Partial Animal Disease

Bibliography

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Introduction

The EU Animal Diseases Information System (ADIS) is designed to register and document the evolution of important infectious animal diseases, as identified by the categorization process performed in the framework of the Animal Health Law (AHL). Search for available translations of the preceding linkEN•••. ADIS provides for uniform conditions for implementing Union notification and reporting, as provided by Regulation (EU) 2020/2002.

ADIS is a disease management tool that ensures immediate notification of alert messages as well as detailed information about outbreaks of the most relevant animal diseases in the countries that are connected to the application. This permits immediate access to information about contagious animal disease outbreaks and ensures implementation of early warning, which enables for a prompt response for controlling the epidemiological situation. This has a direct impact on trade of live animals and their products both for the internal market as well as for international trade with third countries.

While ADIS is a system not directly related with food safety, it has an impact on public health in relation to all zoonotic diseases within its scope.

ADIS has been developed in close collaboration with the World Organisation for Animal Health (OIE) in order to facilitate data exchange between ADIS and OIE World Animal Health Information System (OIE-WAHIS). This feature is partially implemented, and a further release of ADIS will allow for two-way exchange of information with submission of outbreaks to OIE-WAHIS (European Commission, 2022).

The National Scientific & Technical Information Center (NSTIC) produces this bibliography for the Desert Agriculture and Ecosystems Program (DAEP).

This bibliography highlights some of the latest journal articles for the period 2020–2021 using ScienceDirect, Scopus, and Elsevier.

Title: Effects of a Partially Perforated Flooring System on Ammonia Emissions in Broiler Housing—Conflict of Objectives between Animal Welfare and Environment.

Authors: Adler, C., Schmithausen, A. J., Trimborn, M., Heitmann, S., Spindler, B., Tiemann, I., Kemper, N., & Büscher, W.

Journal: *Animals.* **Date:** 2021.

DOI: https://doi.org/10.3390/ani11030707

A partially (50%) perforated flooring system showed positive effects on health- and behavior-based welfare indicators without affecting production performance. Ammonia (NH3) is the most common air pollutant in poultry production, with effects on animal welfare and the environment. The objectives of animal welfare and environmental protection are often incompatible. Therefore, this study addresses the question of how a partially perforated flooring system affects NH3 emissions. According to German regulations, three fattening periods were carried out with 500 Ross 308 broilers per barn (final stocking density: 39 kg m−2). The experimental barn was equipped with an elevated perforated area in the supply section, accessible by perforated ramps. The remaining area in the experimental barn and the control barn were equipped with wood shavings (600 g m−2). Besides the different floor types, management was identical. Air temperature (Temp), relative air humidity (RH), NH3 concentration, and ventilation rate (VR) were measured continuously. Furthermore, dry matter (DM) content, pH, and litter quality were assessed. Towards the end of the fattening periods, the NH3 emission rate (ER) of the partially perforated flooring system was higher compared with that of the littered control barn (all $p < 0.001$). This effect is mainly caused by the higher NH3 concentrations, which are promoted by the lack of compaction underneath the elevated perforated area and the increase in pH value under aerobic conditions. Nevertheless, the partially perforated flooring system offers different approaches for NH3 reduction that were previously not feasible, potentially contributing equally to animal welfare and environmental protection.

Title: Effects of Different Broiler Flooring Systems on Surface Temperature, Air Quality and Carcass Characters of Broilers.

Author: Adler, C., Schmithausen, A. J., Trimborn, M., Heitmann, S., Spindler, B., Tiemann, I., Kemper, N., & Büscher, W.

Journal: *Earth and Environmental Science.* **Date:** 2021.

DOI: https://doi.org/10.1088/1755-1315/735/1/012011

The present study investigated the use of perforated plastic floors with different heights in the broiler performance, surface temperature, air quality, and carcass characters of broilers. Three hundred sixty-seven day-old unsexed chicks randomly divided into 4 groups: control reared on sawdust litter in others used, plastic floors with different heights (5, 10 and 15) cm, for 2nd, 3rd and 4th treatment respectively. The first treatment (sawdust) showed significantly ($P < 0.05$) increase in body surface temperature, as compared to the plastic floors system treatments, and the three plastic floor treatments affected air quality, with less concentrations of ammonia and carbon

dioxide compared to the sawdust. The results showed significant differences ($P < 0.05$) in the live relative weight, where the treatments T2, T3 and T4 were increase at the age of 35 days compared to the sawdust treatment. We suggested the perforated plastic floors could be a good alternative to promote a better quality environment and superior production rates with improved surface temperature.

