REPORT TO

THE DEPARTMENT OF CONSERVATION

SCIENCE AND RESEARCH DIVISION

SEAL FINGER AND MYCOBACTERIAL INFECTIONS

OF MAN FROM MARINE MAMMALS:

OCCURRENCE, INFECTION AND TREATMENT

MARTIN W CAWTHORN
CAWTHORN & ASSOCIATES
MARINE MAMMALS-FISHERIES CONSULTANTS
53 MOTUHARA ROAD, PLIMMERTON
WELLINGTON

ISSN 1171-9834

Reference to material in this report should be cited thus:

Cawthorn, M.W., 1994.
Seal finger and mycobacterial infections of man from marine mammals occurrence, infection and treatment.
Conservation Advisory Science Notes No. 102, Department of Conservation, Wellington. 15p.

Commissioned by: Science & Research Division.
Location: NZMS

CONTENTS

INTRODUCTION

All whales and seals harbour a variety of parasites, bacteria, viruses and fungi. Some of these are pathogenic in humans and can cause chronic painful conditions which are reluctant to respond to many commonly used drugs. Some of the pathogens have only recently been identified and if infected humans are left untreated, are potentially fatal. Geraci (1993) cites some examples noting: "Several investigators working on an outbreak of seal influenza developed painful conjunctivitis caused by the same virus. At least one pox virus in seals can cause irritating skin lesions that take several months to heal. The bacteria Erysipelothrix sp., Leptospira sp. and Loboa loboi have also been transmitted to people from contaminated animals."

This paper is intended to bring to the attention of people working with marine mammals, and members of the medical profession, the symptoms and possible treatments of the serious infections which can be passed from seals and whales to humans. Five case histories are appended.

Of all the conditions resulting from contact with marine mammals, "seal finger' or "spekk finger" (literally blubber finger as it is known to the Norwegians) is the most notorious. The infection is described as a sub-acute, severely painful infection of the fingers which, if left untreated, can result in permanent disability. In fact, the pain involved in this infection can be so severe that there are reports of sealers resorting to amputation of infected fingers in an attempt to cure themselves.

With the development of marine oceanaria and similar facilities where wild or captive bred marine mammals are held in captivity and closely attended by trainers and handlers, the chances of transmission of infectious diseases from animals to humans has increased significantly. Therefore it could be assumed that the chances to study these diseases have increased proportionally. Yet surprisingly little is known of the infective agents responsible for the various conditions often collectively referred to by the generic term "seal finger". It is not surprising therefore that most general practitioners, when confronted by a patient complaining of a "seal finger", are unsure of the appropriate treatment.

SEAL FINGER

Seal finger has been described in the medical literature since 1907 (Candolin, 1953). Cases have now been recorded from people working with harp seals (England, 1924), ring seals and polar bears (Beck and Smith, 1976), South African fur seals (Shaughnessy, pers comm. 1994), New Zealand fur seals (Wilson, pers comm. 1994) and Ross seals in the Antarctic (Panagis et al, 1982). In a pioneering work on the topic, Candolin (1953) investigated 224 cases of seal finger and most of his comments are still valid. Although some microorganisms have been implicated as causative agents, none have yet been formally identified as the sole cause of seal finger.

Seal finger is acquired most frequently by those people involved not only in sealing but also in the handling of seal meat and blubber. It appears that a break in the skin is necessary for

infection to be established (Rodahl, 1943; Markham and Polk, 1979) and, as Rodahl (1943) observed, "spekk finger occurs most frequently among people who take little personal care, and who seldom clean their hands properly with hot water and soap". (Case studies 1, 4 & 5.) Rodahl also noted, "It is a striking fact that Greenland Eskimos appear to be immune from spekk finger, while it is quite common among European hunters." Whether this alleged immunity is a result of personal hygiene, more skilful technique or an historic immunity is unknown. Among the Aleuts who skinned fur seals on St Paul Island, Alaska, seal finger was a common problem infecting many of the men working there during the sealing season. (F. Bruemmer pers.comm.)

