are best monitored for any change in size and number. However, some of these tumours become massive and have an obvious impact on the fish's welfare. Owners are often keen to have large, unsightly tumours removed, and I am sometimes lucky to find a few that are pedunculated and easily removed surgically. Others are more sessile and can become highly invasive, and in those cases, radiography can be useful to assess if there is deep invasion of underlying tissues, which will lead to a poorer prognosis. In some cases that involve the cornea, the eye can be surgically removed and the socket left to heal naturally. However, there is no guarantee that the tumour will not regrow or appear elsewhere. The use of cryosurgery has been reported in the treatment of these tumours, with the best results obtained using liquid nitrogen and as an adjunct to surgical excision. Euthanasia is advised when tumours become so invasive and the patient's quality of life is so poor that it cannot be improved. Either way, you should be realistic about the options in each case.

Of course, if you contact the press in the hope of getting some free publicity, you should be aware that they may 'big it up' as clickbait, and turn a skin lump on its head into something more than it is, as can be seen in this Australian news article

that is still available online 10 years later. You may also note that it is dated 1st of April.

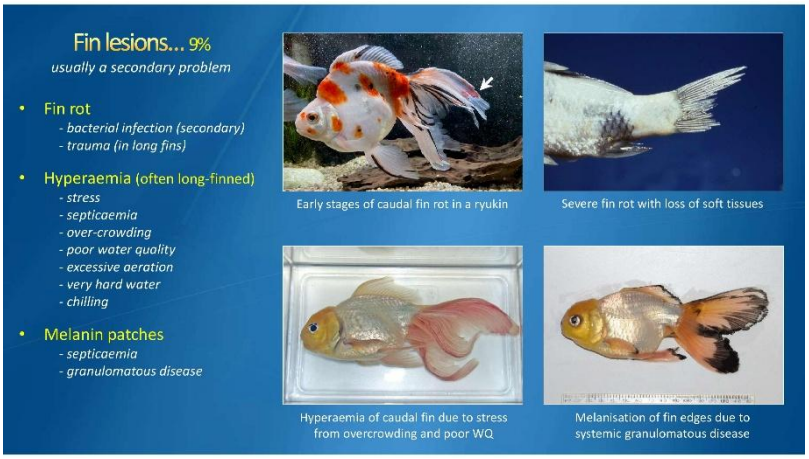


Second on my list is texture changes, of which 'dropsy' is by far the most common. This is a hobbyist term used to describe body swelling or oedema of the skin. The latter causes the scales to protrude and give the body a 'pine cone' appearance, which is technically called lepidorthosis. It is frequently associated with protrusion of the eyes due to a buildup of retrobulbar fluid, which is commonly called 'pop-eye'. Dropsy is a clinical sign and not a disease in itself, that may result from bacterial or viral infections, organ failure or tumours. It should be more correctly described as skin oedema, cutaneous oedema or dermal oedema since fluid accumulates in the scale pockets, which are located within the dermis and are covered by epidermis. There is no effective treatment for most cases. I recently reviewed my cases in various species and found that in goldfish, half of them had granulomatous disease. About a quarter had polycystic kidney disease, and the others had systemic inflammatory disease, suspected toxins or renal disease. You can find my brief review on my website. Other skin texture changes are due to excess mucus production caused by ectoparasites and infection by water mould or fungus.



Ulcers in goldfish are infinitely less common than in koi. There can be several underlying reasons in goldfish, unlike the mystery that surrounds koi ulcers, but in most cases, bacterial infection is present. A common finding in goldfish with bacterial infections is the appearance of localised patches of black or brown pigmentation in the skin and fins. It is thought that this emergence of melanocytes is part of an inflammatory response, and following healing, the brown colouration disappears. Systemic granulomatous disease is common in goldfish, and it is not unusual to find ulceration due to rupture of subcutaneous

granulomas or even penetration into the coelomic cavity. These are often hopeless cases, and owners should be warned of the zoonotic risk and potential infection of other fish in the tank. Some goldfish ulcers start following the secondary bacterial infection of traumatic wounds, or excessive contact with the substrate or desiccation through exposure to air, as in severe cases with buoyancy disorders.



Fin rot is not particularly common in my cases, and it is usually a secondary complication, often related to poor water quality and bacterial disease. There is often an obvious disintegration of the delicate fin tissue, sometimes with an inflamed, irregular margin to the affected fins and exposure of the soft cartilaginous rays. This should not be confused with the general hyperaemia that often occurs in long-finned goldfish such as fantails and veiltails. It is often difficult to say what causes this, but I suspect some is due to stress or subtle water quality problems, particularly in the absence of other obvious clinical disease. The black pigmentation on the fins in this last image appeared within a few days. There were no other external lesions visible on the fish, but it had systemic granulomatous disease with an abscess in the cranial cavity.

No review of skin disease in fish would be complete without some images of parasites. But, as I said at the start, I see so few of these that I presume the commercial over-the-counter medicines must be 'fairly' effective. That doesn't mean you won't see them, but as a rule, if clients phone me to say they can see spots on their fish, and if they haven't already done so, I advise they use some anti-parasite medication as soon as possible, before they bring the fish to see me. Unicellular parasites, and white spot in particular, require urgent medical treatment due to the severe damage they cause to the gills and skin, resulting in a very high mortality.

I would like to briefly thank my clients who let me develop my fish experience at their expense, and often by trial and error: we learn more from our mistakes than we do from our successes. Thanks to the Fish Veterinary Society for encouraging my interest in pet fish, and I am pleased to see that ornamental fish are now appearing as a more regular feature at the conference. And I am very grateful to all the labs that carried out tests for me after my persistent calls: I hope they learned as much as I did. And finally, thank you for listening: I hope you have learned something from all my efforts.

Thank you.