**Relation of Oregano Essential Oil (OEO) and Diarrhea symptoms**

1. **Τίτλος μελέτης:** ***Evaluation of the in-field efficacy of oregano essential oil administration on the control of neonatal diarrhea syndrome in calves***

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**Research in Veterinary Science**

**Ίδρυμα:** Clinic of Farm Animals, School of Veterinary Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece

Diagnostic Laboratory, School of Veterinary Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece

Laboratory of Microbiology and Infectious Diseases, School of Veterinary Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece

Laboratory of Parasitology and Parasitic Diseases, School of Veterinary Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece

**Μελετητές:** Panagiotis D. Katsoulos, Maria A. Karatzia , Chrysostomos I. Dovas, George Filioussis, Elias Papadopoulos, Evangelos Kiossis, Konstantinos Arsenopoulos, Theologos Papadopoulos, Constantin Boscos, Harilaos Karatzias

**Περίληψη μελέτης:** Στη συγκεκριμένη έρευνα, οι συγγραφείς μελέτησαν την επίδραση της καθημερινής πρόσληψης αιθέριου ελαίου ρίγανης (OEO) σε νεαρά μοσχάρια από την ημέρα της γέννησης τους μέχρι την ηλικία των 15 ημερών. Σκοπός τους ήταν να ελέγξουν εάν και κατά πόσο η πρόσληψη ριγανελαίου επηρεάζει θετικά τα συμπτώματα διάρροιας στα νεογέννητα μοσχάρια. Η μελέτη έδειξε ότι η καθημερινή χορήγηση ελληνικού αιθέριου ελαίου ρίγανης σε μοσχάρια για τις πρώτες 10 ημέρες της ζωής τους μειώνει αποτελεσματικά τη σοβαρότητα της φυσικώς αποκτηθείσας διάρροιας υπό συνθήκες αγρού. Επιπλέον, φαίνεται ότι, σύμφωνα με ορισμένες πρακτικές διαχείρισης της υγιεινής, η χορήγηση αιθέριου ελαίου ρίγανης μπορεί να **έχει προληπτική δράση** κατά του συνδρόμου διάρροιας νεογνού. Οι ερευνητές καταλήγουν στο συμπέρασμα ότι το αιθέριο έλαιο ρίγανης μπορεί να λειτουργήσει ως αντικατάστατο των αντιβιοτικών και μπορεί να βοηθήσει στη διαχείριση της διάρροιας σε νεογνά μοσχάρια.

**Abstract:** The objective of this study was to evaluate under field conditions, whether daily administration of oregano essential oil is effective in preventing and/or diminishing the severity of neonatal diarrhea syndrome in calves aged less than 15 days. Ninety-one newborn calves from three dairy farms were assigned into two groups; “Eco” group (n = 46) calves were drenched with Greek oregano (Origanum vulgare ssp. Hirtum) essential oil (ECODIAR® liquid 5%) at the dose of 12.5 mg/kg body weight once per day until the age of 10 days. “Conts” group (n = 45) calves were left untreated and served as controls. All animals were monitored daily for the incidence of diarrhea until the age of 15 days and their fecal score was recorded. Fecal samples were collected on days 3, 6 and 10 for microbiological and parasitological evaluation. Average fecal score throughout the experiment, incidence of diarrhea, duration and severity of diarrhea episodes were significantly lower in Eco group compared to the controls. Daily administration of oregano essential oil in calves for the first 10 days of their life effectively diminishes the severity of naturally acquired diarrhea under field conditions and, under certain hygiene practices, possess a preventive effect against neonatal diarrhea syndrome.

**Conclusions:** The main conclusion of this study is that daily administration of Greek oregano essential oil in calves for the first 10 days of their life effectively diminishes the severity of naturally acquired diarrhea under field conditions. Furthermore, it seems that under certain hygiene management practices oregano essential oil administration might possess a preventive effect against neonatal calf diarrhea syndrome. Although further research is necessary in order to determine the exact mechanisms of these effects, oregano essential oil appears to be a promising adjunct to antibiotics for the management of diarrhea in neonatal calves.

