Mercury in Tissues and Lice of Northern Fur Seals*

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Marine carnivores (Pinnipedia) occupy an important place in the highest trophic level of the marine ecosystem. The northern fur seal, Callorhinus ursinus, subsists solely on marine fishes and invertebrates. Since residues of persistent chlorinated hydrocarbon pesticides, now viewed as pollutants of the environment, have been found in fishes and invertebrates, it is not surprising that residues of these chemicals were detected in the northern fur seal (ANAS and WILSON, 1970). The extensive presence of mercury in the environment and the potential hazards that exist following its transformation by bacteria into methyl mercury have received much attention during the past several years. Methyl mercury has detrimental effects on man (KURLAND, 1960; PIERCE et al. 1972), animals (KELIKOFF, 1971), fishes (ACKEFORS, 1971) and probably adversely affects any organism that accumulates the compound in appreciable amounts. This toxic chemical has been found in marine fishes and invertebrates (ZITOK et al. 1971; RIVERS et al. 1972). It has been found in the ringed seal, Pusa hispida saimensis, in amounts that have led to the postulation that these seals retain mercury in their tissues to a greater degree than other mammals (TILLANDER et al. 1970). These recent reports suggested that the northern fur seal could be contaminated with mercury, and the investigation reported in this paper was conducted to determine the mercury levels in specific tissues of this marine mammal. The mercury levels in the sucking lice of the seal were also determined to obtain information related to the energetic aspects of the louse-seal relationship.

This paper reports the first detection of mercury in the nursing cow, newborn and suckling pups of Callorhinus ursinus and in two species of sucking lice, Antarctophthirus callorhini (Osborn) and Proechinophthirus fluctus (Ferris), which are parasitic on the fur seal. Additional investigations seem warranted and have been planned for the future.

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The Pribilof Islands, Alaska provide major breeding habitats for the northern fur seals. The seals annually return to the Islands to breed in or around June after a long winter journey. During winter, they migrate over long distances, as far as 3,000 miles, and many spend the winter season off the coast of California.

The sucking lice, A. callorhini and P. fluctus are obligate, permanent ectoparasites of the northern fur seals and live on seal blood. Some of the seals are heavily infested with the sucking lice, and the mean population size of 107.6 lice per infested host has been reported (KIM, 1972).

Materials and Methods

Samples of tissues and the sucking lice were collected from fur seals on St. Paul Island, Alaska, in July 1972. Hair and blood samples were taken from two nursing cows, two new-born pups and three 2-month-old pups. Milk samples were taken from two nursing cows, and samples of the sucking lice were collected from five pups. All samples were stored in glass vials and kept frozen from the time of collection until analysis. Two pregnant cows were caged away from the rookery for study. Two new-born pups from which samples were taken were born by these pregnant cows. The flameless atomic absorption spectrophotometric technique was used for mercury analysis (KALB, 1970).

Results and Discussion

Mercury was found in all of the samples analyzed in the investigation, as indicated in Table 1.

TABLE 1.
Mean mercury contents in tissues and the sucking lice samples of the northern fur seal, Callorhinus ursinus (μg/g).

Seals	No. of Samples	Hair[a]	Blood[b]	Milk[c]	Sucking Lice Ac*	Sucking Lice Pf*
Nursing cows	2	4.87	0.0995	0.0145	--	--
Newborn pups	2	3.68	0.0195	--	0.221	--
Pups (2 months)	3	5.36	0.0686	--	0.630	0.513

[a]Air dried: [b]Whole blood: [c]Whole milk.

*Ac = Antarctophthirus callorhini; Pf = Proechinophthirus fluctus

Hair contained the highest level of mercury as compared to those of the blood, milk and lice. The higher mercury content in the hair was not unexpected since mercury has been reported to deposit in large amounts in keratin tissues (SELIKOFF, 1971) and

in the hair of two girls who consumed pork containing methyl mercury (MC INTYRE, 1971).

The levels of mercury in the hair, blood and lice of the 2-month-old pups were considerably higher than those of the newborn pups. Presence of mercury in milk could account for the higher mercury content in the 2-month-old pups. The detection of mercury in milk demonstrates that mercury is readily transferred from the blood to the milk. Presence of mercury in the hair and blood of newborn pups indicates that mercury is able to cross the placental membrane to the fetus in this animal.

Of particular interest was the correlation between the level of mercury in the blood of the seal and that in the hair and lice. A low level of mercury in the blood of the newborn pups led to a low mercury content in the hair and lice, whereas a higher mercury level in the blood of the 2-month-old pups led to a higher mercury content in the hair and lice. These findings suggest that hair and lice samples should be further tested as a means of monitoring to give a reliable index of the mercury level in this marine animal. Although analysis of organ tissues usually gives a better indication of mercury intoxication (MC INTYRE, 1971), killing animals to obtain tissues makes this method unsuitable for routine monitoring purposes. Recently, HUCKABEE et al. (1973) found mercury in the hair of coyotes and rodents and suggested that mercury in animal hair reflects mercury contamination in the animal environment and that hair may serve as an effective monitor of environmental mercury. Further, the mineral content of hair has been considered a valuable index of a person's mineral status and nutrition (STRAIN et al. 1966; KLEVAY, 1970a, b; HAMBRIDGE and BAUM, 1972; GRAEF et al. 1971).

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