**Title page of Case Presentation**

**A fishy tale prevents digital doom following Polly’s peck: the importance of pets in a comprehensive medical history**

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**A fishy tale prevents digital doom following Polly’s peck: the importance of pets in a comprehensive medical history**

**Case presentation**

In August 2014, a 68-year-old man sustained a deep bite to his left 4th and 5th finger from his pet African grey parrot (*Psittacus erithacus)*. The gentleman had a past medical history of chronic obstructive pulmonary disease for which he took regular inhaled steroids, salbutamol, and ipratropium. He was also severely affected by osteoarthritis for which he took long-acting morphine as analgesia. A day following the parrot bite, he saw his family practitioner for a consultation. The practitioner noted a laceration over the 4th proximal interphalangeal phalanx (PIP) with surrounding erythema, and a course of oral antibiotics were prescribed for a presumed diagnosis of bacterial cellulitis. In December 2014, following review by orthopaedic and rheumatology specialists due to persistent swelling, an ultrasound and magnetic resonance (MRI) scan of the left hand were performed, which showed soft tissue swelling but no radiological features to suggest osteomyelitis. In April 2015, the 4th PIP wound continued to be slow to heal and the patient developed an erythematous nodule over the 5th PIP.

In October 2015, the patient re-presented to his GP with worsening 4th finger swelling and erythema and a new erythematous, fleshy nodule on the dorsal aspect of the left wrist. In November 2015, a rheumatologist injected steroids into the 4th PIP joint. In December 2015, the 4th PIP wound re-opened and his entire left hand became erythematous and swollen, and an in-patient MRI showed 4th finger osteomyelitis (Figure 1a). The orthopaedic team performed an initial washout with debridement and amputation was considered. In February 2016, a second washout was performed from which deep tissue swabs showed acid-alcohol fast bacilli on smear.

A day later, the patient was reviewed by the regional infectious diseases team. Clinical examination revealed a dehiscent post-surgical 4th finger wound with severe surrounding oedema (Figure 1b). A comprehensive medical history revealed that, in addition to the African Grey parrot, the patient kept tropical fish and had cleaned the fish-tank thoroughly following the parrot bite. A clinical diagnosis of *Mycobacterium marinum* was made and treatment started with rifampicin and ethambutol. In March 2016, mycobacterial colonies were grown three weeks into culture of the deep tissue swabs on both solid glycerol and pyruvate Löwenstein-Jensen media slopes. These colonies were then further identified as *M. marinum* by the GenoType Mycobacterium CM molecular assay (Hain Lifescience). In April 2016, rifampicin was substituted for azithromycin due to rifampicin causing decreased efficacy of the patient’s opiate analgesia. Over the next 6 months, the patient’s symptoms gradually improved on treatment, he avoided amputation of his finger, and regained full digital function.

**Discussion**

Multiple zoonoses, including *M. marinum*, can be transmitted through the bites, scratches or contact with bodily fluids or faeces of domestic animals (Table 1)1,2. Domestic animal bites are not an uncommon presentation to the emergency department. While the majority of such bites are from dogs and cats, there has been a rise the number of people keeping more exotic animal from which infections can occur1. Commonly isolated pathogens relating to animal bites include: *Pasteurella* species from dog and cat bites; *Salmonella* from reptiles; and *Streptobacillus moniliformis* from rat bites (the cause of rat-bite fever).

*Mycobacterium marinum* is a naturally occurring aquatic organism found in fresh and salt water. In humans, *M. marinum* predominantly causes soft tissue infection following exposure to contaminated water. The most common presentation is “fish-tank granuloma”3: hand infection following exposure to fish-tank water. The majority of cases have a preceding injury to the hand (e.g. bites, abrasions, or puncture wounds) prior to exposure which allowed entry of the mycobacterium through the dermis and into the soft tissues. Prior to the introduction of routine chlorination of swimming pools, swimming pools were the leading source of acquisition of infection and fish-tank granuloma was termed “Swimming pool granuloma” 3.