People who developed infections after working with whales have often assumed they have "seal finger" as the symptoms can be almost identical. Erysipelothrix insidiosa, the causative agent of erysipeloid, has been isolated from the following dolphin species, Tursiops truncatus, T.aduncus, Stenella plagiodon, Grampus griseus, and Lagenorynchus obliquidens (Suer and Vedros 1988). The bacterium Erysipelothrix rhusiopathiae has been isolated from the teeth/gum margin area of 2-year old northern fur seals, northern elephant seals, Atlantic herring fish meal and bite wounds in marine mammal handlers (Suer and Vedros 1988).

Symptoms of Seal Finger

In his classic 1924 description of the commercial seal hunt on the ice north-east of Newfoundland, George Allen England sparingly stated, "Some of the wounds on account (it is said) of the seal fat, develop terrific infections. Seal fingers are such infections of the hands."

Rodahl's (1943) description of the symptoms is somewhat fuller. "When infected, a sudden painful swelling of the finger occurs; the skin takes a reddish colour, with a somewhat taut and shiny appearance. The affected area is soft and swollen, due to a thick colourless fluid; in most cases there is no pus. The patient complains of severe local pain and stiff joints. Throbbing is very marked. In many cases the whole arm becomes swollen, but the site of the infection in all cases I have examined has been the fingers. The axillary lymph glands may also be swollen."

Although seal finger is relatively common in the northern hemisphere, only three cases have been reported from Antarctica (Lavaag 1940, Panagis et al 1982). In the most recent incident, four South African researchers were collecting data and information from 21 Ross seals (Ommatophoca rossi) in the Antarctic pack-ice. The work involved dissection and contact with most tissue types from the seals. Two members of the team working on one seal developed the symptoms of an infection resembling "seal finger".

The first case was noticed some seven days after the last seal was processed. The proximal joint of the index finger became swollen, pink and painful. This condition persisted for 28 days until treated with Vibramycin which cleared the infection after 11 days. The second case appeared 41 days after the last seal was processed. The infection appeared in the distal joint of the forefinger and after three days the swelling was marked. Attempts to straighten the finger were painful. This case was treated with intravenous injection of Aureomycin and Ledermycin capsules were taken orally for seven days, after which the infection cleared (Panagis et al 1982).

Typically the infection is through an insignificant wound, such as a small bite, cut, scratch or graze. In three to seven days a small swelling may be noted at the site of the wound which may otherwise appear normal. The nearest joint usually becomes stiff, hot and exceptionally painful. Throbbing pain, exacerbated by sudden movement, can become so severe that the patients are prevented from sleeping. Swelling varies, but can cause the finger to enlarge to three times normal size and may spread to involve the entire hand, which can eventually look like an over-inflated rubber glove. Abscesses do not form, although a thick plasma-like fluid may exude from the skin. Red lines may appear on the skin, running from the site of infection along the lymph vessels to the nearby lymph nodes, eg in the axilla or groin.

Treatment of Seal Finger

Untreated, seal finger infections will take from three to six months to resolve, especially if there is any joint involvement.

Early treatments used by sealers, other than amputation, usually involved poultices. The most extreme of these treatments is described by Rodahl (1943). "A thick layer of soft soap (sometimes mixed with ordinary washing soda) is spread on the infected hand. The covering bandage is from time to time placed in boiling water. Naturally, this treatment is extremely painful, but the prognosis is said to be good." Other treatments said to be less radical - and less effective - were poultices of camphor oil, and flour and alcohol pastes. These treatments were less a reflection of contemporary medical knowledge than the hopeful use of materials available in ships' medicine chests at the time.

The bacterial etiology of seal finger remains obscure. All that can be said definitely about the agent of seal finger is that it appears to be resistant in vivo to penicillin, sulfonamides, and erythromycin, and is sensitive to tetracycline (Markham and Polk 1979).

