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The Bulletin is a membership journal of the Scandinavian Society for Parasitology. Besides membership information, it also presents articles on all aspects of parasitology, with priority given to contributors from the Nordic countries and other members of the Society. It will include review articles, short articles/communications. Comments on any topic within the field of parasitology may be presented as Letters to the Editor. The Bulletin is also open for a short presentation of new projects. All contributions should be written in English. Review articles are commissioned by the editor, however, suggestions for reviews are welcomed.

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Cover: In Norse mythology, the giant ash tree - Yggdrasill - spreads its limbs over the entire mankind. The ash has three roots, each of them sucking water from its own spring.

The first spring- Hvergelmir - is found in the ice cold North; next to the spring, the serpent Níðhoggr is ceaselessly gnawing at the roots of the ash. The second spring - Mímisbrunnr - is the source of wisdom and is guarded by Mímir. The third spring - Urðarbrunnr - is guarded by three women, the Norns, which mete out man's thread of life.

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NEWS

FROM THE EDITOR

So far, we have sent requests for payment of membership fees together with the Bulletin This has created a few problems, not everybody discovered the message or the enclosed postal giro card. To avoid this problem in the future, it has been decided that the treasurer will mail these messages separately from now on.

We welcome all interested parasitologists to join our society, but to become a member, you have to fill in the application form (you may use page 28) and send it to the secretary, before the members can be accepted by the board of the society.

DONATION OF PHOTOGRAPHIC MATERIAL

At the symposium in Oslo in 1993, a large number of pictures, both slides and paper copies with negative films were donated by Göran Malmberg. These have been taken by him at previous symposia , and they represent a very valuable documentation of those who have participated at our meetings. A nice selection was shown at the banquet of the symposium in Jyväskylä last summer. At this meeting it was proposed that the material should be archived at the Department of Zoology, Stockholm University, and we have now been informed that the pictures have been transferred to this institution for storage.

Announcement

A bibliography and index list on parasites and parasitic diseases of fish in Northern Europe.

Authors: Dr. Oleg Pugachev and doc. Hans-Peter Fagerholm

(ISBN 951-650-506-6 ; 155 pp; Åbo Akademi University Press, US$ 36).

The bibliography can be ordered from the Institute of Parasitology, Åbo Akademi University, BioCity, FIN-20520 Åbo, Finland).

Bull Scand Soc Parasitol 1995; 5 (3): 3-14

DISEASE AGENTS AND ZOONOTIC VECTORS: A SYSTEM WITH NEW FEATURES

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The concept of the parasite/host couple as a system in itself is now commonly accepted in general parasitology. The regulation of snail population density by trematodes, for example, is a well-known phenomenon. The mechanism of this consists not only of a parasitic castration, but also changes in the behavior of heavily infected specimen, which affects the distribution level of infected snails on the littoral. It is also known that some such helminths are converting the amoebocyte functions from defence functions into some kind of nutrition cell activity. Thus, *Dicrocoelium dendriticum* converts the behaviour of their intermediate host invaded by metacercariae, so that the ant is turned into some kind of "kamikaze" waiting on the grass leaves to be eaten by ruminants. But the other aspect of the system function - the influence of the host on the helminth properties - is much less clear, possibly because of the very aged functioning of such systems.

However, numerous investigations are concerned with the influence of blood-sucking arthropod vectors and different animal hosts on their pathogens. We know now that some animals even act as amplifiers of pathogens, and others are used for the attenuation of the pathogenic properties of the agents, permitting them to be used for the production of vaccines. But the idea that the arthropod vector and the transmissible disease agent also constitutes a specific system, has so far not been generally known. For example, in one of the best books, "Taiga tick" (1985), written by a team of highly qualified scientists, the vector biology of tick-borne encephalitis virus is analyzed without taking into consideration the fact that the properties of infected and non-infected specimens are able to be even a bit different.

Only recently among specialists studying arthropods as vector of diseases, the opinion appeared that some very important properties of infected specimens differ from those in the naive blood-suckers. First of all, the object of the investigators' attention was the mechanism of transmission during blood-sucking arthropod feeding. Likewise, changes in salivary gland functions (Ribeiro *et al.*, 1985; Rossignol *et al.*, 1984), influence of arthropod saliva on

the animal host (Ribeiro, 1987, 1989), blood-sucking mode of infected specimens in comparison with non-infected ones (Jenni *et al.*,1980; Molyneux & Jefferies, 1986), and life span and fertility of pathogen-containing vectors, were studied.

But till now the view of the pathogen/vector couple as a real system is not completely developed, because the existence of the system implies bipartite influence of their components as a minimum. In our case these are the influence of the vector on the pathogen and of the pathogen on the vector host.

The simplest system (but only in superficial view) seems to be the couple plague agent / flea. After ingestion of an overthreshold quantity of plague agent (Alekseev & Kondrasheva, 1985) the bacillary *Yersinia pestis* transforms inside the flea gut into the coccal form (Fig. 1, I). Not only the form of the agent, but also at the same time the properties of the pathogen population are changing (Bibikova & Klassovsky, 1974). As a result of selection, some pathogenicity determinants of the plague microbe population in the flea are transforming. Only the changed coccal form is able to aggregate and to block the flea's proventriculus. Quite recently (McDonough *et al.*, 1993) it was stated that some specific plasmids of *Y. pestis* are able not only to enhance the block-forming process, but also to speed up the starvation phase by suppression of blood ingestion and *eo ipso* increasing the feeding attempt activity of infected specimens. Because of the comparative youth - from the evolutionary point of view - of such a system consisting of homoiothermal animal / plague agent / flea, *Y. pestis* seems to be pathogenic not only to susceptible animals, especially synanthropic rats and man, but to the vectors as well. At least rat fleas became sick during plague infection (Kondrashkina, 1969) and, being blocked by the pathogen plugs, even died of starvation. The transformation from baccilliform *Y. pestis* to coccal form in the flea gut has its own price: in