1. **Τίτλος μελέτης: *Effect of dietary supplementation with oregano essential oil on performance of broilers after experimental infection with Eimeria tenella***

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***Archives of Animal Nutrition***

**Ίδρυμα:** Laboratory of Animal Nutrition, Faculty of Veterinary Medicine, Aristotle University, Thessaloniki, Greece

Laboratory of Parasitology and Parasitic Diseases, Faculty of Veterinary Medicine, Aristotle University, Thessaloniki, Greece

**Μελετητές:** I. Giannenas, P. Florou-Paneri, M. Papazahariadou, E. Christaki, N.A. Botsoglou, and A.B. Spais

**Περίληψη μελέτης:** Οι συγγραφείς μελέτησαν την επίδραση του αιθέριου ελαίου ρίγανης ως συμπλήρωμα στη διατροφή κοτόπουλων (ηλικία: 14 ημέρες), μετά την πειραματική τους μόλυνση με **Eimeria tenella**, η οποία μεταξύ άλλων προκαλεί **συμπτώματα διάρροιας**. Σύγκριναν την επίδραση του αιθέριου ελαίου με αυτή της αντικοκκιδιακής λασαλοσίδης. Η μελέτη έδειξε πως το ριγανέλαιο έχει **αντικοκκιδιακή δράση**, όταν συγκρίθηκε με το δείγμα ελέγχου. Ωστόσο, είχε μικρότερη δράση σε σχέση με τη λασαλοσίδη. Εν κατακλείδι, οι ερευνητές θεωρούν πως μπορεί, στο μέλλον, να υπάρξει διατροφή χωρίς κοκκιδιοστατικά συστατικά και προτείνουν περαιτέρω μελέτες για την επίδραση του ριγανελαίου στην αντιμετώπιση της κοκκιδίωσης.

**Abstract:** A study was carried out to examine the effect of dietary supplementation of oregano essential oil on performance of broiler chickens experimentally infected with Eimeria tenella at 14 days of age. A total of 120 day-old Cobb-500 chicks separated into 4 equal groups with three replicates each, were used in this study. Two groups, one infected with 5104 sporulated oocysts of E. tenella and the other not, were given a basal diet and served as controls. The other two groups also infected with E. tenella were administered diets supplemented with oregano essential oil at a level of 300 mg/kg, or with the anticoccidial lasalocid at 75 mg/kg. Following this infection, survival rate, bloody diarrhoea and oocysts excretion as well as lesion score were determined. Throughout the experimental period of 42 days, body weight gain and feed intake were recorded weekly, and feed conversion ratios were calculated. Two weeks after the infection with E. tenella supplementation with dietary oregano oil resulted in body weight gains and feed conversion ratios not differing from the noninfected group, but higher than those of the infected control group and lower than those of the lasalocid group. These parameters correspond with the extent of bloody diarrhoea, survival rate, lesion score and oocyst numbers and indicated that oregano essential oil exerted an anticoccidial effect against E. tenella, which was, however, lower than that exhibited by lasalocid.

**Conclusions:** The results of the present study suggest that oregano essential oil exerts an anticoccidial effect against E. tenella, but less than that exhibited by lasalocid. Under the trade name Ecodiar, oregano oil is an appetite enhancer for poultry and pigs and approved as feed additive by the European legislation. Until now, there is no restriction or advisable withdrawal time for Ecodiar in food producing animals. However, the bioavailablility of the major phenolic constituents of oregano oil deposited in broiler meat cannot be directly demonstrated, since currently no analytical methods have been developed for the quantification of such residues in meat. The hypothesis of rearing broilers without coccidiostats (Ekstrand et al., 1994) appears to be of promise for further investigations on a large scale. Further studies are needed to investigate the activity of different incorporation levels of oregano oil and its efficacy against different Eimeria species.