Broad spectrum tetracycline based drugs which have been successfully used to treat seal finger are Achromycin (Beck and Smith 1976), Vibramycin (Shaughnessy pers comm. 1994, Panagis et al 1982), Tetracycline (Markham and Polk 1979), Aureomycin and Ledermycin (Panagis et al 1982).

MYCOBACTERIAL INFECTIONS FROM SEALS

The stranding and death of seals and sea lions, particularly old animals, is frequently associated with bacterial pneumonia which is one of the most common diseases of marine mammals. The bacteria most commonly isolated from stranded pinnipeds are similar to those reported in cetaceans and include Pseudomonas, Staphylococcus, Streptococcus and Salmonella (Cousins et al 1993). Recently, for the first time a form of Mycobacterium bovis has been isolated from tissues of Australian sea lions (Neophoca cinerea) and New Zealand fur seals (Arctocephalus forsteri) in Western Australia. This infection received some prominence when it was revealed that in 1988 a seal trainer who was employed at a marine park in Western Australia developed pulmonary tuberculosis; the most likely cause being via aerosol transmission of the infective agent through close contact with barking or sneezing seals.

It is important to realise that the primary focus of mycobacterial infection is not necessarily the respiratory system. The infection can readily be sited in complex tissues and their accompanying lymph nodes.

In 1972 a scientist working at the Snares Islands conducted a necropsy on a New Zealand sea lion (Phocarctos hookeri). During the course of the necropsy he noted that "the lung's linings had many white spots on them". The scientist accidentally cut the skin at the base of his right thumb. The wound would not heal properly and five months later his "energy levels had dropped to near zero". He would become very tired for a couple of weeks, then small sores would break out over his head, shoulders and back. These sores would take months to heal. Seven months after the accident a large lymph node swelled up in his right armpit. During field work the node ruptured and discharged. The wound was cleaned and treated by a doctor who put the patient on a course of antibiotics. One year after the original accident, a number of affected lymph nodes were excised along with some of the slow to heal sores nearby.

The patient responded positively to a Mantoux test (a specific test for tuberculosis infection) and was put on a course of Isoniazid to combat what had been diagnosed as an atypical tuberculosis infection. The patient is still affected by the disease which will manifest itself following periods of stress or fatigue. All attempts to isolate and identify the causal agent of the patient's infection have, so far, been unsuccessful (Case Study 3).

Between 1980 and 1985, during field work on sea lions at the Auckland Islands south of New Zealand, my assistant and I routinely necropsied dead animals to try to ascertain causes of death.

Three mature female sea lions were noted to have creamy white caseous nodules over the surface of the lungs and pleura. Examination of a dead male fur seal with worn teeth revealed masses of white modules over the lungs and pleura. The thoracic cavity contained a considerable quantity of thick, whitish fluid. The assessment of a veterinarian was that these animals had probably all succumbed to "verminous pneumonia". This is normally caused by invasion of lung tissue by nematodes which can lead to bacterial infection. Sea lions are commonly parasitised although, to date, lung worms have not been found in Hooker's sea lion (Phocarctos hookeri). Bacterial pneumonia is a common cause of death in older sea lions. Clearly, from evidence such as that presented in Case Study 3, mycobacterial infections are also a factor.

The pathogenesis of pulmonary tuberculosis has been well described. The tissue necrosis is described as "caseous", because it resembles cheese, being homogenous, yellow-white and rich in lipids and proteins derived from tubercle bacilli and dead cells.

Non-tuberculous mycobacteria (NTM) are now a well-recognised cause of pulmonary disease. NTM are ubiquitous inhabitants of the natural environment and exist in a variety of animal hosts and non-biologic reservoirs, including the soil and water.

The major members of the M.tuberculosis complex of mycobacteria are M.tuberculosis, and

M.bovis, the species most often implicated in infections contracted from seals. These organisms are responsible for more than 95% of the pulmonary bacterioses in the world, are environmentally resistant and are regarded as contagious from person to person.