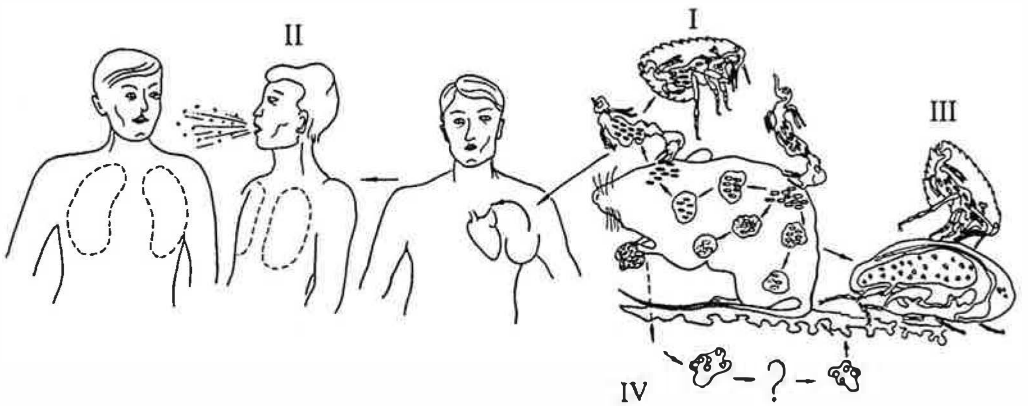

Fig. 1. Plague/fleas/hosts/environment system: I - flea / *Y. pestis*-susceptible rodent; II - generalized and aerial forms of plague; III - *Ornithodoros* "living can" / *Y. pestis* / flea; IV - possible phytophase of the *Y. pestis* cycle (telluric hypothesis).

order to infect a new animal it is necessary to regurgitate many thousands of microbes (Bibikova *et al.*, 1968). Data indicate that in some flea species (Bibikova & Klassovsky, 1974) the pathogenicity of *Y. pestis* strains increases more than in others, and that block formation in the best vectors is observed more often and persists longer than in less suitable vectors.

In Fig. 1, the general (I) and some supplementary routes of plague circulation are demonstrated. This system is not perfect. According to our experimental data, most microbes belonging to a highly pathogenic strain (LD100 for the white mice = 1 *Y. pestis* cell) are destroyed by the bactericidal factor inside the flea gut; and to infect even a good vector it is necessary to ingest thousands of pathogen cells (Bibikova & Alekseev, 1969). Such agent concentration can be observed during the affliction of highly susceptible hosts. Owing to selection under the influence of the flea gut content and changed properties of the digested blood, a transformation of the agent population and a plug formation take place; and at the same time the flea vector becomes sick, its behavior changes, the flea tries to suck blood more often, fails to ingest it and regurgitates part of sucked blood back into the host, infecting animals or humans only when the number of transformed microbe cells in the regurgitated blood is higher than 10,000 (Burroughs, 1947; Bibikova & Alekseev, 1969). Life duration, mode of bloodsucking, and fertility are changing under the influence of the pathogen (Bibikova & Klassovsky, 1974). This implies the existence of not only connections but also feedbacks, which are mainly favourable for the agent but negative for the hosts. Infection is detrimental to vectors, but kills not only animal hosts such as rodents, but also man, especially when the way of transmission changes to the aerial route (Fig. 1 - II). Thus, at least some of the feedbacks are obvious: the flea organism is changing the quantity and quality of the *Y. pestis* population, and the changed pathogen is changing the level of the flea's host-seeking behaviour. The result is profitable for the pathogen transmission.

In this system the feedbacks are obvious because the system is quite imperfect. The pandemic character of plague distribution among man, outbreaks of epizootics among rodents, and its almost complete disappearance during interepizootic periods; all these seem to point out the imperfection of this system. The imperfection seems to be so obvious that it compels to search for another explanation of the existence of *Y. pestis* during interepizootic periods. It is supposed that *Y. pestis* may survive in the soil under the body of a dead animal host (the "telluric hypothesis" - Rivkus & Mitropolsky, 1990) or survive in "living cans" such as the soft tick *Ornithodoros,* from the body of which microbes may be ingested by some flea species (Fig. 1, III).

Proceeding from the rule of contraries, it is possible to suppose that among perfect systems such as tick-borne diseases it would be much more difficult to detect any feedbacks. And such a

conclusion is quite correct, as before our investigation (see "Taiga tick"), most scientists were unaware of any difference between virus-infected and non-infected ticks. Until recently, acarologists were also unaware of the behaviour of *Borrelia burgdorferi*-infected ticks.

It seems that all tick-borne infections are very old, well-balanced systems, and their feedbacks are difficult to detect. One aspect of the vector/pathogen connection is slightly clearer than another. For example it has been confirmed that some properties of the Q-rickettsiosis agent change after passage through the tick body (Balashov & Daiter, 1973), and that the ability of large plague formation and peripheral activity (virulence of non-intracerebrally injected material for rodents) of TBEV (tick-borne encephalitis virus) is lost after 11-25 parenteral passages through the ticks, but can be restored after only one passage through a virus-susceptible animal (Chunikhin *et al.*, 1986). Strains of the same TBE virus derived from *Ixodes ricinus* ticks are not susceptible to dextran sulfate (DS-), and their properties are unchanged on cell culture. However, *I. persulcatus* TBEV strains are DS positive (Chunikhin & Jivanjan, 1977). We suppose that such differences are related to different kinds of saliva-producing cells of *I. ricinus* and *I. persulcatus*. The cement plug-forming saliva cells of the former do not produce glycoproteins, such a component is absent from the virions reproduced in them, and dextran sulfate has no target of action. The differences between the two types of cement plugs are obvious: the translucent

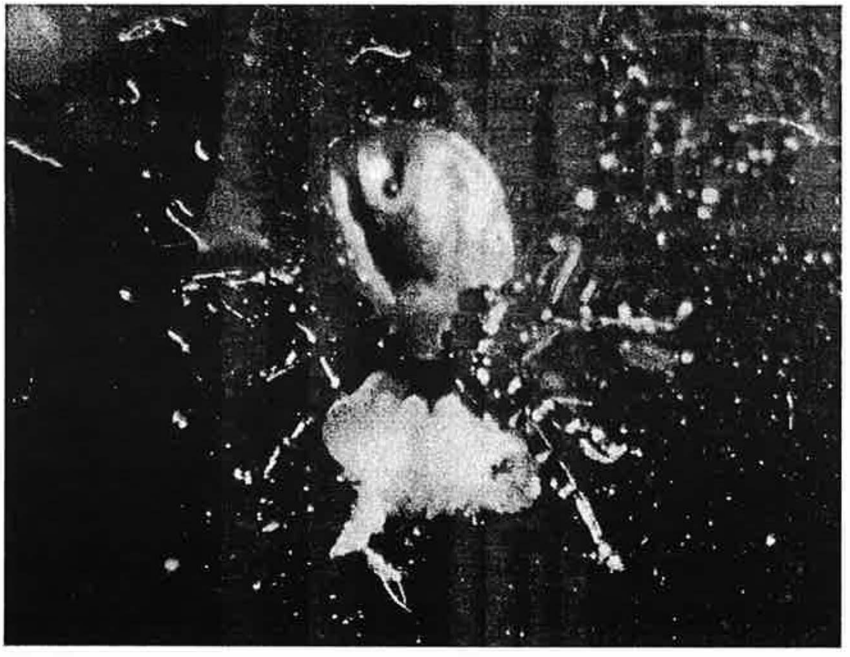

Fig. 2. Salivary cement plug of *Ixodes persulcatus* female.

delicate clouds of *I. ricinus* females saliva which are typical for this species, and the solid white lump of *I. persulcatus* cement formation (Fig. 2).

