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Treatment of infectious diseases in stranded harbour seals

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Introduction

The Harbour Seals Rehabilitation and Research Centre in Pieterburen started its activities of receiving and treating stranded seals 16 years ago. While in the early days mainly newly-born motherless seals were received, care was gradually extended to include an increasing number of older sick animals. The seals vary in age from 3 months to 1 year. Pollution of the sea, particularly by PCBs (polychlorinated biphenyls), is not only lowering the birth rate of seals but impairs their resistance to infection in the first year of life.

Over 90% of these infections occur in the lungs; they are always combinations of parasitic and bacterial infections.

Figure 1 shows the number of seals taken into the centre in the 1980s. A total of about one hundred stranded seals are now taken in every year. About one third of this number are baby seals, the others are young seals nearly always with lung infections (Fig. 2).

First aid

When a young seal is caught, disease has always been raging for some time. This means that the infectious process has already reached an advanced stage. Therefore the seals are badly emaciated and especially dehydrated without exception. Despite their very weak physical condition, the stress caused by confronting humans is often violent.

To prevent such shock, when a stranded seal is found it is first given steroid medication in the form of 1 mg of Decadron* per kg bodyweight. Dehydration is countered with orally administered rehydration salts. This liquid (Fig. 3) is administered 3 times at hourly intervals. In this way the circulation is stabilized. Stabilization is absolutely necessary, since the condition of shock due to a serious infection combined with the stress induced by being caught can easily lead to the lethal condition of respiratory distress. Then the sick animal often dies with symptoms of massive pulmonary oedema.

In normal conditions seals breathe through the nose. In a catarrhal bronchitis the nasal passages are quickly blocked by mucus, making breathing very difficult. We found that this problem could be obviated with the drug Mucosil*. This drug can be sprayed into the nasal passages in liquid form. Mucosil is an acetyl cysteine preparation which breaks down the sulphur bridges in mucus. The viscous mucus becomes liquid and the nasal passages

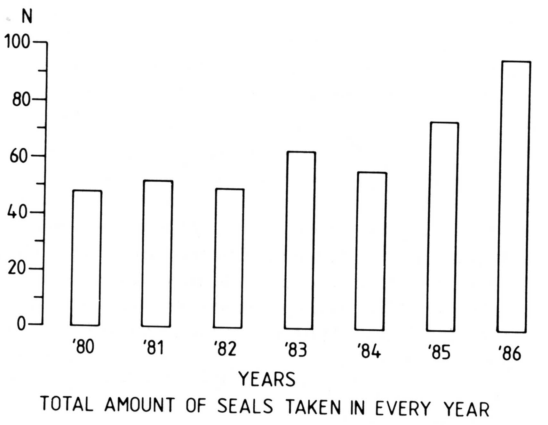

Figure 1.

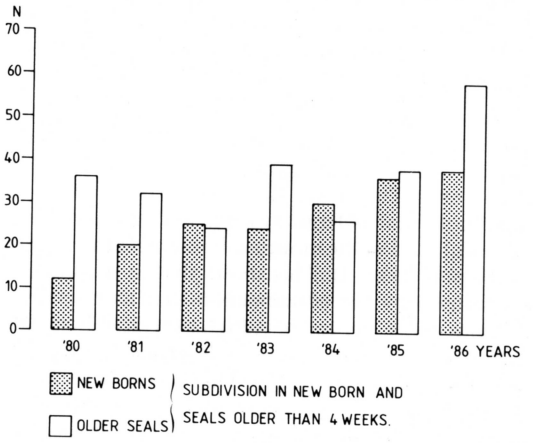

Figure 2.

ORAL REHYDRATION SALTS

Per 100 ml contains this solutions

Glucose	3,64 gr
KCl	0,10 gr
NaCl	0,10 gr
Na-Lactate	0,40 gr

The energetic value is 140 KCal, the osmolarity is 290 mosm/l.

Figure 3.

become free once more. The bronchiospatic component of the respiratory obstruction can be countered with Bricanyl* administered intramuscularly. Bricanyl is a sympathomimetic with selective action on beta-2 receptors of the trachea and bronchial musculature. Beta-1 receptors of the heart are affected to a relatively small extent, so extra tachycardia will not occur.

These are the measures with which we treat the seals even before they are taken into the centre, in order to let the life-threatening pathophysiology take a turn for the better.