Mycobacterial disease is spread either through inhalation of aerosol borne bacilli or through direct transfer through broken skin. The distribution of extrapulmonary infections are as follows: lymphatic 27.5%, pleural 23.4%, genitourinary 12.7%, other 36.4% (Fishman 1988).

Symptoms

The usual nondescript systemic symptoms of mycobacterial disease include slow, progressive fatigue, anorexia, weight loss, irregular menses, and low grade fevers over many weeks to months. The standard tuberculin skin test utilises the intracutaneous (Mantoux) method, where the testing agent is injected into the skin of the dorsal area of the forearm.

Treatment

The approach to treatment varies with the species. Certain antibiotics that are of little use in the treatment of M.tuberculosis sometimes give good results in treating diseases produced by other mycobacteria. Unfortunately, standardised treatment regimens for mycobacteriosis are not available because the diseases the mycobacteria cause are relatively uncommon.

Commonly used drugs in the treatment of mycobacterial disease are Isoniazid, Rifampin, Streptomycin, Pyrazinamide and Ethambutol (Fishman 1988).

SPEKK FINGER AND INFECTIONS FROM WHALES

Contamination of humans from cetaceans is relatively unusual compared to the incidence of infections from seals. The risks of disease are low if those involved take normal, sensible precautions, wear appropriate clothing and keep clean. In my experience, bacterial infections of injuries are few among flensers, lemmers, biologists and others working at whaling stations. The main reason for this is probably the freshness of the meat and blubber being handled, as most of the product, in recent time, was destined for either human or high quality animal food.

My own case of "spekk finger", detailed in Case Study 1, was a result of working with material which, although fresh when landed, had been sitting in the warm sun for a number of hours. Infection was assisted by tardy treatment of an apparently insignificant wound.

Case Study 2, demonstrated the ease by which probable mycobacteria from long dead whales can infect workers, either through wounds or by inhalation of aerosols, in this case from steam cleaning of skeletal material. Neither patient received the appropriate treatment. The subsequent hypersensitivity of one patient in Case Study 2 to handling whale material is unexplained.

Treatment

The bacteria Erysipelothrix sp. has been isolated from a number of toothed whales and generally responds to penicillin.

CONCLUSIONS

It is now clear that some southern hemisphere seals carry both the bacterial agent which causes "seal finger" and also mycobacteria, especially variants of M.bovis, which is readily transmitted to humans either through aerosols from sneezes, coughs and barks, or directly through broken skin. The spores of mycobacteria, which have a waxy coat, are resistant to environmental degradation and can remain viable in sediments and soil for many years. In New Zealand, M.bovis has been a problem in domestic cattle, wild possums (brush tailed phalangers) and deer for many years. The disease may have been contracted by seals via carcasses of these carriers which have been washed down rivers to the sea in the vicinity of seal haulouts or rookeries or from the body wastes of feral deer.

There is an obvious need for a comprehensive study to clarify the range, taxonomic position and origin of the mycobacteria involved in infections from seals.

The agent causing seal finger is probably endemic in seals world-wide. Infections have now been recorded not only from the northern hemisphere, but also from New Zealand, Australia, South Africa and Antarctica.

The risk of infection is low in healthy people who take normal precautions, are free of other infections and are not taking any immunosuppressant drugs. If infection does occur, it is important to recognise whether it is seal finger or a mycoplasma since the treatment for one is quite ineffective against the other.

Seal finger infection follows a regular course which is specific to this disease. It normally responds positively to tetracycline. If left untreated, the chronic infection can result in permanent disability. Mycobacterial infections similarly follow a prescribed course typical of non-tubercular infections. These usually respond to Streptomycin, Isoniazid Rifampin and similar drugs.

RECOMMENDATIONS

1. All people working with whales or seals should be advised of the nature and symptoms of seal/spekk finger and mycobacterial infections.

2. They must be aware of the need for prompt attention to any wounds, however trivial they may seem, and the need for good personal hygiene.

3. Marine mammal workers who are handling animals must have the appropriate drugs in their medical kits which should always be close to hand. Kits should be comprehensive and practical.