Salivary gland cells of this species produce a glycoprotein fraction of the cement-forming saliva. They are included in the capsid of TBE virion strains replicated in these cells of I. persulcatus salivary glands, and such virions are susceptible to dextran sulfate.

We have also supposed (Alekseev, 1986) that the virion hemipopulation within the female tick body is selected in two different parts: more virulent in salivary gland cells and less virulent in the reproductive system (1st and 2nd subgroups, Fig. 3).

The systemic properties of the saliva as an adjuvant and virions produced by salivary cells were demonstrated by Jones *et al.* (1987, 1989) during transmission of virus from infected to naive ticks co-feeding on a non-viraemic host. This phenomenon was then confirmed by us (Alekseev & Chunikhin, 1991) for TBE virus-infected and non-infected ticks. We also revealed the main role of specific vectors belonging to the *Ixodes* genus in such a type of transmission (Alekseev & Chunikhin, 1992). Later, similar results were obtained by Labuda *et al.* (1993). The scheme of this type of experiment is demonstrated in Fig. 4: the infected female in the back cage is a virus source for the non-infected nymphs co-feeding on the same animal at a different distance from the tick donor. There is a reason why we called this a distant transmission route. At the Ninth Acarological Congress, Dr. M. Labuda gave some evidence that virions are using skin Langerhans cells as a carriage for travel from the donor to recipient ticks being attracted by the tick saliva antigens. It remains unclear whether this type of feedback is the result of selection under the influence of the arbovirus reproduction, or whether there

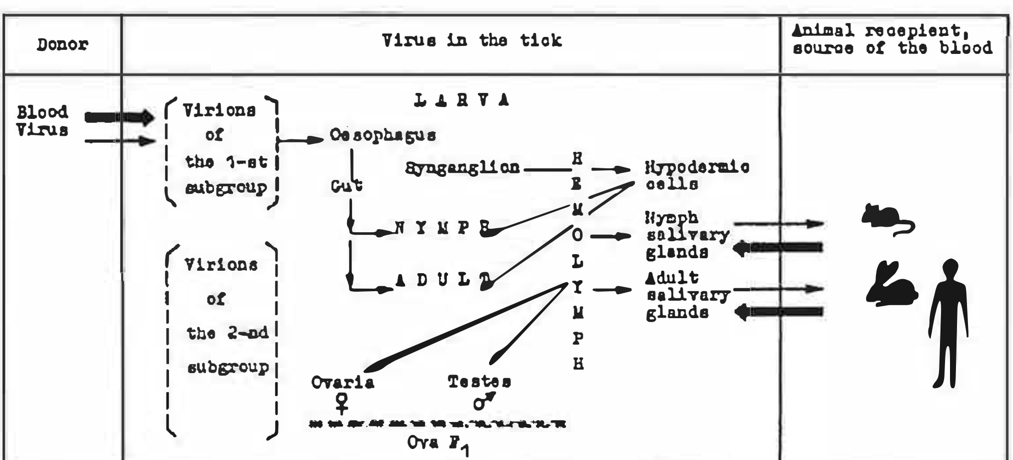

Fig. 3. Scheme of tick-borne encephalitis virus dividing in the two main subgroups inside the tick body.

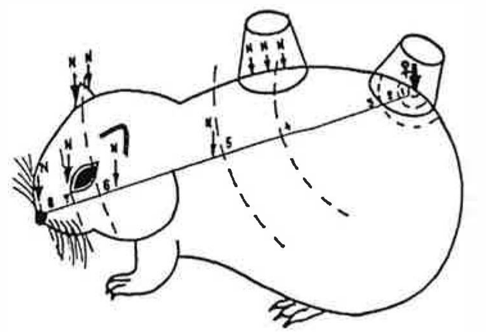

Fig. 4. Scheme of TBE virus distant exchange among co-feeding female (♀) and nymphs (N).

is a phenomenon of utilization by the pathogen of some immanent saliva properties.

Feeding near each other and having the common cement plug, the naive *Ixodes* female is able to ingest the virion-containing saliva from infected individuals. This type of virus exchange was termed transsalival, and we proved that TBE virus acquired this way might be transmitted transovarially by the primary TBEV vector - the *Ixodes persulcatus* female, but not by Amblyomminae tick representatives (Alekseev, 1991).

During copulation, which for the *Ixodes* commonly takes place on the vegetation, the male sometimes bites his sex-mate and may thus transmit to the female not only infected sperm (Chunikhin *et al.*, 1983) with virions of subgroup 2 (Fig. 3), but at the same time also inject in its hemocele salival virions belonging to subgroup 1.

Studying the ways of transmission of TBE virus, it was possible to conclude that the multiformity of virus exchange is typical for a stable system such as tick-borne encephalitis virus and its host vector. Transmissible, transphasic, transovarial, sexual, omovampiric, transsalival, and distant transmission amplified the stability of this durable system (Alekseev, 1993).

But what about the feedback of virus existence in the host? Neither life duration nor fertility changes were noted by any investigators. Neither time and mode of feeding, nor the rate of metamorphosis or diapause were changed. Or at least so it seemed.

But then we began to study the moving activity of artificially infected and naive specimens of Ixodid ticks, including their geo-, hygro- and scent taxises. We observed that tick behaviour is a very useful test for the determination of systemic feedbacks. The data concerning the behaviour of infected insects with which we operated previously, are very controversial. For example, according to Berry *et al.* (1986), the moving activity of filaria-infected mosquitoes is suppressed, and this is clearly due to the influence of worm development in their flying musculature. In the above-mentioned investigations by J.M.C. Ribeiro and P.A. Rossignol, only behaviour changes during the blood-sucking period were analyzed. This moment is obviously one of the most important for the pathogen transmission. But we are certain that changes in the pathogen/vector system are much more complicated. Not only moving (= search) activity arises (e.g. *Aedes aegypti*/*Plasmodium gallinaceum* flying activated

system - Alekseev *et al.*, 1984), but the whole complex of reactions became quite new. For instance, such a change as a decreased susceptibility to moisture among infected specimens - infected specimens are moving much higher against a humidity gradient than non-infected ones - is based on a profound inversion of the water loss and water rehabilitation mechanism. During the same period of desiccation the weight of infected specimens is reduced 7-times less in comparison with the weight of naive ticks (Table 1). We are convinced that also the sexual behaviour of infected ticks is changed. Our experiments, in which we were studying the reactions of ticks to different plant scents, demonstrated that some of these were attractants for naive females, but repellents for naive males. The change of the reaction of infected males to the opposite has very important consequences. The former plant repellent became an attractant, depending on the virus titer inside the tick body. This means an increased probability of sexual transmission of TBEV from male to naive female. At the same time, such a contact increases the probability of the omovampiric route of virus exchange.

