Table 1. Numbers of *P. pestis* (avirulent strain A1122) and quantity of blood ingested by *X. cheopis*.

Fleas	Weight* (mg)	Blood vol. ml × 10^{-4} (calc.) †	Bacterial count‡ × 10^4 (actual)	Bacterial count‡ × 10^4 (calc.)
Unfed ♂♂	0.30			
Fed ♂♂	.40	0.9	5.7	6.5
Unfed ♀♀	.27			
Fed ♀♀	.42	1.4	10.1	10.1

* Weights of fleas, average of 50 per sex; 1.0×10^{-4} ml blood meal weighs 0.1068 mg and contains 7.2×10^4 plague bacilli.

† Calculated on basis of average weight of blood ingested.

‡ Bacterial counts of fleas based on average of five per sex.

The calculated minimum concentration of plague organisms necessary to infect *X. cheopis* has been estimated at 10,000 bacilli per milliliter (*6*). With the avirulent plague strain used in the present experiments, a much higher concentration is necessary to establish successful infection in fleas. In an early test when a blood meal containing 400 million bacilli per milliliter was given to the fleas all the fed insects initially harbored bacteria. After 5 days, however, only two fleas out of 32 yielded microorganisms when they were macerated and cultured. When the bacteria count of the blood meal was increased to 720 million or more, more than 80 percent of the fleas remained infected with plague for more than 5 days.

Definite proventricular blocks associated with empty and constricted stomachs occurred as early as the second day after the infectious meal, but the rate of blocking did not attain 30 to 40 percent until after 6 to 9 days. Typical ventricular plague masses were observed on the third day and were found in more than half of the fleas examined from the fifth day on.

The *P. pestis* strain A1122, used for these studies, was tested before and after its use in infecting fleas and was found completely avirulent. The white rats, on each of which 60 or more infected fleas fed continuously for 15 days, showed no ill effects. Studies are in progress to challenge the immunity of these animals.

As expected, these preliminary results do not demonstrate any change of virulence after one passage in the flea, but they do establish the fact that a completely avirulent strain of plague multiples forms typical plague masses, and produces proventricular blocks in *X. cheopis* identical to those produced by virulent strains of plague. The blocking of the fleas appears to have a threshold requirement of concentration of microorganisms. This requirement, which may be different for each sex, has not been established, and it is also uncertain whether the quantity of bacteria would have any relationship to the virulence of different strains of plague. Furthermore, it is not known whether other bacteria and other avirulent plague strains will behave similarly to strain A1122 in the flea. These and other problems are now under investigation and will be reported in detail elsewhere.

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Communications

Echinococcosis on St. Lawrence Island, Alaska

Parasitological investigations undertaken on St. Lawrence Island (North East Cape) during part of the summer of 1954 revealed a high incidence of alveolar echinococcosis. Of 198 field mice *Microtus oeconomous* Pallas, *Clethrionomys rutilus* (Pallas) examined, 33 harbored the *Echinococcus* parasite. Such infections, usually confined to the liver, ranged in appearance from a focus that was barely perceptible to an infection that almost completely filled the abdominal cavity. The right lobe of the liver of one *Microtus* contained multilocular cysts whose over-all dimensions are 40 mm in length by 25 mm in width. In another *Microtus*, the entire body cavity was nearly filled with cystic formations. The cysts, aside from infecting both the right and left lobes of the liver, were scattered throughout the intestinal mesenteries and over the stomach and heart surfaces.

Two of 12 ground squirrels *Citellus undulatus* (Pallas) were infected with *Echinococcus*. In one of these animals, a massive infection had destroyed three-fourths of the right lobe of the liver. The general appearance of the multilocular cysts in ground squirrels differed only slightly from that in field mice, being somewhat whiter and with larger (3 to 6 mm) and less granular individual cysts. Of four shrews *Sorex jacksoni* (Hall and Gilmore) examined, one was heavily infected with *Echinococcus*. The appearance of the cystic formations in this animal was similar to that observed in field mice.

We have been unable to find records in the literature of alveolar *Echinococcus* occurring naturally in shrews or ground squirrels. Foxes *Alopex lagopus* (Linnaeus) harbored mature cestodes of the genus *Echinococcus*. Of six hosts autopsied, four were infected with this parasite. The general appearance of the cestodes suggested that they may be *E. granulosus*; however, confirmation of this must await further study, both microscopic and experimental.

