Rearing the Long-Nosed Cattle Louse[1] and Cattle Biting Louse[2] on Host Animals in Oregon[3]

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ABSTRACT

During the spring and summer months in the Willamette Valley of Oregon, populations of cattle lice normally decline. However, when the cattle were restrained from self-grooming, small natural infestations of the long-nosed cattle louse, *Linognathus vituli* (L.), as well as populations transferred to noninfested hosts, invariably built up to large numbers and persisted. Mixed populations of *L. vituli* and the cattle biting louse, *Bovicola bovis* (L.), built up simultaneously on the same host. *L. vituli* tended to congregate on the lower and *B. bovis* on the upper body regions. This finding suggested the existence of some degree of antagonism between the 2 species, since when either was the sole infesting louse it tended to occupy most body regions with considerable uniformity. When an infected host was allowed to self-groom, it quickly reduced or entirely eliminated its population of lice.

In most temperate areas of the world, cattle lice are perennially a serious problem. Populations usually increase during the fall and winter and decline during the other seasons. However, at any season the densities of infestations among herds and within a given herd may vary widely. Causes for such fluctuations are not fully understood, since methods of obtaining an experimental colony or of maintaining it on normal hosts have not been available. However, Lewis and Christenson (1962) partially solved the rearing problem during their investigations of the biology of the cattle biting louse, *Bovicola bovis* (L.).

In the 1st tests that Lewis and Christenson conducted with the cattle biting louse they investigated the function of self-grooming by noncarrier hosts. When the noncarrier hosts were restrained from self-grooming and placed in covered, screened stalls, large populations of the louse built up on them during the warmer months. Conversely, when they were allowed

[1] Anoplura: Linognathidae.
[2] Mallophaga: Trichodectidae.
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to self-groom freely, the infested animals quickly and drastically reduced their populations of lice.

Some field observations of Lewis and Christenson (1962) suggested that populations of the long-nosed cattle louse, *Linognathus vituli* (L.), also would build up on cattle restrained from self-grooming, but on this point the laboratory studies were indeterminate.

Our research on cattle lice was resumed at the Corvallis laboratory in 1961 and continued through 1963. We made most observations during the warmer months because we expected that populations of lice might be induced to build up in cool weather. Our 1st studies in 1961 were with *L. vituli* only, but subsequently we observed mixed populations of *L. vituli* and *B. bovis*. This report summarizes the progress we made in these studies.

MATERIALS AND METHODS.—The screened stalls in which the cattle were confined measured 2.74×3.35 m and had metal roofs and concrete floors. The roofs shaded the host cattle. Each stall was equipped with a homemade, nonswivelling wooden stanchion which prevented the animals from self-licking but did allow limited rubbing.

We estimated the populations by counting the lice per cm² observed in 4 parts of the hair. Counts were made on the neck, brisket, escutcheon, tailhead, withers, upper and lower parts of the shoulders, sides, flanks, and hips, and on the underneath portions of the belly. When populations were dense, we examined 6-cm² portions in each body area for the counts; with moderate infestations we examined areas as large as 15-cm square. With sparse populations we systematically searched even larger areas, including the poll and face.

DEFINITION OF TERMS.—Self-grooming refers primarily to self-licking but does not exclude self-rubbing and communal intraherd licking. Noncarrier differentiates animals that usually have few or no lice from those few individuals, called "carriers," that for undetermined reasons tend to have constant infestations of lice.

RESULTS.—*Long-Nosed Cattle Louse on Cattle in Covered Stanchions.*—We began our studies with this louse on March 3, 1961, using three 193.1-kg beef-breed heifers. When stanchioned, these heifers were similarly infested with *L. vituli* localized in 2 or 3 nonadjoining clusters on the brisket and withers at a density of 0.5 to 1/cm² per cluster; an occasional louse could be found also on the underneath portions of the belly. After 5 weeks of confinement in the stanchions, each animal had a rather uniformly distributed population at an average density of 1.5/cm². Two of the heifers were then liberated and one was retained in its stanchion. The infestation on the confined animal increased to 2 lice/cm² by the end of the 6th week and remained at that level through the following 3 weeks. On the other hand, populations on the 2 released animals ebbed in 1 week to the number and distribution pattern of preconfinement (probably because of self-grooming by the heifers) and remained in that state for the following 3 weeks. We then ended the test, since results apparently confirmed our original premise that this louse would build up on infested animals restrained from self-grooming.

We began a 2nd test August 4, 1961. A louse-free, 307.5-kg Brown Swiss heifer was stanchioned and infested with 100 randomly selected *L. vituli* from another animal. At the end of a month she had a uniformly distributed population (primarily nymphs) at an estimated density of 0.16/cm². By the 7th week, populations had increased to an estimated 0.5/cm²; most of these also were nymphs. Since it was very late in the summer, the test was then terminated. However, we considered that our results further confirmed that this species builds up during the warmer seasons on cattle not free to self-groom.

