

## **Diatomaceous earth in the prevention of worm infestation in purebred pigeons**

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**Abstract:** *Diatomaceous earth in the prevention of worm infestation in purebred pigeons.* The aim of the study was to determine the effectiveness of diatomaceous earth in the prevention of worm infestation in purebred pigeons and forms of its application. Diatomaceous earth (diatomite) was given to pigeons in the province of Mazovia. The following pigeon breeds were used in the experiment: motyl warszawski, białoogon białolot berliński, szpak i mewka. An addition of the natural mineral at 2% of the daily dose of feed was given for three weeks in 10 dovecotes. The pigeons were divided into two groups. The Group I comprised 150 birds in five dovecotes. These birds were given grain (feed mix for pigeons, made by Kampol) plus diatomite mixed with a mineral additive (mineral complementary feed, made by Biowet). Group II comprised 150 birds in the other five dovecotes. These birds were given grain (feed mix for pigeons, made by Kampol) mixed with diatomite. The experiment found that the number of parasite eggs in the group I was reduced after a week following the application of diatomite, whereas the number of *Capillaria* nematode eggs and the proportion of *Eimeria* coccidia oocysts decreased considerably in group II.

**Key words:** Diatomaceous earth (diatomite), parasites, pigeons

### **INTRODUCTION**

Purebred pigeons are kept by a number of breeders and hobbyists and they have many admirers and enthusiasts around

the world. However, the birds are susceptible to infestation by parasites, which poses many problems for their owners. Breeders must struggle with both internal and external pigeon parasites, which frequently cause permanent damage or death to the birds. Parasitic diseases are also an underlying cause of many other diseases, mainly infectious ones. Moreover, pathogens transmitted by pigeons can pose a potential threat to human health or life. It is important from a breeder's perspective to have not only an efficacious drug against the parasitoses already detected, but also to have some preventive measures ready. There are several de-worming products for pigeons, but these are synthetic substances. Synthetic drugs are not usually neutral to the bird's body, they weaken it and have a negative effect on the internal organs (liver) and breeding performance. The optimal solution for pigeon owners would be a natural product which is non-invasive and can effectively prevent parasitic diseases. Amorphous diatomaceous earth of freshwater origin is a proposed product that meets these criteria.

Diatomaceous earth (Fig. 1), or diatomite, are fossilised remnants of shells of diatoms, which were microscopic unicellular algae living in water several

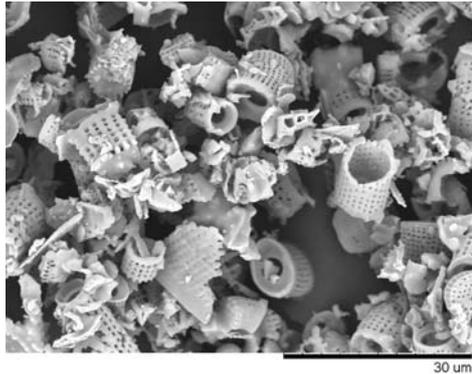


FIGURE 1. Diatomaceous earth ([http://www.wikiwand.com/pl/Ziemia\\_okrzemkowa,2015](http://www.wikiwand.com/pl/Ziemia_okrzemkowa,2015))

million years ago which formed layers of organogenic rocks when the water bodies dried out. Shells of diatoms in diatomaceous earth are made mainly from silicon dioxide ( $\text{SiO}_2$ ) and trace amounts of other minerals. Consumed by humans or animals, they pass through the gastrointestinal tract, with small amounts being absorbed to the bloodstream as orthosilicic acid ( $\text{H}_4\text{SiO}_4$ ). Moving along the digestion tract, diatom shells destroy parasites and their eggs along their way and they are subsequently excreted. This is a physical process, the rough surface of the shells rubs against the parasites' bodies, damaging them and causing their death. Additionally, cylindrical shells of diatoms have pores which absorb water from the environment, which dehydrates pathogen bodies and ultimately kills them. Diatoms are not identical in all deposits of diatomaceous earth.

Deposits of freshwater origin are characterised by a stable content of diatoms with permanent (cylindrical), durable shells. Saltwater deposits contain a mixture of different diatom types, with different shapes and their fossilised shells are relatively brittle. The constant composition and durable structure of diatomaceous earth are important for its effectiveness. An important aspect is that usable diatomaceous earth is amorphous, i.e. non-crystalline. Crystalline silica has very hard, sharp and relatively thick particles, which are harmful to the walls of the gastrointestinal tract in humans and animals and it is used, for example, in filtration systems. Amorphous silica is gentler, it rubs against the walls of the digestive tract with no damage (Haney 2015). The amorphous form of diatomaceous earth is commonly used in the USA in agriculture and in animal breeding, e.g. as an anti-caking agent added to fodders and a product for controlling internal and external parasites in farm animals (Quartes 1992, Fields 2000, Dawson 2004, Maurer et al. 2009).

