

Doktordisputas

Dissertation



Helge Kreützer Johnsen forsvarte sin avhandling «Nasal Heat Exchange. An experimental study of effector mechanisms associated with respiratory heat loss in Norwegian reindeer (*Rangifer tarandus tarandus*)» ved Universitetet i Tromsø den 7. juli 1988. Helge K. Johnsen er vokst opp på Finnsnes i Troms, Norge. Han har sin utdannelse fra Universitetet i Tromsø. Hovedfageksamen i fysiologi 1983: «Nasal vann- og varmeveksling hos norsk rein (*Rangifer tarandus tarandus*).»

For tiden universitetsstipendiat ved Universitetet i Tromsø, Avdeling for Arktisk Biologi.

Helge Kreützer Johnsen defended his PhD thesis «Nasal Heat Exchange. An experimental study of effector mechanisms associated with respiratory heat loss in Norwegian reindeer (*Rangifer tarandus tarandus*)» at the University of Tromsø on 7 July 1988. He was educated at the University of Tromsø and is now working at the same university with a university scholarship.

Summary: Nasal heat exchange is an important effector mechanism both for reduction of heat loss in the cold and for facilitation of respiratory heat loss under hyperthermic conditions. Control of nasal heat exchange is determined by autonomic activity on the basis of peripheral and central thermal inputs to the temperature controller. Operation of the mechanism is achieved through three complementary, but functionally separate effector mechanisms depending on the level of the thermal load. These include a circulatory, a secretory and a respiratory component.

Based on physiological and anatomical evidence from studies on reindeer it is suggested that reduction of respiratory heat loss in the cold is mainly the result of counter current circulation in the nose which results in a temperature gradient along the turbinates. In this situation the blood runs rostrally within the arterial network and returns caudally within the venous plexus before it leaves the nasal mucosa via the sphenopalatine group of veins.

During panting, on the other hand, vasodilation of the nasal mucosa, accompanied by enhanced secretory and respiratory activity, is followed by increased shunt flow through AVAs with subsequent direction of venous blood through the anterior outlet, the dorsal nasal veins. In this situation, therefore, blood flow to the nose is distributed unidirectionally within the nasal mucosa, but counter current with respect to the inspired air thereby permitting optimal heat loss from the nasal mucosa. At moderate levels of heat stress the cold venous effluent from the nose is conveyed to the jugular veins directly and used for general body cooling. When body temperature exceeds a certain threshold the blood is re-routed and directed to the cavernous sinus for selective cooling of the brain. Distribution of the cold venous effluent in either direction is suggested to be due to sympathetic control of vasomotor tone in the angular oculi and facial veins on the basis of an antagonistic adrenergic neuroeffector organization of the vessels.

Transition from closed to open mouth panting at high levels of heat stress, which is accompanied by continued inspiration through the nose and expiration through the mouth, has two important consequences. Firstly, heat loss from the nasal mucosa is improved because the obligatory partial heat recovery, which takes place when the expired air passes over the slightly cooled surface of the nasal turbinates, is avoided. Secondly, selective cooling of the brain is maintained.

Master of science

Rolf Egil Haugerud, Universitetet i Tromsø, har vært oppe til hovedfageksamen (Cand. Scient.) i økologi, zoologi 17. juni 1988 med oppgaven «A life history approach to the parasite-host interaction *Linguatula arctica* Riley, Haugerud and Nilssen, 1987 - *Rangifer tarandus* (Linnaeus, 1758)» som består av to engelskspråklige artikler. Rolf Egil Haugerud er født 1944 i Drammen, har lærerskolen fra Tromsø 1965-67, studerte nordisk og biologi ved Universitetet i Trondheim 1970-73. Utenom studiene har han vært knyttet til skoleverket i Nord-Norge 1964-84. Han deltar nå i prosjektet «Makroparasitter hos rein».

Bihulemarken *Linguatula arctica* er en tungemark (Pentostomida) som finnes hos rein, først og fremst hos kalver. De fleste kalvene er infisert med etterlarvale stadier i bihulene utover høsten og vinteren. Bortsett fra sluttlarvestadiet som er funnet i de øvre luftveier, er de tidligere larvestadier ikke observert, men sannsynligvis er de å finne i forskjellige innvoller før sluttlarvene ankommer bihulene fra august til november. Det er registrert vertsreaksjoner, men uten kjennskap til larvene, er det for tidlig å si noe bestemt om patogen betydning.