4. Wear good (untorn) gloves when handling animals, carcasses or tissues.

5. Wear waterproof clothing to prevent clothing being contaminated by fluids such as blood.

6. After completing necropsies, all clothing and reusable equipment must be scrubbed clean. Hands must be washed clean, then scrubbed with antiseptic.

7. Medical staff nearest the work sites should be informed of the symptoms and treatment of these infections.

8. Any bites, grazes or cuts resulting from handling marine mammals should be reported to medical staff with remarks as to the source of the injury.

9. A comprehensive investigative programme should be put in place to ascertain the possible sources and extent of these infective agents in seals and whales around New Zealand.

REFERENCES

Beck, B., Smith, T.G. 1976 *Seal Finger: an unsolved medical problem in Canada* Can Med. Assoc.J. 115:105

Candolin, Y. 1953 *Seal Finger (Spekkfinger) and its occurrence in the gulfs of the Baltic Sea* Acta.Chir.Scand.(Suppl.) 177.62

Cousins, D.V., Williams, S.N., Reuter, R., Foreshaw, D., Chadwick, B., Coughran, D., Collins, P., and Gales, N. 1993 *Tuberculosis in wild seals and characterisation of the seal bacillus* Aus.Vet.J.70(3):92-97

England, G.A. 1924 *Vikings of the Ice* Doubleday, New York. p.39

Fishman, A.P. 1988 *Pulmonary Diseases and Disorders* Vol.3 (2nd Edit.) McGraw Hill, Auckland

Geraci, J.R. and Valeria J. Lounsbury 1993 *Marine Mammals Ashore: A Field Guide for Strandings* Texas A&M University Sea Grant College Program Publication TAMU-SG-93-601 ISBN 1-883550-01-7

Lavaag, K. 1940 *To tilfelle av 'Spekkfinger' Tisskrift fur Den Norske Tegeforening* 60:173-178

Markham, R.B. and B. Frank Polk 1979 *Seal Finger* Reviews of Infectious Diseases Vol. 1(3): 567-569

Panagis, K., Apps P., and Knight, M.H. 1982 *Seal Finger: occurrence in Antarctica* S.Afr.J. Antarct.Res.,Vol.12, 1982

Rodahl, K. 1943 *Notes on the prevention and treatment of 'Spekkfinger'* Polar Reocrd 4:17-18

Suer, I.D. and Neylan A Vedros 1988 *Erysipelothirx rhusiopathiae.I. Isolation and characterization from pinnipeds and bite/abrasion wounds in humans* Dis.aquat.Org.5: 1-5

Thompson, P.J., Cousins, D.V., Gow, B.L., Collins, D.M., Williamson, B.H., and Dagnis, H.T. 1993 *Seals, Seal Trainers, and Mycobacterial Infection* Am.Rev.Respir.Dis.147: 164-167

Acknowledgements

I would like to thank the following for their interest and support:
Steve Attwood, Marthan Bester, Fred Bruemmer, Debby Cousins, Anna Dyzel, Nick Gales, Joe Geraci, Mike Hine, Don Horning, Gerald McCormack, Simon Mitchell, Chris Robertson, Peter Shaughnessy, Tom Smith and Kerry-Jane Wilson.

APPENDIX 1

Case Study 1

In July 1967 I was working as a Canadian Government biologist sampling commercially caught whales at a whaling station in Nova Scotia. Whaling had been brisk and six animals had been landed. The heads, the last part of the whales to be processed, had been pulled to one side of the flensing deck pending processing. During the process of removing the wax ear plug (used for ageing) from the ear canal I cut the skin over the proximal joint of my right index finger on a sharp sliver of bone. The wound was trivial, about 6mm long and 1mm deep, lifting a small flap of skin. There was very little bleeding and what blood appeared was diluted by the film of whale oil on my skin. Gloves were rarely worn as the whales landed were extremely fresh being destined for consumption. On completing my sampling - about 20 minutes after cutting my hand - I cleaned and dressed the wound.