The aim of the study was to determine the effectiveness of diatomaceous earth in the prevention of worm infestation in purebred pigeons and forms of its application.

## MATERIAL AND METHODS

Amorphous diatomaceous earth from freshwater deposits of *Melosira preice-lanica* human- and animal-consumable grade diatoms obtained from the purest source available in the USA, according to the Food and Drug Administra-

tion (product Fossil Shell Flour® PermaGuard), was ground into fine powder and used in the experiment.

Diatomite was given to pigeons in the province of Mazovia. The following pigeon breeds were used in the experiment: Warsaw butterfly, Berlin white tail, starling and Polish owl. An addition of the natural mineral at 2% of the daily dose of feed was given for three weeks in 10 dovecotes. The pigeons were divided into two groups. Group I comprised 150 birds in five dovecotes. These birds were given grain (feed mix for pigeons, made by Kampol) and apart diatomite mixed with a mineral and vitamin additive (mineral complementary feed made by Biowet). Group II comprised 150 birds in the other five dovecotes. These birds were given grain (feed mix for pigeons, made by Kampol) mixed with diatomite.

On days 1, 11 and 21 of the experiment (series 1, 2, 3), bird faeces were collected randomly from five points of the dovecotes and were examined for parasites using McMaster's method.

Parasite eggs and oocysts were counted in 1 g of a sample. The parasitological examination was conducted at the Veterinary Diagnostic Laboratory of Infectious and Invasive Diseases of the Faculty of Veterinary Medicine of the University of Life Sciences in Warsaw.

### RESULTS AND DISCUSSION

There were three groups of parasites identified in the pigeon faeces: nematode eggs of the genus *Capillaria*, nematode eggs of the genus *Ascaridia* and oocysts of coccidia *Eimeria* sp.

The experiment found that the number of parasite eggs in the Group I was reduced after a week following the application of diatomite, whereas the number of *Capillaria* nematode eggs and the proportion of *Eimeria* coccidia eggs decreased considerably in Group II (Figs 2, 3). It can be explained by the higher intake of diatomite added to the mineral complementary feed. In general, since pigeons are fed a mixture of differ-

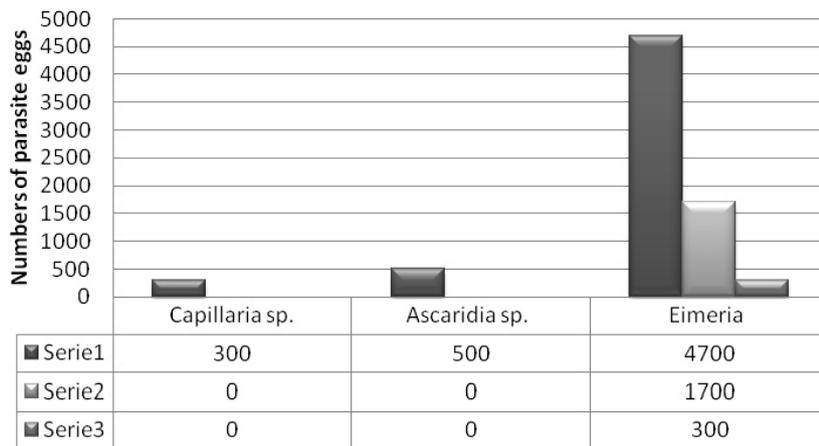


FIGURE 2. Results of the parasitological examination (Group I)

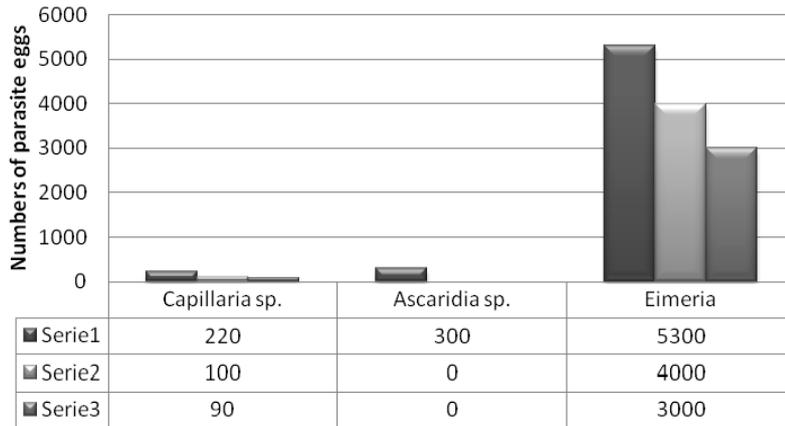


FIGURE 3. Results of the parasitological examination (Group II)

ent seeds (wheat, peas, sunflower, maize, barley, dari, cardi, etc.) they are reluctant to consume granulated feed. The birds which were taught to consume mineral complementary feed (mineral as a loose product in a separate feeder) were more eager to consume the diatomite they were given, compared to the group of pigeons which were given grain, and they were given micronutrients in drinking water.