Mixed Populations of the Long-Nosed Cattle Louse and the Cattle Biting Louse in Covered Stalls.—We began our studies with mixed populations of the 2 species April 20, 1961, when a 226.8-kg Guernsey heifer was placed in a wooden stanchion in a screened stall. She had a natural infestation of about 150 *B. bovis* in 1 small area between her ears, and several hundred *L. vituli* were transferred to her from another animal. In the 3rd week after confinement both species had spread uniformly over the upper 46 cm of the body area from the withers to the tailhead, at an average density of 0.5 and 1/cm², respectively. Only *L. vituli* was observed on the brisket and other lower parts of the body. In the 5th week *B. bovis* averaged 8/cm², almost all on the upper parts of the body, whereas *L. vituli* averaged 3/cm², almost all on the lower parts of the body including the brisket and escutcheon. Only small numbers of each species were in areas heavily populated by the other. After the 5th week, both species rapidly rose to (and remained at) densities of more than 16 and 6/cm², respectively, while maintaining the distribution pattern just described. The heifer was released on August 4; within 3 days her vigorous self-grooming had virtually eliminated the infestation of *B. bovis* and reduced that of *L. vituli* to an average of 0.05/cm². When we ceased observations on September 1, no *B. bovis* and less than a dozen *L. vituli* could be found.

We resumed studies with mixed populations of the 2 species April 27, 1962, by stanchioning a heavily coated, dairy-breed steer. Initially his infestation consisted of a naturally occurring, evenly distributed population of *B. bovis* averaging 1.3/cm². Two weeks later, hair containing eggs of *L. vituli* was taped to his withers. Within a week very small nymphs of *L. vituli* were present on the withers but *B. bovis* was uniformly distributed at an average of 16/cm². The steer was then released for 30 hr. During this 30-hr period he accelerated the shedding process by licking and rubbing off his entire old, very loose hair coat and with it about 99% of the population of *B. bovis*. He was then reconfined in a stanchion constructed so that he could lick a small area on his right side and flank. Three weeks after the 2nd confinement, *B. bovis* averaged 2.5/cm² whereas *L. vituli* were present in but small numbers. But in the area where the steer could lick, *B. bovis* averaged only 1/36 cm² and *L. vituli* were not detected. At the end of the month, on June 22, *B. bovis* averaged 2.5/cm² and were distributed primarily over the upper 46 cm of the steer's body. *L. vituli* had increased to an average of 1/cm² and was distributed primarily in areas below those infested by the cattle biting louse. Both averaged only 1/36 cm² in the area that could be licked. These population densities and distribution patterns remained relatively constant during the following month, since heavier population buildups were apparently retarded by the steer's persistent removal of a large proportion of the lice constantly migrating into the area being self-licked. To test this assumption, we restrained the steer from further self-licking. Within 2 weeks *B. bovis* had built up to 8 and *L. vituli* to 2/cm². At the end of 3 weeks *B. bovis* averaged more than 16 and *L. vituli* 2.5/cm². The steer was released on September 4; the populations then declined precipitously. By October 1, the steer apparently harbored no lice of either species.

We began additional observations in 1962 on August 27 with a louse-free 226.8-kg Guernsey heifer infested at confinement with several hundred of both species. Populations of both built up steadily, with *B. bovis* reaching 16 and *L. vituli* 2.5/cm² by October 1. As with previous infestations, *B. bovis* was primarily on the upper 46 cm of body area; *L. vituli* primarily on the lower areas. Populations and distribution patterns were very nearly constant during the next month, at which time the test was terminated.

Studies with mixed populations in the screened stalls were resumed on April 18, 1963, with a louse-free, 249.5-kg Aryshire heifer infested at the time of confinement with several hundred of both species taken from an animal near Nashville, Oregon. Populations built up steadily; *B. bovis* averaged more than 16 and *L. vituli* 2.5/cm² by May 30. Densities and distributions remained rather constant for the next 3 weeks. We then modified confinement conditions to allow the heifer to lick an area about 46 cm in diam on each of her sides. Within a week populations of *B. bovis* in the unlicked area had dropped to about 8/cm² and those of *L. vituli* to 0.8, but the distribution pattern was unchanged. In the licked area neither species averaged more than 1/36 cm². The distribution pattern and population level continued without significant change until August 28, when the heifer was released into a pasture. One month later, we could find no lice on her.

DISCUSSION.—The evidence obtained indicates that in shaded stalls, populations of the long-nosed cattle louse will build up and persist during the warmer months on hosts restrained from self-grooming. The data also support the conclusion of Lewis and Christenson (1962) that self-grooming is 1 mechanism by which cattle protect themselves from lice. This phenomenon may be rather general among animals, since Bell et al. (1962) showed that self-grooming (including communal grooming) is a mechanism by which mice protect themselves from lice. In addition, the further evidence obtained supports the observations of Lewis and Christenson (1962) that the shedding process in the spring very much helps the cattle rid themselves of populations of lice that build up during the winter.

The data suggest that some degree of antagonism existed between *B. bovis* and *L. vituli*. When either species was the sole infesting louse, it tended to occupy most body regions with considerable uniformity. However, when the 2 species were simultaneously present in large numbers on the same host, *B. bovis* occupied primarily the upper body regions, and *L. vituli* the lower; only rarely were the 2 species present in large numbers in the same area.

In these tests, populations of lice (including eggs only) were transferred from infested to noninfested hosts, on which in every instance the lice built up to large numbers and persisted. This method of propagation should facilitate the study of any reported colony of lice in which resistance to insecticides has been noted. It also offers the possibility of conducting sustained, repeatable studies of the biology of lice at a location and time chosen by the investigator.

REFERENCES CITED

Bell, J. F., W. L. Jellison, and C. R. Owen. 1962. Effect of limb disability on lousiness in mice. I. Preliminary Studies. Exp. Parasitol. 12 (3) : 176–83.

Lewis, L. F., and D. M. Christenson. 1962. Induced buildup of populations of *Bovicola bovis* on cattle in Oregon. J. Econ. Entomol. 55 (6) : 947–9.

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