Clinical aid

On first admission to the centre the seals are subjected to classical physical diagnostics.

As an essential part of admission examinations, bacterial cultures are routinely done of mouth and anus. In a bacteriological laboratory it is determined what bacteria types occur in what places, and to what antibiotics the microbes are sensitive. By determining the composition of the bacterial flora in the mouth and anus, essential data can be obtained concerning the gravity of the sickness of the animal. Normally there is a major difference between the bacterial flora in mouth and anus. In a relatively healthy animal no pathogenic organisms are found in the mouth. The sicker the animal, the weaker its immunological defense system, and the more the bacterial flora in the mouth will resemble the culture in the anus (Fig. 4). This shows that in seals one is confronted by the phenomenon that as resistance declines there occurs bacterial overgrowth in the digestive tract. This overgrowth triggers a mechanism of repetitive reinfection. That is why seriously ill seals are not only systematically treated with antibiotics, but their mouths are smeared with a disinfectant paste. This paste contains antibiotics and an

Age; 9 month 23-10-87
Female harbour seal 77

Sensibility	Mouth Colony I	Mouth Colony II	Anus Colony III	Anus Colony IV	Anus Colony V
Penicilline	0	0	0	0	0
Erythromycine	1	0	1	0	0
Cloxacillines	0	0	0	0	0
Cefradine	0	0	0	0	0
Ampicillines	0	1	0	0	1
Cefuroxim	0	2	0	2	3
Tetracycline	0	2	0	0	0
Chlooramfenicol	0	3	0	3	3
Cefotaxim	0	3	0	3	3
Tobramycine	0	3	0	2	3
Netilmicine	0	3	0	3	3
Amikacine	0	3	0	2	3
Ticarcilline	0	3	0	0	3
Sulfa	0	0	0	0	3
Trimethoprim	3	0	0	0	0
Co-trimoxazol	0	0	0	0	0
Nitrofurantoine	0	0	0	0	0
Pipemidinezuur	0	0	0	0	0
Mecillinam	0	0	0	0	0
Piperacilline	0	3	0	0	3
Polymyxine	0	3	0	3	0
Vancomycine	3	0	3	0	0
Ceftazidim	0	3	0	3	3

Colony I	Streptococcusfaecalis	Growth Density	+++
Colony II	Escherichia Coli	Growth Density	+++
Colony III	Streptococcusfaecalis	Growth Density	+++
Colony IV	Escherichia Coli	Growth Density	+++
Colony V	Proteus Vulgaris	Growth Density	+++

Figure 4.

antimycotic. The antibiotics in the paste are not reabsorbed in the digestive tract. In this way the bacteria in the sick animal are attacked from two ends. The type of antibiotic selected depends on the antibiogramme. The most frequently occurring bacterial types are Streptococcus faecalis, Escherichia coli, Proteus mirabilis, and Pseudomonas aeruginosa, although Streptococcus haemolyticus is regularly found, too.

These are well-known bacteria, but what is often causing problems is their pattern of resistance. Especially streptococci have a resistance pattern that is causing concern (Fig. 5). More often than not streptococci are found which are sensitive to only one or two antibiotics, thereby severely narrowing down the choice of drugs. However, due to the narrow sensitivity spectrum, growth opportunities are created for other bacteria, which have a different, narrow sensitivity band. This makes regular repeat tests of bacterial cultures necessary, and the choice of antibiotics used in treatment should also be varied at regular intervals. Fortunately, proteus and pseudomonas have a broader sensitive spectrum. The resistance pattern of coli types, by contrast, is very treacherous (Fig. 6). Diminished sensitivity is a regular phenomenon. With these bacteria sensitivity to only one or two antibiotics happens frequently, making regular antibiotic changes necessary. A responsible antibiotics policy is only possible with frequently repeated bacteriological laboratory work.

Age; 3 weeks 17-07-86
Female harbour seal
Mouth

Sensibility	ColonyI	Colony II	Colony III	Colony IV	Colony V
Penicilline	0				
Erythromycine	0				
Cloxacillines	0				
Cefradine	0				
Ampicillines	0				
Cefuroxim	0				
Tetracycline	0				
Chlooramfenicol	0				
Cefotaxim	0				
Tobramycine	0				
Netilmicine	0				
Amikacine	0				
Ticarcilline	0				
Sulfa	0				
Trimethoprim	3				
Co-trimoxazol	0				
Nitrofurantoine	0				
Pipemidinezuur	0				
Mecillinam	0				
Piperacilline	0				
Polymyxine	0				
Vancomycine	3				
Ceftazidim	0				

Colony I	Streptococcusfaecalis	Growth Density	+++
Colony II		Growth Density	
Colony III		Growth Density	
Colony IV		Growth Density	
Colony V		Growth Density	

Figure 5.