Four days later, the area around the cut was markedly swollen, tight and puffy with only a little pus accumulated at the edges of the cut. The joint was extremely painful and stiff. I thought it possible that a small particle of dirt had remained in the wound to cause the inflammation. I then soaked the finger in hot water, lanced the swelling and cleaned it thoroughly. Two days later the swelling had increased to involve my entire hand. The index and second fingers were swollen to about twice normal size and immobile. Pain in the joints of the index finger was extreme and the whole hand throbbed heavily. Red stripes extended from the wrist halfway up my forearm.

I consulted the local general practitioner and penicillin as immediately given intramuscularly. This was accompanied by a course of oral antibiotics for 10 days. The combination of drugs held the infection in check but neither reduced the swelling nor the stripes up my arm. Nine days after the initial cut the hand remained swollen, stiff and extremely painful. I returned to the doctor who prescribed Achromycin (tetracycline hydrochloride) with the instruction to complete both courses of drugs. Two days after starting the second drug the swelling and reddening was reducing rapidly. Twenty one days after the original wound the hand was near normal and the cut had healed. Full mobility was regained after 21 days medication. There was no recurrence of any symptoms.

The infection was described as "spekk finger" by Norwegian whalers who were familiar with the symptoms but, regrettably, not the cure.

Case Study 2

In 1993 two of the curatorial staff at the Queen Victoria Museum, Launceston, Tasmania, collected two stranded cetaceans, which had been dead about 7 days, to retrieve the skeletons for display in the museum. During the recovery of the skeletons, both men were, at times, working up to their waists in sea water with viscera, tissues and body fluids floating around them - not an unusual occurrence for enthusiastic museum collectors. One of the men grazed his fingers slightly in the process.

The bones were returned to the museum where the men began removal of the last remnants of tissue by scraping and then blasting the material from the bones using a high pressure steam cleaner. Both men were dressed in plastic coveralls.

About seven days after this job, both men became lethargic. One developed swollen lymph nodes in the armpits and neck. The other, who had grazed his hand, developed very swollen fingers which were red and extremely sore. There was no pus present and pressure on the swelling could not produce any discharge. He also developed open sores over the skin.

Both men suffered from painful conjunctivitis.

The two men consulted general practitioners who were uncertain in their diagnoses. Blood tests for glandular fever proved negative. No drugs or anti-biotics were prescribed.

One of the two patients is now apparently hypersensitive to whale material. Whenever he comes in contact with whale tissue or oily bones the same symptoms of lethargy and swollen lymph nodes recur. Whether these symptoms are the result of contact with infected tissues or inhaled infective agents in the aerosol from the steam cleaner is impossible to tell. It could be the result of either or a combination of both.

The history of the patient who grazed his hand is similar to what is normally described as "spekk finger".

Case Study 3

In January 1972 scientists were conducting field research on the Snares Island about 200 km south-west of New Zealand. A male Hooker's sea lion hauled out by the accommodation but where the scientists were living some distance above the sea. The animal was obviously ill and became progressively thinner over the next two months until it died in March.

One scientist pulled the animal down to the tide-wash where he dissected it. His investigation revealed only a few white mites in the oesophagus and the presence of many white spots on the surface of the lungs.

During the dissection, the scientist cut himself at the base of the right thumb. He thought little of the incident at the time but the cut did not heal. By August he noted his "energy levels had dropped to near zero" and he required a lot of sleep. Recurrent spells of lassitude came in series - "very tired for a couple of weeks, then small sores would break out on my head, shoulders and back. These sores took months to heal." In October, seven months after cutting himself during the dissection of the sea lion, a large swelling developed in the scientist's right armpit.

Eleven months after the original infection the scientist, who was again in the field, slipped and fell, breaking the skin and rupturing the swollen gland in his armpit which discharged a substantial amount of pus. A doctor who was present cleaned and dressed the wound and gave the patient antibiotics (unspecified).