Title: Maximum Levels of CrossContamination for 24 Antimicrobial Active Substances in Non-Target Feed. Part 2: Aminoglycosides/Aminocyclitols: Apramycin, Paromomycin, Neomycin and Spectinomycin.

Authors: Allende, A., Koutsoumanis, K., Avelino Alvarez-Ordóñez, Bolton, D., Sara Bover-Cid, Chemaly, M., Davies, R., De Cesare, A., Herman, L., Hilbert, F., Lindqvist, R., Nauta, M., Ru, G., Simmons, M., Skandamis, P., Suffredini, E., Andersson, D. I., Bampidis, V., Johan Bengtsson-Palme, . . . Peixe, L.

Journal: *EFSA Journal.* **Date:** 2021.

DOI: https://doi.org/10.2903/j.efsa.2021.6853

The specific concentrations of apramycin, paromomycin, neomycin and spectinomycin in non-target feed for food-producing animals, below which there would not be an effect on the emergence of, and/or selection for, resistance in bacteria relevant for human and animal health, as well as the specific antimicrobial concentrations in feed which have an effect in terms of growth promotion/increased yield, were assessed by EFSA in collaboration with EMA. Details of the methodology used for this assessment, associated data gaps and uncertainties, are presented in a separate document. To address antimicrobial resistance, the Feed Antimicrobial Resistance Selection Concentration (FARSC) model developed specifically for the assessment was applied. However, due to the lack of data on the parameters required to calculate the FARSC for these antimicrobials, it was not possible to conclude the assessment until further experimental data become available. To address growth promotion, data from scientific publications obtained from an extensive literature review were used. Levels in feed that showed to have an effect on growth promotion/increased yield were reported for apramycin and neomycin, whilst for paromomycin and spectinomycin, no suitable data for the assessment were available. It was recommended to carry out studies to generate the data that are required to fill the gaps which prevented the calculation of the FARSC for these four antimicrobials.

Title: Microbial Contamination of the Air in Livestock Buildings as a Threat to Human and Animal Health – A Review.

Authors: Chmielowiec-Korzeniowska, A., Trawińska, B., Tymczyna, L., Hanna Bis-Wencel, & Matuszewski, Ł.

Journal: *Annals of Animal Science.* **Date:** 2021.

DOI: https://doi.org/10.2478/aoas-2020-0080

Livestock buildings are often contaminated with bacterial and fungal microflora. Animals living in the buildings, especially their excreta and secretions and their feed, can be a source of

microorganisms, including pathogens. Significant microbial contamination occurs in pig houses, poultry houses and cowsheds. The microbes most frequently isolated from the air of these buildings are bacteria of the genera Streptococcus, Staphylococcus, Bacillus, and Clostridium and of the family Enterobacteriaceae. Among fungi, the most common are Aspergillus, Trichoderma, Penicillium, Cladosporium and Alternaria. Microbes present in livestock buildings often pose a hazard to workers, in whom they can cause infectious and allergic diseases, especially respiratory disease. Bacterial endotoxins may also pose a threat to humans and animals. For this reason it is important to carry out microbiological monitoring and preventive measures on livestock farms and to maintain appropriate environmental conditions. This will reduce microbiological contamination of livestock buildings and improve both workers' health and animal welfare.

Title: Effect of Nanosilica and Bentonite as Mycotoxins Adsorbent Agent in Broiler Chickens' Diet on Growth Performance and Hepatic Histopathology.

Authors: Ghazalah, A. A., Abd-Elsamee, M., Kout Elkloub, M. E. M., Mohamed, A. K., & Rehan, A. A. A.