We do not know how the behavior of the infected female before and during oviposition under the influence of the environment can change its reactions to it; but at least dropping off the animal host may depend on the plant-related aspect of the coenosis; and we do not consider it controversial to argue that this dropping mechanism is not random. This certitude is based on the results of our experiments with feeding and developing nymphs. The time of dropping-off and the duration of the engorged nymph phase development depends on the scent in which they fed on the mouse.

Repellent or attractive scents had an effect not only on the dropping and developing time, but also influenced the weight of infected or naive nymphs when fed.

Using a horizontal ticksdrome we demonstrated that the speed of the movement of the TBE-infected tick is greater than that of non-infected specimens, not only just after inoculation (Fig. 5, I), but three weeks later, when the virus titer was as high as 4.7 lg LD50 in 0.03 ml (Fig. 5, II). Infected females moved to the attractive center of the ticksdrome much

	Mean mass per tick, mg						
Tick sample (n=10)	Initial (a)	After desiccation (b)	Difference (a-b) Abs.	%	After moistening (c)	Difference (c-b) Abs.	%
Naive	1.98	1.69	0.29	14.60+3.7	2.19	0.50	29.5+4.8
TBEV-infected	2.04	1.99	0.05	2.45+1.6	2.04	0.05	2.6+1.7
				P < 0.01		P < 0.001	

Table 1. Results of desiccation of naive and TBEV-infected females of *Ixodes persulcatus*

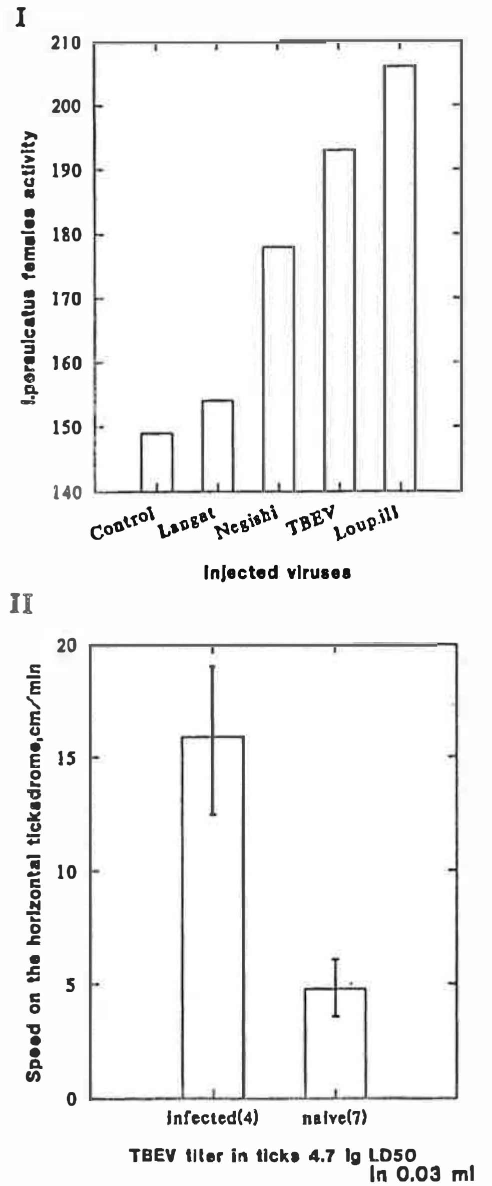

Fig. 5. Immediate (6 h. after inoculation, I) and postponed (21 days later, II) reactions of *Ixodes persulcatus* females to the arbovirus injection.

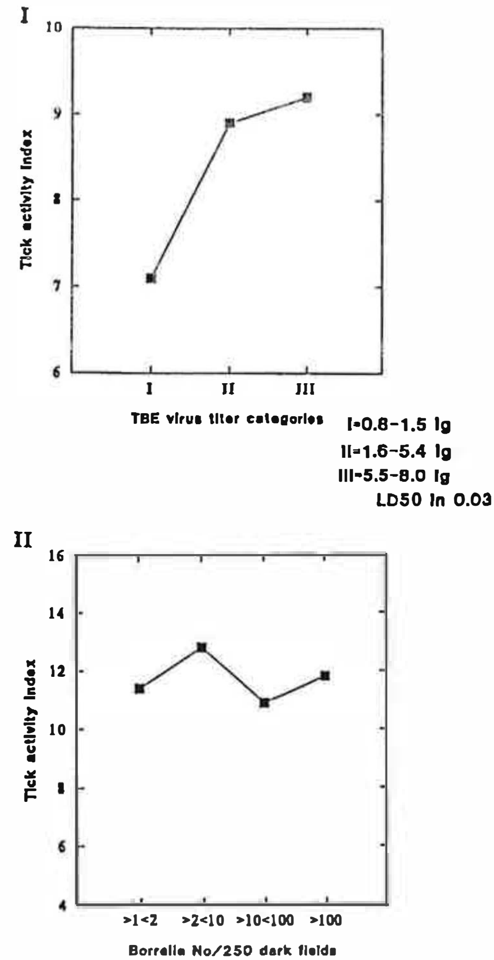

Fig. 6. Dose dependence of *Ixodes persulcatus* activity under the influence of different pathogens.

more actively than control specimens (Alekseev, 1991).

Using an inclined ticksdrome and the activity index - the sum of the moving parameters, such as speed, the maximal height above humidity level, and the rate of the distance covered by the tick above it, we concluded that there is a direct correlation between moving activity and TBEV concentration in the tick body, which does not exist in *Borrelia*-infected specimens (Fig. 6, I, II).