Symptoms of *M. marinum* skin and soft tissue infection usually start as a solitary violaceous plaque, nodule, or non-healing ulcer followed by a typical sporotrichoid rash. A sporotrichoid rash is one in which erythematous fleshy nodules spread proximally from the source of the infection (most commonly a wound on the hands) along the lymphatic system. The lesion that our patient described developing over his wrist was the early progression of a sporotrichoid rash. Skin and soft tissue infection is the most common presentation with disseminated infection being rare and usually only occurring in people with immunocompromise including those who have had chemotherapy and HIV-positive patients3.

With regards to culture and identification of *M. marinum*, the organism has an intermediate growth rate with an optimum growth temperature which is lower than other mycobacteria. Skin biopsies of suspected *M. marinum* should be inoculated into slopes containing pyruvate Löwenstein-Jensen medium and then incubated at 28-30°C. Molecular assays such as the GenoType Mycobacterium CM molecular assay (Hain Lifescience) can then be used to identify mycobacterial species. While resistance testing is sometimes performed, it is not routinely required in the clinical setting unless the patient experiences treatment failure or has repeated positive cultures following appropriate treatment.

There is a dearth of evidence regarding optimal treatment for *M. marinum*. Combination therapy of clarithromycin or rifampicin with ethambutol is the most widely used regimen with high reported cure rates4,5 but use of this regimen is supported by prospective or retrospective cohort analyses rather than randomised control trial level evidence. Other potential agents used for mild disease can include trimethoprim-sulphamethoxazole and doxycycline. Treatment should continue for one to two months following symptom resolution which typically means approximately three to four months of treatment. Isoniazid, streptomycin and pyrazinamide should not be used due to innate resistance of *M. marinum* to these antimycobacterial agents5.

Clinicians must be cognisant of interactions between certain antimicrobials used to treat *M. marinum* and other medications. For example, rifampicin is a potent cytochrome P450 enzyme inducer whereas macrolide antibiotics (such as azithromycin and clarithromycin) are cytochrome P450 enzyme inhibitors. Common interactions of rifampicin and macrolides with other medications include a decrease (rifampicin) or increase (macrolides) in the drug concentrations of opiate analgesia, certain anti-epileptic medications, and oral anticoagulants. In the case of our patient, rifampicin induction caused a decrease in the effectiveness of his opiate analgesia and therefore had to be substituted with azithromycin.

Pet ownership is an often-neglected part of a medical history with both patients and health professionals sometimes being unaware of the potential risks of zoonotic diseases5. In this case, eliciting multiple pet ownership - after an 18 month diagnostic delay - contributed to saving this gentleman’s *M. marinum* infected finger from amputation.

**Table 1: Pathogens commonly associated with domestic animals1**

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| Animal | Commonly Associated Pathogens |
| Dogs and cats | *Pasteurella, Streptococcus, Staphylococcus, Neisseria, Fusobacterium, Porphyromonas* |
| Birds | *Chlamydia psittaci* (psittacosis), *Cryptococcus neoformans*, Avian flu |
| Reptiles | *Salmonella* |
| Rodents | *Salmonella*, *Francisella tularensis*, *Streptobacillus moniliformis* (rat bite fever), Lymphocytic choriomeningitis virus, *Trichophyton* |
| Fish | *Mycobacterium marinum, Erysipelothrix rhusiopathiae*  |

**Multiple Choice Questions**

**Question 1: Which of the following organisms is correctly paired with a domestic animal with which it is associated?**

1. *Histoplasmosa capsulatum* and dogs
2. *Mycobacterium marinum* and parrots
3. *Streptobacillus moniliformis* and rats
4. Hanta virusand reptiles

**Question 2: Which of the following is the most common clinical presentation of *Mycobacterium marinum* infection in humans?**

1. Pulmonary disease
2. Disseminated disease
3. Gastrointestinal disease
4. Skin and soft tissue disease

**Question 3: Which of the following regimens is a recognised management option for treatment of *Mycobacterium marinum* skin and soft tissue infection?**

1. Rifampicin or clarithromycin and ethambutol
2. Pyrazinamide
3. Isoniazid and Streptomycin
4. Trimethoprim

**Figure Legends**

Figure 1a: MRI scan of left hand showing osteomyelitis with complete destruction of 4th PIP joint and significant soft tissue oedema

Figure 1b: Dehiscence of left fourth finger wound following orthopaedic debridement and deep tissue sampling

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