Observations on the incidence of echinococcosis in field mice on St. Lawrence Island suggest that the infection becomes well established in its hosts long before macroscopic diagnosis is possible, and that for a true incidence of infection the livers of such hosts must be sectioned and studied histologically. Such a study of 198 livers collected on St. Lawrence Island is now in progress. Dog and fox feces from infected animals are being studied under tundra conditions as to their viability. Immunity and pathological effects on hosts are being made. It is hoped that a more comprehensive report on host-parasite relationships can be given at a later date from the series of experimental infections now in progress with the St. Lawrence Island form of *Echinococcus*.

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Abbreviation of Bacterial Generic Names

Probably because they have become accustomed to writing on small surfaces, such as test tubes and ¾-in. labels, bacteriologists often use some form of "laboratory shorthand," and when writing scientific papers continue this practice. Thus the convention seems to have grown up that in the binomial of a bacterial name, the first, or generic, name should be abbreviated. Fifty years ago this was of little consequence, because all rod-shaped bacteria were placed in the genus *Bacillus,* and the abbreviation *B.* was universally adopted. However, in the last forty years there has been a gradual, but ever-increasing, revolt against the *Bacillus* system of classification and nomenclature and a greater splitting of bacteria into different genera. As new names were coined, bacteriologists abbreviated them, usually into the form using the initial letter, thus *Corynebacterium* became *C.,* and this system worked well in papers dealing with bacteria of only one genus or of several genera beginning with different letters.

Authors of textbooks had a more difficult problem, because it was obviously desirable that an abbreviation used in one chapter should have the same meaning when it was used in another chapter. Ford, in his *Textbook of Bacteriology* (1927), usually spelled out the generic name, although in the descriptive sections the *B.* form was used occasionally. The nine-volume *System of Bacteriology,* published in 1929–31 for the Medical Research Council, avoided all taxonomic issues, and used the *Bacillus* system of nomenclature. Topley and Wilson, however, in their textbook made a serious attempt to have distinctive abbreviations for generic names, abbreviations that are fairly widely, but not universally, used by scientific journals in England. The extension of such a system outside the medical field seemed to be a logical step, and the problem was to see whether an extension was possible.

Distinctive abbreviations. The index of edition 6 of Bergey's *Manual of Determinative Bacteriology* was used as a source of generic names, but names used for viruses (pp. 1127–1286) were excluded. A few names proposed since 1948 have been added, but the additions do not materially affect the results. Ideally the abbreviations should be distinct from similar abbreviations used in algology, mycology, and protozoology (for example, *E. coli* might be used for *Escherichia coli* or for *Entamoeba coli*), but the problem has been kept as simple as possible by restricting it to bacterial generic names.

The first few letters make a convenient short form, as *Staph.* for *Staphylococcus,* but they are not always without ambiguity; for example, *Strep.* or *Strepto.* might be used for *Streptobacillus, Streptobacterium, Streptococcus, Streptomyces,* or *Streptothrix,* and *Str.* could be used for all these and for *Streptus.* There are 28 prefixes common to three genera, 17 common to four genera, four common to five genera, seven common to six genera, and 24 common to seven or more genera; the maximum is the prefix *Thio-,* which is common to 27 genera.

So far the analysis has shown that both initial letters and prefixes make ambiguous abbreviations, but we have ignored the specific epithet, which would, in certain cases, make the generic abbreviation clear. Thus *S. typhi* or *S. typhosa* would be clear because, *up to now,* the specific epithets *typhi* or *typhosa* have not been proposed for a species of any other bacterial genus with a name beginning in *S.* However, it would be foolish to suppose that no author will ever propose a new binomial of the form *S. . . . typhi* or *S. . . . typhosa.* In a similar manner *E. coli* has a definite meaning to a bacteriologist but, because of *Entamoeba coli,* is ambiguous to a clinical pathologist or to a physician.

It would be possible to use different letter combinations as short code designations for generic names, but there are so many disadvantages that the scheme would not work in practice. It would be essential to set up an international code-letter registration board so that the same code letters would be used for only one genus. Each editor and every reader would need a key to the code letters, or the generic names and codes would have to be an essential part of each paper.

Questionnaire to editors. Most journals have definite policies on abbreviations for weights and other measures, and some have approved short forms for generic names. I was asked by one editor if it would be possible to have an agreed list of abbreviations for bac-