Also *Borrelia*-infected ticks are changing their behaviour under plant

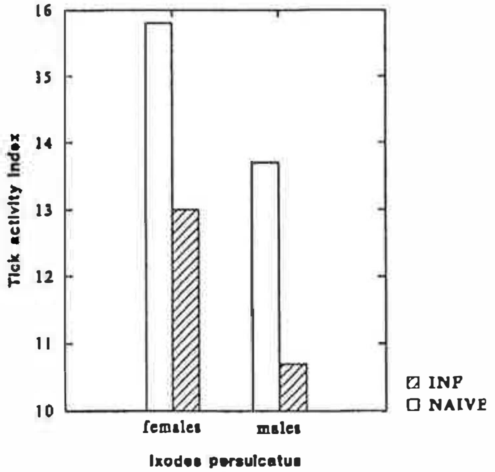

Fig. 7. Suppression of moving activity of *Borrelia*-infected ticks collected in nature.

scent influence in comparison with the naive specimens (Alekseev, 1991). But *Borrelia*-infected ticks, at least adult ones, demonstrated a suppressed moving activity in comparison with naive specimens (Fig. 7). This means that the tick/*Borrelia* system is functioning differently from the tick/virus system.

Such differences in the moving activity of ticks infected by different pathogens is not only of theoretical interest, as can be seen from Fig. 8. The behaviour of the infected part of the tick population determines the success of the

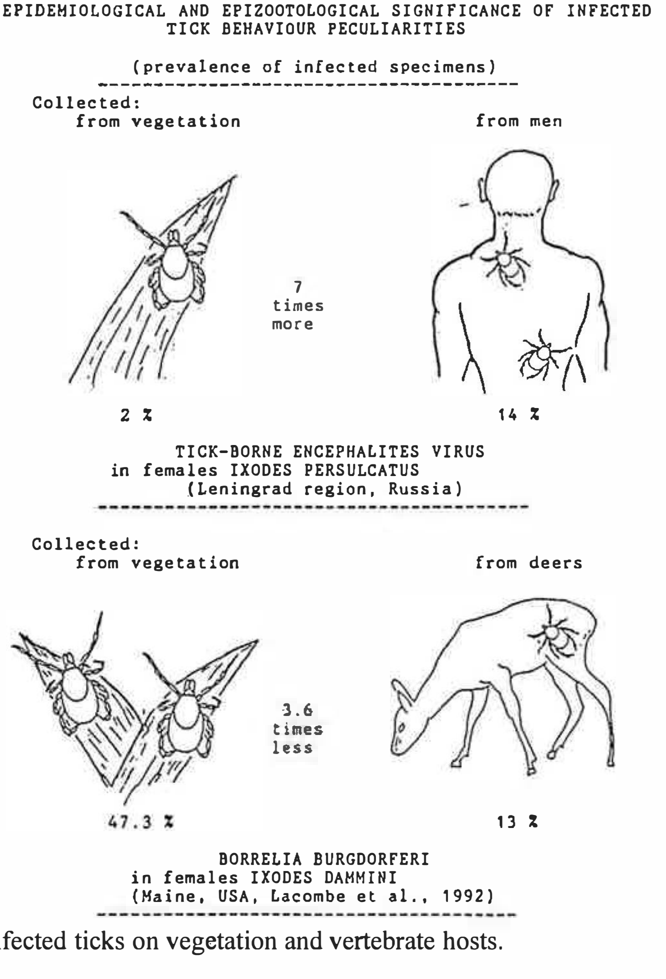

Fig. 8. Ratio of infected ticks on vegetation and vertebrate hosts.

Rivkus YuZ, Mitropolsky OV. Teriophase - as a step of the plague development. Abstr 5th Meeting of Theriological Society: Moscow 1990; 3: 216-217 (In Russian)

Rossignol PA, Ribeiro JMC, Spielman A. Increased intradermal probing time in sporozoite-infected mosquitoes. Amer J Trop Med Hyg 1984; 33: 17-20

Taiga tick *Ixodes persulcatus* Schulze (Acarina, Ixodidae). Morphology, systematics, ecology, medical importance. L Nauka 1985: 416 pp (In Russian)

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TRICHINELLA EXAMINATIONS OF COMMERCIALLY HUNTED HARP AND HOODED SEALS

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Trichinellosis is common among carnivores in the Arctic and the polar bear *(Ursus maritimus),* arctic fox *(Alopex lagopus)* and walrus *(Odobenus rosmarus)* are species frequently infected (Rausch, 1970). Cases have also been reported among members of the seal family (Phocidae), i.e. in the bearded *(Erighnatus barbatus),* ringed *(Phoca hispida)* and harp seals *(Phoca groenlandica)* (Rausch, 1970; Bessonov, 1974).

Norwegian commercial seal hunting is restricted to harp and hooded *(Cystophora cristata)* seals that live in the North Atlantic and the Barents Sea. There is a limited but well established tradition of human consumption of meat from these seals, and questions arise whether this consumption may lead to *Trichinella* infection.

Questions also arise if trichinellosis may occur in dogs and farmed fur foxes fed meat from harp seals, that, following seasonal migration from the Barents Sea/North Atlantic, drown in fishing nets on the coast of northern Norway. Some years these migrations occur in the form of extensive invations, and the carcasses of drowned seals constitute a considerable offal and environmental problem.

Thorshaug and Rosted (1956) examined the diaphragms of 1955 harp and 192 hooded seals killed in the Norwegian hunting areas during the period 1949-1953. All animals were found negative for *Trichinella* muscle larvae by the conventional trichinoscope method.

Samples of the diaphragms of 1000 harp and 175 hooded seals hunted north of Jan Mayen, and 175 harp seals hunted in the northern Barents Sea, were collected in April/May 1992. The samples were kept cool without freezing. In the laboratory, 2 grams of each diaphragm sample were examined in series of 50, using the magnetic stirrer digestion method employed by the Public meat inspection

in Norway (Framstad, 1980). The digestion fluid was examined using a stereomicroscope with a 14x magnification.

All examined sample series were negative with regard to *Trichinella* larvae.

Our results are in accordance with those of Thorshaug and Rosted (1956). It can be concluded that the harp and hooded seal populations living in the Arctic waters north of Norway do not seem to represent a source of *Trichinella* infection.

References

Bessonov AS. Epizoology and epidemiology of trichinellosis in the U.S.S.R.: Prospects for the eradication of the infection. In: Kim CW., ed. Trichinellosis. New York, Intext, 1974: 557-562

Framstad K. Magnetrører-trikinkontroll-metoden (Magnetic stirrer digestion in *Trichinella* meat inspection. Nor Vet Tidsskr 1980; 92: 507-514

Rausch RL. Trichinosis in the Arctic. In: Gould SE, ed. Trichinosis in man and animals. Springfield, Illinois: Charles C. Thomas, 1970: 348-373

Thorshaug K., Rosted AF. Researches into the prevalence of trichinosis in animals in Arctic and Antarctic waters. Nord Vet-Med 1956; 8: 115-129

ABSTRACTS FROM THE 17TH SYMPOSIUM OF THE SCANDINAVIAN SOCIETY FOR PARASITOLOGY IN JYVÄSKYLÄ, FINLAND, 15 - 17 JUNE, 1995.

