

Parasites as the etiology of paranasal sinusitis in foxes

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Paranasal sinuses, colloquially referred to as paranasal glands, occur in most carnivorous animals. Their conditions are a common problem of many species of animals, including dogs and foxes. Excessive mucus and no possibility of its removal contribute to the occurrence of irritating clinical problems known as paranasal sinusitis. The causes of the state are most often sought in bacterial infections. On the grounds, the recommended way of the therapeutic management is, apart from restoring patency, local use of antibiotics. The study was aimed at demonstrating other pathogens responsible for inflammatory changes occurring in the paranasal sinuses in foxes.

MATERIAL AND METHODS. Thanks to the kindness of ZHW in Lublin, the bodies of foxes shot by hunters and tested for rabies, were used for the research. In the years 2017–2018, 175 tissue samples of foxes were collected covering the anal sections with the paranasal sinuses. Pre-test samples were deep-frozen at –80 C for 3 weeks to eliminate the risk of *Echinococcus multilocularis* infection. The sinuses were subjected to a sectional examination with use of a stereoscopic microscope. Additionally, a scrape smear of the sinus mucosa was examined. Isolated parasites or dispersion forms were assessed morphometrically and photographic documentation was carried out. For detailed identification, isolated nematodes were subjected to a molecular examination (PCR). The condition of the mucous membrane, the volume and content of the secretion were also assessed.

RESULTS. In the mucosa and sinus lumen, nematodes from the subfamily of Capillariinae and tapeworms of the genus *Mesocestoides* were found in 72 animals tested (41.14%). Molecular analysis of nematodes concerning fragments of the ribosomal DNA region (18S, ITS,) indicates that it belongs to the *Pearsonema* genus. Molecular analysis confirmed the species of tapeworms as *Mesocestoides litteratus*. In 66 animals (37.7%), *Pearsonema paranasalis* nematodes were found and in 9 foxes (6.2%) proglottids of tapeworms of the genus *Mesocestoides*. In 52 animals (29.7%) nematodes, in the number of 1 to 8 specimens, were found. In 39 animals (22.3%), nematodes were confirmed in both sinuses and in 13 (7.4%) only in one paranasal sinus. In 14 (8%) animals, no nematodes were found, but *P. paranasalis* eggs were found in the mucosa scrap. Nematodes and eggs present in the sinuses were in the mucous membrane and some eggs in the mucus of the mucous membrane. Proglottids of *M. litteratus* were found in one sinus in the number of 1 to 5 segments in 6 foxes, and in 3 foxes in both sinuses. The sinuses infected by nematodes of *P. paranasalis* with an intensity of more than 2 nematodes showed signs of inflammation (hyperemia and the presence of a large volume of mucous and purulent secretion). In sinuses with lower

intensity of invasions of the nematodes and with the presence of the segments of *Mesocestoides litteratus* there was no excessive secretion.

CONCLUSIONS. The cause of a significant percentage of cases of inflammation of the paranasal sinuses in the foxes may be parasitic invasions, especially those of nematodes from the subfamily of Capillariinae identified as *P. paranalis*. The deep location of nematodes and depositing their eggs in the mucous membrane may cause longer shedding of eggs during the invasion than it results from the length of the patent period.