1. **Τίτλος μελέτης: *Essential Oil Blend Could Decrease Diarrhea Prevalence by Improving Antioxidative Capability for Weaned Pigs***

*(Published: 21 October 2019)*

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**Ίδρυμα:** State Key Laboratory of Animal Nutrition, College of Animal Science and Technology, China Agricultural University, Beijing 100193, China

**Μελετητές:** Qiyu Tian and Xiangshu Piao

**Περίληψη μελέτης:** Τα αιθέρια έλαια, όπως το αιθέριο έλαιο ρίγανης, φαίνεται πως έχουν **θετικές επιδράσεις όταν χρησιμοποιούνται ως πρόσθετα διατροφής** απογαλακτισμένων χοίρων. Σύμφωνα με την έρευνα των Qiyu Tian και Xiangshu Piao (2019), τα συμπληρώματα αιθέριων ελαίων έχουν **φυσικές αντιμικροβιακές ιδιότητες**. Η χρήση τους **βελτιώνει την απόδοση ανάπτυξης** (growth performance) και **έχει θετική επίδραση στην πρόληψη και διαχείριση της διάρροιας** στους χοίρους. Τα τελευταία οφείλονται στην αύξηση της αντιοξειδωτικής ικανότητας των απογαλακτισμένων χοίρων, μέσω των συστατικών τους, όταν προσλαμβάνονται σαν πρόσθετα σε μια καθημερινή διατροφή.

**Abstract:** Finding an alternative to in-feed antibiotics is important because of increasing contemporary concern regarding drug residues and the development of drug-resistant bacteria. The purpose of this study was to test the hypothesis that essential oils added to the feed would decrease diarrhea prevalence in post-weaned pigs. Ninety weaned piglets (initial body weight (BW): 8.1 ± 1.4 kg) were randomly assigned to one of three dietary diets: (1) a control diet (CON, the basal diet without antibiotics), (2) an antibiotic diet (AB, CON supplemented with colistin sulfate, 20 mg/kg and bacitracin zinc, 40 mg/kg), or (3) an essential oil diet (EO, CON supplemented with an essential oil blend 100 mg/kg) in a completely randomized block design for a 28-day period. The results revealed that AB and EO improved the average daily gain of the piglets from day (d) 15 to 28 (p < 0.05). The diarrhea prevalence in piglets fed AB and EO was lower than that of piglets fed CON (p < 0.05). There was no significant difference in the growth performance or diarrhea prevalence between the AB and EO treatments. Nutrient digestibility was measured at d 28. Compared with CON, EO increased the apparent total tract digestibility of gross energy and crude protein (p < 0.05). Villus height in the duodenum and the ratio of villus height to crypt depth in the jejunum for piglets fed AB and EO was greater than those for piglets fed CON (p < 0.05). The essential oil blend improved the superoxide dismutase (SOD) and catalase (CAT) activities and total antioxidant capacity (T-AOC), but decreased the 8-hydroxy deoxyguanosine content in serum on d 14 (p < 0.05). Decreased malondialdehyde (MDA) and protein carbonyl content were observed on d 28 in comparison with CON (p < 0.05). The mucosa in the jejunum of pigs fed EO had greater T-AOC, SOD levels, and glutathione peroxidase (GSH-Px) activities than that of pigs fed CON (p < 0.05). Pigs fed EO and AB had greater GSH-Px activity in the liver tissue than pigs fed CON (p < 0.05). Not only did jejunal and ileal mucosa have EO upregulated SOD1 mRNA expression (p < 0.05), this was also the case in liver tissue. GPx1 expression in the ileal mucosa and GPx4 expression in the liver tissue were higher for pigs fed EO when compared to those fed CON (p < 0.05). Collectively, a dietary essential oil blend supplementation, which has natural antimicrobial properties, could enhance growth performance and decrease diarrhea prevalence in weaned pigs through increases in antioxidative capacity.

**Conclusions:** Overall, dietary essential oil supplementation could decrease diarrhea prevalence and enhance growth performance in weaned pigs through improved antioxidative capacity. Given the similarly positive effects of antibiotics and essential oils on the performance of weaned pigs, the essential oil blend is regarded as a growth promoter in the weaning diet.