Age; 2 weeks 20-07-86
male harbour seal
mouth

Sensibility	ColonyI	Colony II	Colony III	Colony IV	Colony V
Penicilline	0				
Erythromycine	0				
Cloxacillines	0				
Cefradine	0				
Ampicillines	0				
Cefuroxim	0				
Tetracycline	0				
Chlooramfenicol	0				
Cefotaxim	0				
Tobramycine	3				
Netilmicine	3				
Amikacine	3				
Ticarcilline	2				
Sulfa	0				
Trimethoprim	0				
Co-trimoxazol	0				
Nitrofurantoine	0				
Pipemidinezuur	0				
Mecillinam	0				
Piperacilline	0				
Polymyxine	3				
Vancomycine	0				
Ceftazidim	0				

Colony I	Escherichia Coli	Growth Density	+++
Colony II		Growth Density	
Colony III		Growth Density	
Colony IV		Growth Density	
Colony V		Growth Density	

Figure 6.

Antiparasitic policy

The stomach/intestinal parasites which occur in seals can be effectively controlled with agents like Droncid and/or Piperazine. The lung worms which occur, such as ostostrongylus and parafilaroides, are a major and often lethal problem. Ripercol* appears to be an effective drug here, but there are some quite nasty aspects. Intramuscular injection will nearly kill the seal. Oral administration is more appropriate, but normal doses will lead to serious toxicity phenomena. It appears that Ripercol kills the lung parasites in such a sweeping and dramatic way that the seal's body cannot cope with the autolytic products released by the drug's action and gets into a state of shock. This mechanism is probably aided by anatomical factors. Parafilaroides is present in the alveoli and in the interstitial lung tissue. Contrary to other vertebrates, the bronchii and bronchioli of seals up to the transition to the alveoli are covered with smooth muscle. Autolytic products probably induce a tissue reaction, including bronchial constriction. This means that too rigorous antiparafilaroides treatment will cause a severe loss of gas-exchange capacity in the seal's lungs. To control and contain this mechanism, when dealing with seals which had massive parafilaroides infection we introduced the following work method. First, on the basis of the antibiogramme it is made sure that the seal is well-provided with appropriate antibiotics. Before Ripercol is administered, corticosteroids are given to prevent shock. To stimulate the animal coughing up the bronchial sputum with the killed lung worms, Fluimucil is administered orally twice daily.

Fluimucil is n-acetylcysteine in granular form which acts as a solvent of mucus and mucopurulent material. Since Ripercol in normal doses has a much too drastic effect, one third of the normal dose is administered on three consecutive days. This complex antiparasite treatment is adopted when the seal is seriously ill. Once the animal is beginning to recover but is not yet without parafilaroides, the course of one third the normal dose of Ripercol can be repeated for three consecutive days, but this time without the extensive precautions.

Summing up

The title of this address refers to the control of infectious diseases in seals. One may think that in a narrow sense this only relates to antibacterial treatment. That is not the case. Any antibacterial therapy will be useless if the many other aspects of the sick animal are not treated at the same time. Good food and proper rehydration as a first measure are essential.

If the animal has been inadequately rehydrated, antibiotic levels in the blood will reach unacceptable values. Infectious pulmonary processes tend to give

rise to production of much sputum. If the sputum is not removed quickly and effectively there will be problems with the gas-exchange in the lungs.

The most important aspect, however, is constant monitoring of the bacterial cultures in the sick animal. Regular checks with identification of the bacteria which are present in the body, together with determining the sensitivity of these bacteria to antibiotics appear to be an indispensible part of any adequate treatment of sick seals.

*Drugs mentioned in the text:—
Decadron
and Bricanyl by Astra Pharmaceuticals
Mucosil by Ciba-Geigy
Ripercol by Janssen Pharmaceutical.

Erratum: Reference figs 4, 5 and 6 for 'Sensibility' read 'Sensitivity'.