Journal: *Animals.* **Date:** 2021**.**

DOI: https://doi.org/10.3390/ani11072129

Simple Summary: Mycotoxins cause significant economic losses in feed ingredients, nutritional value, feed palatability, and the poultry industry. Thus, there is a need for ways to eradicate or inactivate mycotoxins in chicken feed. The present feeding trial aims to evaluate the use of nanosilica and bentonite to prevent the harmful effects of a mycotoxin-contaminated diet on broiler performance, histopathological, and carcass traits. The obtained results revealed significant improvements in broiler growth performance resulting from the addition of nanosilica at 0.20% and bentonite at 0.50%. Additionally, the hepatoprotective efficacy of nanosilica was evident at different dose levels. Consequentially, it could be used in broiler's contaminated diets without negatively affecting birds' health.AbstractMycotoxins are toxic secondary metabolites produced by different strains of fungi, such as aspergillus, fusarium, and penicillium that can contaminate feed ingredients or the entire feed of poultry and animals. Mycotoxins can cause many serious complications to both humans and animals due to carcinogenic, mutagenic, and immunosuppressive disorders. Therefore, the present experiment aims to investigate the effect of broiler chickens' diets supplemented with different levels of nanosilica (NS) as an adsorbent agent of mycotoxins on their growth performance and hepatic histopathology. Detectable levels of toxins were present in the feed before feeding, and all levels of mycotoxins were above the normal limit. A total of 180 one-day-old male Arbor Acres broiler chickens were allocated randomly to six treatment groups with three replicates per group, including ten chickens per replicate. The experiment lasted for five weeks, and dietary treatments included control diet and diets with four levels of nanosilica as 0.05%, 0.10%, 0.15%, and 0.20% as well as 0.50% bentonite (fixfin® Dry) diet. Bodyweight, body weight gain, average daily feed intake, and feed conversion ratio were measured weekly. At the end of the fifth week, six chickens per treatment were sacrificed to investigate the effects of NS and bentonite on carcass characteristics and hepatic histopathology.

The results showed that providing broiler chickens' diets with an adsorbent agent, such as NS or bentonite, can reduce the side effects of mycotoxins and enhance their growth performance. The best record was achieved with NS at 0.20%, compared with the control group and other dietary treatment groups. Accordingly, 0.20% of NS could be used in broiler chickens' diets to minimize the harmful effects of mycotoxins.

Title: Dynamics and Diversity of Microbial Contamination in Poultry Bedding Materials Containing Parts of Medicinal Plants.

Author: Gontar, Ł., Sitarek-Andrzejczyk, M., Kochański, M., Buła, M., Drutowska, A., Zych, D., & Markiewicz, J.

Journal: *Materials.* **Date:** 2022.

DOI: https://doi.org/10.3390/ma15041290

Microorganisms thriving in poultry bedding materials during their exploitation are involved in the development of several diseases and disfunctions of animals. They can also contaminate food products and pose risks to the environment and human health. This study provides an analysis of dynamics and diversity in microbiological contamination observed during the exploitation of poultry bedding materials containing parts of medicinal plants: Satureja hortensis, Origanum vulgare, Melissa officinalis, Salvia officinalis, and Thymus vulgaris, compared with standard types of beddings: straw chaff and straw pellets. The research was carried out in two 42-day experimental cycles involving in total 2400 broiler chickens. Each week, the total count of mesophilic bacteria, fungi and yeasts, the presumptive presence and count of Staphylococcus sp., Escherichia sp., Listeria sp., Salmonella sp., and Candida sp. were determined by culturing on selective media, along with pH and moisture measurements. After 35 days of the experiment, a reduction of the total count of mesophilic bacteria above 1 log compared to the control (11.86 vs. 13.02 log CFU/g) was observed. As the count of yeasts decreased after 21 days, an increase in the total count of bacteria was reported, which indicates a strong competition between microorganisms. The results improve our understanding of the temporal effects of using materials containing parts of medicinal plants on the microbial contamination in poultry litter.

Title: Can Biochar Improve the Sustainability of Animal Production?

Authors: Graves, C., Kolar, P., Shah, S., Grimes, J., & Sharara, M.

Journal: *Applied Sciences.* **Date:** 2022.

DOI: https://doi.org/10.3390/app12105042

Animal production is a significant contributor of organic and inorganic contaminants in air, soil, and water systems. These pollutants are present beginning in animal houses and impacts continue through manure storage, treatment, and land application. As the industry is expected to expand, there is still a lack of affordable, sustainable solutions to many environmental concerns in animal production. Biochar is a low-cost, sustainable biomaterial with many environmental remediation

applications. Its physicochemical properties have been proven to provide environmental benefits via the adsorption of organic and inorganic contaminants, promote plant growth, improve soil quality, and provide a form of carbon sequestration. For these reasons, biochar has been researched regarding biochar production, and application methods to biological systems have a significant influence on the moisture content, pH, microbial communities, and carbon and nitrogen retention. There remain unanswered questions about how we can manipulate biochar via physical and chemical activation methods to enhance the performance for specific applications. This review article addresses the positive and negative impacts of biochar addition at various stages in animal production from feed intake to manure land application.