We are here presenting abstracts of four communications, which were not printed with the proceedings in the previous issue of the Bull SSP (Vol. 5 No. 2 1995)

THERAPEUTIC EFFICACY OF DORAMECTIN AGAINST *Cephenemyia trompe* (REINDEER THROAT BOT) AND *Hypoderma tarandi* (REINDEER WARBLE)

Antti Oksanen, Norwegian College of Veterinary Medicine, Department of Arctic Veterinary Medicine, N-9005 Tromsø, Norway

The study was conducted at the Kaamanen Reindeer Research Station in Finland to determine the efficacy of doramectin administered subcutaneously at a dose of 200 mcg/kg against natural infections of throat bot *(Cephenemyia trompe)* and warble *(Hypoderma tarandi)* in reindeer. A group of forty reindeer consisting of 36 females and 4 males of various adult ages were selected, uniquely identified by numbered collars and randomly allocated within sexes to one of two treatment groups. Mid of December (Day 0) all animals were weighed and treated according to assignment. Animals in T1 group received a subcutaneous injection of saline (1 ml/50 kg) whereas the animals in T2 group received doramectin at a dose rate of 200 mcg/kg. All trial animals were kept commingled with the rest of the herd, so that the total of 120 animals were kept on a typical winter pasture of 15 km^2. On Day 129 all trial animals were clinically examined for throat bot and warble infestation. According to the results of the pharyngoscopic examination all but one animal in the saline treated control group were infected with throat bots. This reflects well the expected high natural infection rate. The maximum number of larvae counted was 100. No *C. trompe* larvae were detected at the pharyngoscopic examination in any of the doramectin treated animals. The same rate of infestation was observed in the saline treated group (T1) for *H. tarandi.* All but one animal were infested and maximum numbers of 200 nodules were counted. No H. *tarandi* nodules were found at the visual and/or manual examination of any of the animals treated with doramectin (T2). In this exploratory study doramectin injected subcutaneously at a dose of 200 mcg/kg to reindeer kept for the winter period proved to be 100 % efficient against natural infestation of throat bot *(Cephenemyia trompe)* and warble *(Hypoderma tarandi).* No abnormal clinical signs or other adverse reactions were observed in any animal administered doramectin.

INTERACTIONS BETWEEN *TRYPANOSOMA BRUCEI* AND CD8+ CELLS

Tomas Olsson, Molecular Medicine Unit, Department of Medicine, Karolinska Hospital, Stockholm, Sweden

African Trypanosomosis (sleeping sickness) is caused by an extracellular hemoflagellate, *Trypanosoma brucei* (*T.b.*) transmitted by the tsetse fly. *T.b. gambiense* (West Africa) and *T.b. rhodesiense* (East Africa) cause disease in humans, while *T.b. brucei* is non-pathogenic for humans but readily infects rodents and is commonly used for experimental infections. In a series of studies using *T.b. brucei* our laboratory has demonstrated a bidirectional activating signalsystem between the parasite and the immune system. Thus, the parasite releases a molecule which activates CD8+ cells to cytokine production, especially interferon γ). The parasite in turn responds to interferon γ mitogenially. This bidirectional activating system also has relevans in vivo. Experiments utilizing CD4+ and CD8+ knock-out mice have shown much lower parasitemia and longer survival times in CD8+ knock-out mice. Furthermore, parasite levels are extremely low in mice with the interferon γ gene knocked-out, as compared to wild type mice. Interestingly, in part the host restriction range may be determined by species specific responses to INF γ. The human pathogen *T.b. gambiense* bind both rat and human IFN γ but respond mitogenially only to human IFN γ. Vice versa, *T.b. brucei* bind both rat and human IFN γ but responds mitogeniacally only to rat IFN γ.

PARASITE ADAPTATION AND HOST RECOGNITION OF FUNGI IN INVERTEBRATES

Kenneth Söderhäll, Department of Physiological Botany, University of Uppsala, Villavägen 6, 752 36 Uppsala, Sweden

Some animal pathogenic fungi have been shown to be adapted to a parasitic mode of life. The fungus, *Aphanomyces astaci*, which belongs to the Oomycetes, is such an example and this fungus is a parasite on freshwater crayfish. The means by which this fungus have adapted itself to a parastic life is by producing chitinases and specific proteinases which can degrade the cuticle, its narrow host range (crayfish), that the hyphae can resist the action of the proPO-system in the cuticle and the capacity of the zoospores to undergo "repeated zoospore emergence" (Söderhäll & Cerenius,1992). If the fungal hyphae penetrates into the hemocoel, it has to deal with the defense activities of the host.

In invertebrate animals a non-self recognition system operates to recognize microorganisms. This system is named the prophenoloxidase activating system (proPO-system), and if this system is activated, this can be seen as melanin deposits on the foreign intruder. The proPO-system is turned into its active form by minuscule amounts of fungal beta-1,3-glucans, bacterial lipopolysaccharides or peptidoglycans, and as a consequence a series of serine proteinases are induced to their active form. The final result is the specific proteolytic cleavage of prophenoloxidase (Aspan *et al*, 1995; Hall *et.al,* 1995), and the active enzyme phenoloxidase can then produce melanin from phenols.

The protein which will bind the fungal beta-1,3-glucans has recently been purified and cloned (Cerenius *et al*, 1994). Several other proteins which are involved in the defence activities have also been isolated and cloned (for reviews see Söderhäll *et al*, 1994, Cerenius & Söderhäll,1995). The cellular defence reactions have also been studied in detail and we have found that two molecules are directly involved in the communication between the cells during a fungal infection, namely the glucan-binding protein and a 76 kD factor (Söderhäll *et al,* 1994). In summary, then the molecular details on how the proPO-system is activated is beginning to be understood as well as the cellular comunication occuring in invertebrate animals.

References:

Aspan A, Huang T-S, Cerenius L, Söderhäll K. Proc Natl Acad Sci USA 1995; 92: 939943
Hall M, Scott T, Sugumaram M, Söderhäll, K, Law JH. Proc Natl Acad Sci USA 1995 (in press)
Cerenius L, Söderhäll K..American Zoologist 1995; 35: 60-67
Cerenius L, Liang Z, Duvic B, Keyser P, Hellman U, Palva ET, Iwanaga I, Söderhäll K. J Biol Chem I994; 269: 29462-29467
Söderhäll K, Cerenius L. Ann Rev Fish Diseases 1992; 2: 3-23
Söderhäll K, Cerenius L, Johansson MW. Ann NY Acad Sci 1994; 712: 155-161

DISTRIBUTION OF TREMATODE *Phyllotistomum elongatum* IN POPULATIONS FIVE FISH SPECIES

A.E. Zhokhov, Borok, Russia

Objectives:
This study was conducted in order to determine distribution of *Ph. elongatum* in fish populations depending on the age and the degree of host-parasite specificity.