On return to Christchurch in March, 12 months after the initial infection, the patient was given a Mantoux test to which he reacted "very positively". He was hospitalised, the infected lymph node in his armpit and a couple of the larger, slow to heal sores were surgically removed. An "atypical tuberculosis"* infection was diagnosed and he was prescribed a course of an anti-tuberculin drug, Isoniazid, for about six months.

Gradually his energy levels picked up, the sores healed and it appeared that he was rid of the infection. Unfortunately this was not so. Symptoms identical to those initially experienced - a period of extreme tiredness followed by the eruption of sores which were very slow to heal - returned every six months or so.

Eventually, these became so bad that in the late 1970s he was again prescribed a further course of Isoniazid, and then another in the early 1980s. Several more large unhealed lesions were excised.

Twenty two years after cutting himself during the dissection on the Snares Islands he still has the infection and has only recently recovered from another outbreak. The onset of the complaint is predictably precipitated by stress or over-tiredness, the lesions are smaller and now take only 3-4 weeks to heal. The patient now feels that he has some element of control over the infection and can prevent a relapse by avoiding stress and fatigue where possible.

It is noteworthy that various culture techniques used to isolate and specifically identify the organism responsible for this "atypical tuberculosis"* have, so far, been unsuccessful. The patient has no doubt that the infection was from the dead Hooker's sea lion he dissected.

* A general term referring to tuberculosis caused by mycobacteria other than M.tuberculosis.

Case Study 4

In November 1974 a scientist working at the seal rookery on Open Bay Islands, Jacksons Bay, was threading a wire through a skull collected from a dead fur seal. The following account is based on the scientist's recollections and diary notes.

"As I was threading the wire, it pierced my finger but the cut was not deep and, in itself, of no significance. After 2-3 days the finger swelled, looked pasty white and became very painful. The pain spread up my arm. I vividly remember searing pain in the elbow and subsequently the shoulder joint. Approximately four days following the injury, I returned to Christchurch and consulted a doctor who diagnosed "septicaemia". I was put on a course of antibiotics and the arm was partially immobilised in a sling. The antibiotics reduced the symptoms but over the next 12 months I had recurrent bouts of "septicaemia" almost any time the skin was broken. These were treated with a variety of penicillin based drugs and other antibiotics but none gave more than temporary relief. Long term relief came only when prescribed double doses of two different antibiotics simultaneously.

Septicaemia recurred at gradually increasing intervals for several years with symptoms identical to those described above; after two days the area around the wound would swell, become puffy and white with increasingly severe pain and tenderness. After a short 2-3 day course of antibiotics the symptoms would reduce then disappear.

The symptoms have not recurred for the last 10 years or so and I believe the problem is now resolved."

Regrettably there are no records available which describe either the diagnoses made or the drugs prescribed in this case.

Case Study 5

On 30 January 1994 a member of the Department of Conservation staff was assisting with seal surveys on Open Bay Islands, Jacksons Bay. During this work he was bitten by a young seal on the third (ring) finger of the left hand, cutting the skin between the hand and the proximal joint. A few of days after returning home he noted there was a little swelling around the wound which had almost closed with just a little pus visible.

On 2 February 1994, three days after the bite, the hand was swollen, tender and warm. He consulted his doctor who prescribed a course of Erythromycin and advised him to return immediately if the symptoms did not respond to the medication. In a few days, the hand became grossly swollen and the pain intense. An x-ray of the hand was made on 8 February (9 days following the bite) and revealed no bone or joint involvement.

The hand continued to swell slowly, was intensely painful and there was some concomitant swelling of axillary lymph nodes. Augmentin and Noroxin were prescribed without effect. On 14 February (+ 15 days) the patient was admitted to hospital and placed on intra-venous Augmentin. This reduced the pain and swelling to the point where he was discharged on oral Erythromycin on 19 February 1994 (+20 days).

Three days later (+23 days) on 22 February, the patient presented again with a very hot, very swollen and extremely painful hand. On the advice of the author, tetracycline was prescribed and the patient commented that the effect, following the initial double dose, "was almost immediate". The swelling and pain reduced very quickly. Tetracycline was continued for a full 10 days. By 4 March 1994 (+33 days) the wounds were well healed and he had recovered full power in his grip. By 31 March only a mild swelling of the dorsum of the hand remained.