Slektinger av *L. arctica* har gnagere og rovdyr som mellomverter, rovdyr av hundefamilien som sluttverter. Reinen er imidlertid sluttvert i livssyklusen til *L. arctica*. I den første artikkelen testes tre mulige overførings- eller smitemåter. Resultatene tyder på at bihulemarken har en direkte livssyklus med overføring om sommeren via beite, selv om vertikal transmisjon fra simle til foster/kalv ikke kan utelukkes. Det er også mulig at snegl kan fungere som transportvert.

Den andre artikkelen beskriver den vekst og reproduktive utvikling som skjer i bihulene fra 4-5 mm langt sluttlarvestadium hos 3-4 mnd. gamle kalver til voksen, eggleggende parasitt hos ettåringene. Sammenliknet med nærstående arter må *L. arctica* ha en meget rask larval utvikling (progenese). *L. arctica* er en spesiell representant for tungemarkene: Parasitten har direkte livssyklus med adskilte, årlige generasjoner og en utvikling i reinen som tar 10-12 måneder. Den har kort tid til rådighet for transmisjon. Transmisjonen er vanligvis begrenset til yngste aldersgruppe hos verten. Livssyklus avhenger samsynligvis både av klima, vertsresistens og reinens adferd.

Arbeidet med *L. arctica* har også gitt indikasjoner om reproduktiv strategi hos tungemarkene.

Rolf Egil Haugerud, University of Tromsø, has taken the degree of Cand. Scient. (master of science) in ecology, zoology with the thesis «A life history approach to the parasite-host interaction *Linguatula arctica* Riley, Haugerud and Nilssen, 1987 - *Rangifer tarandus* (Linnaeus, 1758).» The thesis comprises of two papers written in English. Rolf Egil Haugerud was born in 1944 in Drammen. He has been a teacher in northern Norway 1964-84 and has further studied at the University of Trondheim 1970-73.

Linguatula arctica is a tongue worm (Pentastomida) found in reindeer calves. Most calves are infected with postlarval worms in the sinuses during autumn and winter months. The larval stages are not yet found except for the endlarval stage (nymph) from the upper respiratory tract. The earlier stages may be found during summer in various viscera because the endlarvae reach the sinuses from August to October/November. Host reactions were registered but it is too early to conclude about pathological impact.

Rodents and ungulates normally are linguatulid intermediate hosts with canines as definitive hosts. However, the reindeer is the final host in the life cycle of *L. arctica*. In the first paper three transmission possibilities were hypothesized and tested. The results although not conclusive, suggest a direct life cycle with transmission in the short arctic summer. Vertical transmission as alternative strategy is also probable. Transmission to a gastropod species

indicates a paratenic function.

The second article describes growth and development from 4-5 mm long endlarva in 3-4 months old calves to patent parasites (max. 145 mm) in yearlings. The data imply a very rapid development (2-2 1/2 months) from transmission to endlarva stage (progenesis). Obviously, *L. arctica* is a very special tongue worm with its northern distribution. Its direct life cycle, its discrete and annual generations with a developmental time of almost one year, its restriction to the youngest age group of the herbivorous host and its short time available for transmission. Life cycle probably depends on climate, host resistance and the social behaviour of the host.

The observations of *L. arctica* also give indications of general reproductive strategy among pentastomids.

Obituaries Minneord



Professor Vladimir Nikolaevich Andreev

Professor V. N. Andreev who died on September 29, 1987 at the age of eighty, was a leading Soviet scientist in the field of reindeer husbandry. The name of Prof. Andreev is widely known abroad as well. He was the most competent specialist in the sphere of tundra geobotany and reindeer range investigation.

V. N. Andreev was born in 1907 in Leningrad. He was educated at Leningrad University, later on he took the post-graduate course at the USSR Academy of Sciences. From the student's years he devoted himself to the research of tundra vegetation and range resources. He began his wide and prolonged expeditions to the Far North from the European tundras. His early studies on the vegetation of Kanin peninsula tundras and his investigations of biology and ecology of lichens became classic in the field of tundra geobotany.