Materials and methods
Fishes from Volga reach of Rybinsk Reservoir were examined during the period March - May, 1988-1994 (328 samples of white bream, 260 - of blue bream, 340 - of roach, 646 - of bream and 466 - of ide). The fish were subdivided into 8 age groups from fingerlings up to the oldest according to-body length.

Results
The incidence and intensity (worm/fish) of trematodes in blue bream population increases with age. The oldest fish are infected to a maximum extent. On the contrary, the both indices of infection in the ide decrease with age. Fingerlings are infected the most in this species. Infection of bream is the greatest and increases with age. The incidence of *Ph. elongatum is* maximal in the largest fish and minimal in fingerlings. The parasite occurrence in the rest of the population of the bream (I+ - 14+) is approximately the same. Intensity increases with age smoothly. Infection of roach and white bream is low. Trematodes are found only in middle-aged fish of populations of these species. The described distribution of *Ph. elongatum is* determined by fish feeding spectrum and their way of infection. Fish juveniles are infested by *Ph. elongatum* cercaria (Zhokhov, 1987), while adults are infested when eating molluscs *Pisidium amnicum,* which contain metacercaria (Zhokhov, 1991).

Conclusions
Bream is the main consumer of P *amnicum* and so is the most specific host of *Ph. elongatum* in Rybinsk Reservoir.

References
Zhokhov AE. New data on the developmental cycle and biology of the trematode *Phyllodistomum elongatum (Fasciolata, Gorgoderidae).* Parasitologya 1987; 21: 134-139
Zhokhov AE. Two types of cercariae of the trematode *Phyllodistomum elongatum (Fasciolata, Gorgoderidae)* from *Pisidium amnicum.* Parasitologya 1991; 25: 63-68

Announcement

16th International Conference

WORLD ASSOCIATION FOR THE ADVANCEMENT OF VETERINARY PARASITOLOGY

Pretoria, South Africa, 17-22 August 1997

The Parasitological Society of Southern Africa, the host organisation, is proud to invite veterinary parasitologists from all over the world to attend the first ever WAAVP International Conference on the African continent.

Theme: *Veterinary Parasitology into the 21st Century*

The theme is two-pronged, as reflected in the logo. In the developed nations the current emphasis is very much on hi-tech aspects. The Conference will be an ideal time to assess progress and state expectations in this field as we enter the 21st century. Much of this technology can be implemented in developing nations, but financial constraints often dictate that alternative control strategies are adopted. The proposed subthemes are:

*Hi-tech:*Development of novel vaccines, Application of molecular biology, Immunology and host-parasite interactions, Alternatives to animal experimentation,New systems for animal maintenance, Remote scanning and satellite surveillance

Developing countries: Sustainable parasite control strategies, Socio-economic impact of parasitic disease, Managing parasitic disease in developing countries, Ticks and tick-borne disease control, Parasites of working animals

These subthemes will be addressed in plenary papers, submitted papers, workshopsand poster sessions.

Other **workshops** may include:Antiparasitic testing guidelines, Teaching of Veterinary Parasitology, Resistance to parasiticides, Wildlife Parasitology, Control of nematode growth and development

Conference organiser:
16th WAAVP Conference, Event Dynamics,
P O Box 567, STRATHAVON, 2031,
Republic of South Africa
Tel: +27-11-883-6155; Fax: +27-11-883-9643

FIRST ANNOUNCEMENT

Parasites and Ecology of Marine and Coastal Birds

Symposium held in Stykkishólmur, Iceland, 15-18 June 1996

The symposium is arranged on behalf of the **Scandinavian Society for Parasitology** (SSP) with financial support from the Nordic Academy for Advanced Studies (NorFA).

The purpose of the symposium is to bring together parasitologists, ecologists and ornithologist for exchanging ideas and information and to develop cooperative projects in marine and coastal bird ecology that take parasitism into consideration.

Invited speakers will give lectures on pathogenicity and ecological impacts of parasites, and ecologists will deal with ecological aspects of coastal and marine birds.

Participants are encouraged to give oral presentations or present posters.

The plenary lectures, and abstracts of other talks and posters, will be published in the Bulletin of the SSP.

Five graduate students from the Nordic and Baltic countries, wishing to give talks at the symposium, will be supported by NorFA. Applications, including a Curriculum vitae, should be sent before 31 January 1996 to the local organizing committee.

For further information, which will be announced in December 1995, please fill in the enclosed form and send it immediately to the local organizing committee.

Scientific organizing committee:
Karl Skírnisson (Keldur, University of Iceland)
Kurt Buchmann (RVA University of Copenhagen, Denmark)
Hans-Peter Fagerholm (Åbo Academy, Finland)
Arne Skorping (University of Tromsø, Norway)
Jan Thulin (Inst. of Marine Research, Lysekil, Sweden)

Local organizing committee:
Karl Skírnisson (Keldur, University of Iceland, Reykjavík)
Arnór Þórir Sigfússon (Icelandic Institute of Natural History, Reykjavík)
Kristinn Haukur Skarphéðinsson (Icelandic Institute of Natural History, Reykjavík)

Parasites and Ecology of Marine and Coastal Birds

Symposium held in Stykkishólmur, Iceland, 15-18 June 1996

I am interested in attending the symposium and wish to receive further information:

Name: ______________________________

Organization: ______________________________

Address: ______________________________

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Telefax: ______________ e-mail: ______________

I intend to submit a paper [ ] (final date 31 December 1995)
I intend to submit a poster [ ]

Title: ______________________________

____

____

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Send to the local organizing committee before 1 December 1995:

c.o. Karl Skírnisson,
Institute for Experimental Pathology,
Keldur, University of Iceland,
IS-112 Reykjavík, ICELAND
Fax + 354 567 3979, e-mail karlsk@rhi.hi.is

Protokoll fört vid generalförsamlingen för Nordisk Förening för Parasitologi, 16 juni 1995, Universitetet i Jyväskylä, Finland

Närvarande 20 medlemmar.

Mötet öppnades kl. 18.02 av föreningens ordförande Inger Ljungström, som önskade de närvarande välkomna.