Title: Bio-Based Waste' Substrates for Degraded Soil Improvement—Advantages and Challenges in European Context.

Authors: Kacprzak, M., Kupich, I., Jasinska, A., & Fijalkowski, K.

Journal: *Energies.* **Date:** 2022.

DOI: https://doi.org/10.3390/en15010385

The area of degraded sites in the world is constantly expanding and has been a serious environmental problem for years. Such terrains are not only polluted, but also due to erosion, devoid of plant cover and organic matter. The degradation trends can be reversed by supporting remediation/reclamation processes. One of the possibilities is the introduction of biodegradable waste/biowaste substrates into the soil. The additives can be the waste itself or preformed substrates, such composts, mineral-organic fertilizers or biochar. In EU countries average value of compost used for land restoration and landfill cover was equal 4.9%. The transformation of waste in valuable products require the fulfillment of a number of conditions (waste quality, process conditions, law, local circumstances). Application on degraded land surface bio-based waste substrates has several advantages: increase soil organic matter (SOM) and nutrient content, biodiversity and activity of microbial soil communities and change of several others physical and chemical factors including degradation/immobilization of contaminants. The additives improve the water ratio and availability to plants and restore aboveground ecosystem. Due to organic additives degraded terrains are able to sequestrate carbon and climate mitigate. However, we identified some challenges. The application of waste to soil must comply with the legal requirements and meet the end of use criteria. Moreover, shorter or long-term use of bio-waste based substrate lead to even greater soil chemical or microbial contamination. Among pollutants, "emerging contaminants" appear more frequently, such microplastics, nanoparticles or active compounds of pharmaceuticals. That is why a holistic approach is necessary for use the bio-waste based substrate for rehabilitation of soil degraded ecosystems.

Title: Maximum Levels of CrossContamination for 24 Antimicrobial Active Substances in Non-Target Feed. Part 6: Macrolides: Tilmicosin, Tylosin and Tylvalosin.

Authors: Koutsoumanis, K., Allende, A., Avelino Alvarez-Ordóñez, Bolton, D., Sara Bover-Cid, Chemaly, M., Davies, R., De Cesare, A., Herman, L., Hilbert, F., Lindqvist, R., Nauta, M., Ru, G., Simmons, M., Skandamis, P., Suffredini, E., Andersson, D. I., Bampidis, V., Johan Bengtsson-Palme, . . . Peixe, L.

Journal: *EFSA Journal.* **Date:** 2021.

DOI: https://doi.org/10.2903/j.efsa.2021.6858

The specific concentrations of tilmicosin, tylosin and tylvalosin in non-target feed for food-producing animals, below which there would not be an effect on the emergence of, and/or selection for, resistance in bacteria relevant for human and animal health, as well as the specific antimicrobial concentrations in feed which have an effect in terms of growth promotion/increased yield, were assessed by EFSA in collaboration with EMA. Details of the methodology used for this assessment, associated data gaps and uncertainties, are presented in a separate document. To address antimicrobial resistance, the Feed Antimicrobial Resistance Selection Concentration (FARSC) model developed specifically for the assessment was applied. However, due to the lack of data on the parameters required to calculate the FARSC, it was not possible to conclude the assessment until further experimental data become available. To address growth promotion, data from scientific publications obtained from an extensive literature review were used. Levels in feed that showed to have an effect on growth promotion/increased yield were reported for tilmicosin and tylosin, whilst for tylvalosin no suitable data for the assessment were available. It was recommended to carry out studies to generate the data that are required to fill the gaps which prevented the calculation of the FARSC for these three antimicrobials.

Title: Evaluating the Effects of Pine and Miscanthus Biochar on Water Activity and Escherichia coli Populations in Commercial Broiler Litter.

Authors: Marty, C. A.

Journal: *BMC Infectious Diseases.* **Date:** 2021.