APPENDIX 2

SUGGESTED FIRST AID KIT FOR MARINE MAMMALOGISTS

1. Antiseptic solution (Dettol etc)
2. Sterile Saline Washes (wound flushing)
3. Nail Brush
4. Antibiotic Solution (Betadine surgical scrub)
5. Topical Antibiotic (Betadine dry powder spray - ointment)
6. Wound Dressings (Field pressure dressings)
7. Leucopore Adhesive Tape
8. Telfa Pads (non-adhesive dressing pads)
9. Adhesive Butterfly Wound Sutures
10. Autraumatic Wound Sutures and Suturing Forceps
11. Lignocaine
12. Crepe Bandage
13. Elastonet
14. Tube Gauze (with applicator/s)
15. Tetracycline (capsule form)
16. Erythromycin (capsule form)
17. Anti-inflammatory drug (Voltarin etc)
18. Tourniquet
19. Thermometer (clinical)
20. Scissors
21. Safety Pins
22. Pain Relief (Temgesic etc)
23. Aspirin, Panadol
24. Cotton Buds, Forceps, Snips (for cutting boots etc)
25. A list of local emergency contact numbers and persons (especially cell phone) and radio frequencies for medical services. These should be plastic laminated and kept in the kit.

Note: Before departing for the field ALWAYS check team members for tolerance to specific drugs, especially aspirin and penicillin.

APPENDIX 3

HANDLING HEALTHY ANIMALS

Handling all seals is often difficult and potentially dangerous, particularly when dealing with the speedy and agile sea lions and fur seals. Ailing animals are usually lethargic and relatively docile, whereas healthy seals are resilient, active and will often take the aggressive initiative in any confrontation where their escape routes are restricted. When fur seals and sea lions attack, they will usually deliver a powerful bite, securing their prey firmly with the large canine and caniform incisor teeth, and then shake laterally, using their immensely strong necks, to cause severe tissue damage. Even small bites from pups are potentially dangerous.

It is therefore imperative that you are able to control the head if you are going to safely manipulate and handle seals in any way.

Heavy leather welder's gauntlets with long tops are effective protection for pup bites.

When lifting healthy or moribund pups, pick the seal up by one scutter (hind flipper), slide the other hand beneath the seal and grasp the opposite fore-flipper close to the body supporting the seal's weight on your forearm. Seal pups are more comfortable and less likely to struggle when held supported in this way. If they begin to struggle, pull the scutter toward you while pushing the fore flipper away thus straightening the animal's body and preventing it from turning.

When dealing with large juveniles and adults it is advisable to immobilise them, either with a net or by using a choker-pole. The latter is simple to make and use and is particularly effective. The poles should be of soft but resilient wood, such as Kahikitea (white pine), about 50mm diameter and 2-2.5m long. A piece of rope (not less than 12mm diameter) about 85cm long is threaded through two holes 30-35cm apart drilled through one end of the pole. A simple knot tied at each end of the rope prevents it from pulling through the holes.

When using the pole drop the loop around the seal's neck so it lies behind the angle of the jaw. Turn the pole so the loop winds up on itself until it is firm, but not over-tight. The aim is to control the movement of the head, not throttle the seal.

If the seal is large, two poles can be used from opposite sides to push the head toward the ground. The animal can then be moved about by pushing the poles forward or by lifting the scutters up so the seal must walk forward on its fore flippers. Alternatively, it can be netted or physically constrained by some other method for movement and manipulation.

SAFETY WATCHPOINTS:

- Do not stand in front of the animal.
- Do not stand between a released seal and the sea.
- Do not handle the heads of seals which are unrestrained.
- Do not handle seals without some form of protection such as long topped leather gloves.
- Do not over-tighten choker-poles or obstruct airways.
- Keep handling episodes as brief as possible.