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## THE ROLE OF THE COYOTE IN AN INFECTION OF MAN AND ANIMALS

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ABSTRACT: As part of epidemiological studies on hydatid disease in the central valley of California, a survey was made of seven counties of possible infections with *Echinococcus granulosus* in the coyote (*Canis latrans*). Of 173 animals examined, seven (4.0 per cent) were found infected, six of them from Tehama County.

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Echinococcosis or hydatid disease is an infection caused by the cystic larval stages of closely related tapeworm parasites *Echinococcus granulosus* and *E. multilocularis*. Our discussion is concerned with the *E. granulosus* infection known as classical hydatid disease in which the cyst is unilocular in the intermediate host. *E. multilocularis* on the other hand has, as its name implies, multilocular cysts and is often referred to as the alveolar form of hydatid disease.

The life cycle of *E. granulosus* involves a carnivore as a definitive host harboring the adult tapeworm and a herbivore as an intermediate host harboring the larval stages in cystic forms. The carnivore becomes infected by ingesting the cysts and the intermediate host becomes infected by ingesting the eggs passed in the stool of the infected carnivore.

Under completely natural conditions the larval *E. granulosus* occurs in large ruminants such as the cervids and the adult tapeworm occurs in the wolf (*Canis lupus*). Through years of domestication the dog gradually replaced the wolf and the domesticated ruminants replaced the wild cervids (Rausch, 1967). Through association with the domesticated dog, man becomes infected by ingesting the tapeworm eggs passed in the stool of the infected carnivore.

The most important reservoir host of *E. granulosus* is sheep although cattle, pigs, horses and camels have been reported as intermediate hosts (Schantz, 1969a). In California, and for the first time in the United States, the classical dog-sheep-dog transmission cycle was reported (Sawyer, 1969). These and further epidemiological studies revealed *E. granulosus* infection in dog, sheep and man in several counties of California extending from Colusa County in the north to Kern County in the south (Schantz, 1969b).

Despite the fact that coyotes (*Canis latrans*) are numerous in California, it was not known to what extent if any they and other species of wildlife might also contribute to the maintenance of this cycle. Sweatman (1952), Miller (1953), and Holmes (1961) have reported *E. granulosus* in *C. latrans* in Canada and more recently Leiby and Carney (1968) have reported the immature *E. multilocularis* in five out of fifteen coyotes in North Dakota.

The cystic stages of *E. granulosus* in deer (*Odocoileus* sp.) in California have been described by Brunetti and Rosen (1970). They report that out of 2,049 deer examined, *E. granulosus* cysts were found in the lungs of 26 deer for an overall infection rate of 1.3 per cent. The highest incidence of infection was in Glenn and Tehama counties with infection rates of 24.2 and 24.0 per cent respectively. The fact that *E. granulosus* cysts are present in deer and that important items in the diet of coyotes are remains of domestic livestock and deer (Ferrei, 1953) prompted an investigation as to what role the coyote plays if any in the maintenance of the hydatid disease cycle in California.

In cooperation with the Bureau of Sport Fisheries and Wildlife, United States Department of Interior, Sacramento, California, and the Department of Epidemiology and Preventive Medicine, School of Veterinary Medicine, University of California, Davis, California, a study was made of 173 coyote intestinal contents in which seven were found to be infected with the *E. granulosus* tapeworm. The positive animals were from only two of the seven counties surveyed. Six infected coyotes out of thirty (an infection rate of 20 per cent) were from Tehama County and a single coyote collected from Mariposa County was found to be infected.

The 20 per cent infection rate of coyotes in Tehama County and the 24 per cent infection rate of deer in that same area points to an established sylvatic cycle. Further studies are required to determine whether *E. granulosus* is being maintained in Tehama County by deer and coyotes or whether infected dogs and sheep are also present in this area. A collection of coyote intestines from Glenn County is presently underway to determine if similar comparisons of deer and coyote infection rates can be made.

This is the first time that coyotes have been found infected with *E. granulosus* in the United States although Riley (1939), Chandler (1944), Butler and Grundmann 1954, Ameel (1955) and Gier and Ameel (1959) have all conducted extensive surveys for coyote helminths. To our knowledge the wolf is the only other wild definitive host reported for *E. granulosus* (Riley, 1933 and 1939) in the contiguous United States. The recent findings of *E. granulosus* in sheep, dogs, coyotes and man in several counties in California suggest that this infection is well established in this state. Magath (1954) points out that in countries where Echinococcosis is endemic, control measures such as those aimed at the dog-sheep-dog life cycle may not prove altogether effective because of the presence of sylvatic Echinococcosis. It becomes an extremely difficult task to eradicate any disease in which a sylvatic cycle is involved and Magath further points out that the only effective control of hydatid disease rests on an educational program aimed at teaching basic sanitation.

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