1. Jørn Andreassen valdes till mötets ordförande.

2. Antti Oksanen valdes till mötets sekreterare.

3. Göran Malmberg och Göran Bylund valdes till protokolljusterare för generalförsamlingens protokoll.

4. Inger Ljungström presenterade styrelsens verksamhetsberättelse för den senast tilländalupna verksamhetsperioden och nämnde praktiska problem med telefonmötena. Verksamhetsberättelsen godkändes.

5. Birgitte J. Vennervald presenterade skattmästarens översikt över kassaställningen och revisorernas berättelse.

6. Bokslutet fastställdes och ansvarsfrihet beviljades beträffande den senaste verksamhetsperiodens förvaltning.

7. Birgitte J. Vennervald, som var i tur att avgå, blev återvald.

8. Som suppleanter till styrelsen blev Tor Atle Mo och Catarina Svensson omvalda.

9. Flemming Frandsen och Mathias Eydal blev omvalda som revisorer och Lars Åke Nilsson som revisorsuppleant.

10. Medlemsavgiften beslöts efter diskussion höjas till 150 (ordinarie medlem) och 75 (student) kronor. Birgitte J. Vennervald hade utrett möjligheterna till betalning med kreditkort. som skulle vara betydligt billigare än betalning via postgiro. Medlemmarna rekommenderas att använda denna nya betalningsform.

11. Nästa generalförsamling hålls på Bornholm, Danmark, i slutet av maj (efter pingsten) 1997 i förbindelse med SSP XVIII. Före beslutet diskuterades priser, turister, mygg m.m.

12. Jorun Tharaldsen informerade att "Editorial Board" för NFP:s Bulletin skall utvidgas och poängterade, att Bulletinen inte gäller som en helt vetenskaplig tidskrift.

Karl Skirnisson informerade om symposiet "Ecology and Parasitology of Coastal and Marine Birds" som skall ordnas på Island och ha 6-7 inviterade föreläsare.

Bjørn Berland påpekade att "high technology" (e-mail) kunde spara pengar vid förmedling av information inom föreningen.

Birgitte J. Vennervald påminde om att nya medlemmar formellt skall accepteras av styrelsen enligt reglerna.

13. Jørn Andreassen avslutade gener lförsamlingen kl 18.34.

Antti Oksanen
Sekreterare

Göran Malmberg
Justerare

Göran Bylund
Justerare

GUIDELINES FOR CONTRIBUTORS

All contributions should be submitted as word-processed manuscripts on floppy disk, accompanied by two exactly matching print-outs of good reading-quality. The preferred storage medium is a 3½ inch disk in MS-DOS or MS-DOS compatible format. The text should be written in Words or WordPerfect or other word processing programs convertible to these. **With a Macintosh computer, save the file in the MS-DOS compatible option.** Please indicate the word processor (and version) used to generate the file, the type of computer, the operating system, and the formatted capacity of the diskette.

The articles/communications should normally not exceed 4 printed pages, including tables, figures, and references, and may contain a maximum of 2000 words if there are no figures or tables. The first page should show the title of the article, and the name(s) of the author(s). The authors' addresses should be given, and the complete correspondence address with telephone and telefax number (if available). The text should follow, without subheadings, but a short summary, maximum 100 words, may be included.

The text should be typed unjustified (unaligned right margins), without hyphenation (except for compound words), and at 1 ½ line spacing. Do not type page numbers. Label the hard copies by hand at the bottom of the page. Please ensure that the digit 1 and the letter 'l' have been used properly, likewise with the digit 0 and the letter 'O'. Do not use decorative formatting, such as boldface and centred headings, or underlining of titles or subheads.

Authors are obliged to follow the rules governing biological nomenclatures, as laid down in e.g. the *International Code of Zoological Nomenclature.* Disease names should follow the principles of *Standardized Nomenclature of Parasitic Diseases* (SNOPAD).

Figure legends must be included on the diskette, but the **figures will be handled conventionally.** They should be marked on the back with the title of the article and name of the (first) author.

Line drawings should be provided as good quality hard copies suitable for reproduction as submitted.

Photographs must be provided as glossy prints, and be of sufficiently high quality to allow reproduction on standard (not glossy) paper. Colour plates will not be printed.

References in the text shold be stated by giving in brackets the name of the author and the year of publication, e.g. (Thornhill, 1987) or (Austin & Austin, 1987). If there are more than two authors, only the first name plus *et al.* is given (Lund-Larsen *et al,* 1977). The reference list should be in alphabetical order, and follow the style set forth in *Uniform Requirements to Manuscripts Submitted to Biomedical Journals,* Br

Med J 1988; 296: 401-05. References to journals should contain names and initials of the authors, article title, the abbreviated name of the journal, year of publication, volume, and first and last page numbers of the paper. Journals should be abbreviated according to the "List of journals indexed in *Index Medicus*". Authors without access to this list may type the full name of the journal, and the Editor will take care of the abbreviations. If there are more than six authors, list only the first three and add *'et al'*. Personal communications and unpublished data should not be used as references, but may be inserted in the text (within parenthesis marks).

Examples of correct forms of references are given below:

Standard journal article:
Anonymous. Some facts on small animal practice. Vet Rec 1987; 120: 73
Horsberg TE, Berge GN, Høy T et al. Diklorvos som avlusningsmiddel for fisk: klinisk utprøving og toksisitetstesting. Nor Vet Tidsskr 1987; 99: 611-15
Lund-Larsen TR, Sundby A, Kruse V, Velle W. Relation between growth rate, serum somatomedin and plasma testosterone in young bulls. J Anim Sci 1977; 44: 189-94

Books and other monographs:
Austin B, Austin DA. Bacterial fish pathogens: disease in farmed and wild fish. Chichester: Ellis Horwood, 1987
McFerran JB, McNulty MS, eds. Acute virus infections of poultry: a seminar in the CEC programme, Brussels 1985. Dordrecht: Martinus Nijhoff, 1986. (Current topics in veterinary medicine and animal science 37)
Sosialdepartementet. Tsjernobyl-ulykken: Rapport fra Helsedirektoratets rådgivende faggruppe. Oslo: Universitetsforlaget, 1987 (Norges offentlige utredninger NOU 1987: 1)
Thornhill JA. Renal endocrinology. In: Drazner FH, ed. Small animal endocrinology. New York: Churchill Livingstone, 1987: 315-39

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In the interest of speed, no proofs will be sent to authors. It is therefore of vital importance that the manuscripts are carefully checked before submission.

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SCANDINAVIAN SOCIETY FOR PARASITOLOGY

Please return to the secretary:
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BULLETIN OF THE SCANDINAVIAN SOCIETY FOR PARASITOLOGY

VOL. 5 No. 3 **CONTENTS** **NOVEMBER 1995**