A similar tendency was observed by Bennetti et al. (2011) on laying hens kept in the open air. The hens which were given diatomite had considerably fewer eggs of *Capillaria* and *Heterakis* and slightly fewer oocysts of *Eimeria*. The data in the literature on the use of diatomite are inconclusive. Several publications confirmed the effect of diatomaceous earth in the prevention of worm infestation in animals. The therapeutic effects of diatomite were also confirmed by Allen et al. (1998), Fernandez et al. (1998), Milton and Klopfenstein (2000), Lartigue and Rossanigo (2004), Ahmed et al. (2013). Bernard et al. (2009) conducted a study with goats and did not

confirm a significant de-worming effect, although differences in blood morphology and the proportion of red and white blood cells were observed, although some authors claim that the differences may have been caused by the physiological changes in goats and their productivity. Van der Meulen et al. (2008) reported that the amount of feed consumed by hens increased in response to an increase in the amount of sand in their diet. This allowed them to maintain the production of eggs and their body weight. It is not clear how diatomite can help hens to maintain their body weight or improve egg production. It is possible that diatomite offers essential trace elements or that it can improve the absorption of some nutrients. Diatomite consists of 86–94% of silicon and the remaining part consists of aluminium, calcium, phosphorus, sodium, potassium, magnesium, iron, sulphur and other trace elements (Korunic 1998, McLean et al. 2005).

The observations indicate that further studies are necessary to assess the effect

of diatomite given to pigeons and its effect on such features as productivity, increased body weight and immunological response. It is also necessary to establish the form in which diatomite is given, in a form acceptable to pigeons, who generally consume a mixture of seeds.

### CONCLUSIONS

- There were no reported negative effects on the health of diatomaceous earth birds.
- Using diatomite in the diet of pigeons considerably reduces the amount of internal parasites in their gastrointestinal tract with time of use, often to complete eradication of the parasites.
- Diatomite can be successfully used in controlling parasites of the gastrointestinal tract and in de-worming in purebred pigeons.
- Diatomite can be an environmentally-friendly alternative to synthetic products against internal parasites in pigeons and other breeding birds and is non-invasive to the environment and birds.

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**Streszczenie:** Ziemia okrzemkowa w profilaktyce odrobaczania gołębi rasowych. Celem badania było określenie skuteczności działania ziemi okrzemkowej w profilaktyce odrobaczania gołębi rasowych oraz formy jej podania. Ziemię okrzemkową (diatomit) podawano w gołębnikach zlokalizowanych na terenie województwa mazowieckiego. Eksperyment przeprowadzono na gołębiach ras: motyl warszawski, białoogon białołot berliński, szpak i mewka. Dodatek naturalnego minerału podawano w ilości 2% dziennej dawki paszy przez okres trzech tygodni w 10 gołębnikach. Gołębie podzielono na dwie grupy. W grupie I 150 ptaków pochodzących z pięciu gołębników otrzymywało ziarno (mieszanka dla gołębi firmy Kampol) oraz osobno ziemię okrzemkową wymieszaną z mieszanką paszową uzupełniającą mineralną (firmy Biowet). W grupie II 150 gołębi

z pozostałych pięciu gołębników otrzymywało ziemię okrzemkową wymieszaną z ziarnem (mieszanka dla gołębi firmy Kampol). W kale gołębi zidentyfikowano trzy grupy pasożytów: jaja nicieni z rodzaju *Capillaria*, jaja nicieni z rodzaju *Ascaridia* oraz oocysty kokcydiów z rodzaju *Eimeria*. W przeprowadzonym doświadczeniu stwierdzono w pięciu gołębnikach (ZO + ziarno + mieszanka mineralna Biowet) całkowitą likwidację jaj pasożytów już po tygodniu stosowania ziemi okrzemkowej, a w pięciu pozostałych (ZO + ziarno) wyraźne zmniejszenie liczebności jaj nicieni *Capillaria* oraz zmniejszenie udziału oocyst kokcydiów *Eimeria*.

**Słowa kluczowe:** ziemia okrzemkowa (diatomit), pasożyty, gołębie

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