1. **Τίτλος μελέτης: *Dietary oregano essential oil alleviates experimentally induced coccidiosis in broilers***

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**Preventive Veterinary Medicine**

**Ίδρυμα:** Department of Animal Science, Faculty of Agriculture Science, University of Guilan, 41635-1314 Rasht, Iran

**Μελετητές:** M. Mohiti-Asli, M. Ghanaatparast-Rashti

**Περίληψη μελέτης:** Οι ερευνητές, στην παρούσα εργασία μελέτησαν την επίδραση του αιθέριου ελαίου ρίγανης σε κοτόπουλα που έχουν προσβληθεί πειραματικά με παράσιτα (Eimeria) που προκαλούν κοκκιδίωση. **Η κοκκιδίωση αποτελεί μία από τις πιο συνηθισμένες και σοβαρές ασθένειες που μπορεί να προσβάλουν τα πουλερικά**. Τα πιο συνηθισμένα συμπτώματα της κοκκιδίωσης είναι η **διάρροια**, η απώλεια βάρους και η αφυδάτωση κ.α. Η μελέτη έδειξε ότι το ριγανέλαιο μπορεί να λειτουργήσει ως ανασταλτικός παράγοντας της κοκκιδίωσης. Οι συγγραφείς καταλήγουν στο **ότι η χρήση 500 ppm ριγανελαίου ως συμπλήρωμα διατροφής των κοτόπουλων μπορεί να θεωρηθεί αξιόπιστη εναλλακτική έναντι των κοκκιδιοστατικών φαρμάκων.** Έτσι, μπορούμε να πούμε ότι το ριγανέλαιο λειτουργεί θετικά ως θεραπευτικός παράγοντας σε κοτόπουλα που παρουσιάζουν συμπτώματα διάρροιας, τα οποία οφείλονται στα παράσιτα του γένους Eimeria.

**Abstract:** An experiment was conducted to determine the effects of oregano essential oil on growth performance and coccidiosis prevention in mild challenged broilers. A total of 250 1-d-old chicks were used in a completely randomized design with 5 treatments and 5 replicates with 10 birds in each replication. Experimental treatments included: (1) negative control (NC; unchallenged), (2) positive control (PC; challenged with sporulated oocysts of Eimeria), (3) PC fed 200 ppm Diclazuril in diet, (4) PC fed 300 ppm oregano oil in diet, and (5) PC fed 500 ppm oregano oil in diet. At 22 d of age, all the experimental groups except for NC were challenged with 50-fold dose of Livacox T as a trivalent live attenuated coccidiosis vaccine. On d 28, two birds were slaughtered and intestinal coccidiosis lesions were scored 0–4. Moreover, dropping was scored in the scale of 0–3, and oocysts per gram feces (OPG) were measured. Oregano oil at either supplementation rate increased body weight gain (P = 0.039) and improved feed conversion ratio (P = 0.010) from d 22 to 28, when compared with PC group. Using 500 ppm oregano oil in challenged broilers diet increased European efficiency factor than PC group (P = 0.020). Moreover, challenged broilers fed 500 ppm oregano oil or Diclazuril in diets displayed lower coccidiosis lesions scores in upper (P = 0.003) and middle (P = 0.018) regions of intestine than PC group, with the effect being similar to unchallenged birds. In general, challenged birds fed 500 ppm oregano oil or Diclazuril in diets had lower OPG (P = 0.001), dropping scores (P = 0.001), litter scores (P = 0.001), and pH of litter (P = 0.001) than PC group. It could be concluded that supplementation of oregano oil at the dose of 500 ppm in diet may have beneficial effect on prevention of coccidiosis in broilers.

**Conclusions:** Challenge of broilers on d 22 with Eimeria (acervulina, maxima, and tenella)impaired growth performance, mainly from 22 to 28 d of age. Inclusion of 500 ppm oregano oil in diet of challenged broilers alleviated the detrimental effects of coccidiosis same as Diclazuril. Therefore, according to the results of this study, and harm effects known for using anticoccidiosis drugs, supplementation of broilers diet with 500 ppm oregano oil could be a trustworthy alternative for coccidiostat medications.

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