DOI: https://www.proquest.com/dissertations-theses/evaluating-effects-pine-miscanthus-biochar-on/docview/2616380181/se-2

The decrease in subtherapeutic antibiotic administration in poultry has increased the need to address production challenges caused by pathogens, such as E. coli. One potential way to improve bird health and reduce bacterial infection is through the addition of litter amendments that absorb moisture. Biochar (BC) has previously been shown to increase water holding capacity in poultry litter, but its effects on E. coli mitigation are unknown. The objectives of this research were to 1)

evaluate water activity of poultry litter amended with pine and miscanthus BC, and 2) determine the effects of different BC inclusion rates on litter E. coli populations. The studies found that BC increased water activity when mixed with broiler litter, and pine BC resulted in lower E. coli counts over time than miscanthus BC. An inclusion rate of 30% by weight of pine BC was most effective at reducing E. coli populations in broiler litter.

Title: Evaluation of Sodium Bisulfate on Reducing Salmonella Heidelberg Biofilm and Colonization in Broiler Crops and Ceca.

Authors: Megan, R. P., James, A. B., Genovese, K. J., Yuhua, Z. F., Zhao, D., Wang, X., Milby, A. C., & Morgan, B. F.

Journal: *Microorganisms.* **Date:** 2021.

DOI: https://doi.org/10.3390/microorganisms9102047

Salmonella Heidelberg (SH) on contaminated poultry causes economic and health risks to producers and consumers. We hypothesized that sodium bisulfate (SBS) would decrease SH biofilm on polyvinyl chloride (PVC) coupons and decrease the horizontal transfer of SH in broilers. Experiment 1: Salmonella Heidelberg biofilm was cultured with PVC coupons, which were treated with SBS at a pH of 3.5 for 10 min, 8 h, and 24 h. Experiment 2: Nine replicate pens per treatment were divided between two rooms. A seeder contact model was used to mimic a natural infection environment. Treatments consisted of tap water or sodium bisulfate in water at a pH of 3.5. Salmonella Heidelberg incidence and enumeration were measured in crops and ceca. Sodium bisulfate significantly reduced biofilm by 2.16 and 1.04 logs when treated for 8 and 24 h, respectively. Crop colonization was significantly decreased in trials 1 and 2 by 0.29 and 0.23 logs, respectively. Crop pH was significantly decreased in trial 2. Ceca colonization was significantly decreased in trial 1 by 0.39 logs. The results from the present study suggest that SBS may be administered to drinking water to decrease SH gut colonization and to reduce biofilm.

Title: Reduction of the Adverse Impacts of Fungal Mycotoxin on Proximate Composition of Feed and Growth Performance in Broilers by Combined Adsorbents.

Authors: Mgbeahuruike, A. C., Toochukwu, E. E., Ashang, M. U., Ojiako, C., Obasi, C. C., Ezema, C., Okoroafor, O., Mwanza, M., Karlsson, M., & Chah, K. F.

Journal: *Journal of Pure and Applied Microbiology.* **Date:** 2021.

DOI: https://doi.org/10.3390/toxins13060430

Synergistic interaction of adsorbents in reducing the adverse impacts of mycotoxin on performance and proximate composition of broiler feeds was investigated. Fungal growth was induced by sprinkling water on the feed. S. cerevisiae + bentonite, kaolin + bentonite or S. cerevisiea + kaolin adsorbent combinations (1.5 g/kg feed) were added and the feeds were stored in black polythene bags. An untreated group was kept as a positive control while fresh uncontaminated feed was used as a negative control. Mycotoxins were extracted from the feeds and quantified using reverse phase HPLC. Proximate composition, nutrient digestibility of the feeds, feed intake and weight gain of the broilers were measured. Deoxynivalenol (DON) concentration in the contaminated/untreated

feed was 347 µg/kg while aflatoxin B1 (AFB1) was 34 µg/kg. Addition of bentonite and kaolin in the contaminated feed reduced AFB1 and DON to significantly lower levels. Feed intake and weight gain were low in the broilers fed the contaminated feed. The carbohydrate level was significantly ($p < 0.05$) reduced from 62.31 to 40.10%, crude protein digestibility dropped from 80.67 to 49.03% in the fresh feed and contaminated feed respectively. Addition of the adsorbents (S. cerevisiae and bentonite) significantly ($p < 0.05$) improved these parameters.

Title: Insights into the Gut Microbial Communities of Broiler Chicken Fed Black Soldier Fly Larvae-Desmodium-Based Meal as a Dietary Protein Source.

Authors: Ndotono, E. W., Khamis, F. M., Bargul, J. L., & Tanga, C. M.

Journal: *Microorganisms.* **Date:** 2022.

DOI: https://doi.org/10.3390/microorganisms10071351

The utilization of insect-based diets to improve gastrointestinal function and gut health in poultry is gaining global attention as a promising feed additive. The objective of this study was to determine the optimal inclusion level of the full-fat black soldier fly larvae (BSFL) and Desmodium intortum (DI) in broiler chicken diets and to evaluate their impact on the microbial community in the gut. The bacterial communities were characterized using Oxford nanopore sequencing of the full-length bacterial 16S rRNA gene. Four dietary treatments, T1 (25% DI + 75% BSFL), T2 (50% DI + 50% BSFL), T3 (75% DI + 25% BSFL) and T4 (100% fishmeal + 0% DI + BSFL), were fed to the broiler chickens for a period of 42 days. Out of the 395,034 classified reads analyzed, the most predominant phyla identified across all the four dietary treatments were Firmicutes (94%), Bacteroidetes (3%), and Proteobacteria (2%). The T1 diet showed the highest alpha diversity and richness according to the Chao1 and Shannon indices. Beta diversity assessment revealed a significant influence of diet on the abundance of the microbiome. There was an increase in beneficial lactic acid bacteria with increasing inclusion of BSFL in the diets. Our findings strongly support the inclusion of BSFL into poultry diet as a promising protein source to reshape the gut microbiota for improved gut health, immune response, and food safety.

Title: Alfalfa Forage Production and Nutritive Value, Fermentation Characteristics and Hygienic Quality of Ensilage, and Soil Properties after Broiler Litter Amendment.

Authors: Netthisinghe, A., Woosley, P., Rowland, N., Willian, T., Gilfillen, B., & Sistani, K.

Journal: *Agronomy.* **Date:** 2021.

DOI: https://doi.org/10.3390/agronomy11040701

Recycling broiler litter (BL) nutrients is an important strategy for sustainable forage production. However, BL can contain Clostridia bacteria that can contaminate forages at harvest, resulting in poor ensilage quality and botulism-related animal health risks. A better understanding of the effects of BL amendment on alfalfa (Medicago sativa L.) production and ensiling is beneficial for promoting manure-based alfalfa production. This 2-year study examined the effects of high-level

BL (HBL) at 112 kg N ha−1 and low-level (LBL) at 56 kg N ha−1 on alfalfa forage production, fermentation characteristics, and Clostridium botulinum concentrations in silage and haylage produced from 350 g dry matter (DM) kg−1 forage and 500 g DM kg−1 forage respectively, and soil characteristics compared to a control treatment (CT). Results showed that the application of BL did not affect forage production (12.8–13.1 MG ha−1) and nutritive value. The alfalfa produced high forage yield with superior ensilabilty in the second year. The BL application increased soil NH4-N, Ca, Fe, and B, but did not affect fermentation characteristics or Clostridium botulinum concentrations in ensilage. Silage had superior fermentation quality, and Clostridium botulinum concentration was found to be higher than in haylage. Broiler litter fertilization for alfalfa is environmentally safe and has forge production, ensilage fermentation quality, and botulism risks similar to CT.

Title: Preventive Antimicrobial Action and Tissue Architecture Ameliorations of Bacillus Subtilis in Challenged Broilers.

Authors: Soliman, E. S., Hamad, R. T., & Abdallah, M. S.

Journal: *Tropical Diseases Travel Medicine and Vaccines.* **Date:** 2021.

DOI: http://www.doi.org/10.14202/vetworld.2021.523-536

Background and Aim: Probiotics improve intestinal balance through bacterial antagonism and competitive exclusion. This study aimed to investigate the in vitro antimicrobial activity, as well as the in vivo preventive, immunological, productive, and histopathological modifications produced by probiotic Bacillus subtilis. Materials and Methods: The in vitro antimicrobial activities of B. subtilis (5×106 CFU/g; 0.5, 1.0*, 1.5, and 2.0 g/L) were tested against Escherichia coli O157: H7, Salmonella Typhimurium, Candida albicans, and Trichophyton mentagrophytes after exposure times of 0.25, 0.5, 1, and 2 h using minimal inhibitory concentration procedures. A total of 320 1-day-old female Ross broiler chickens were divided into five groups. Four out of the five groups were supplemented with 0.5, 1.0*, 1.5, and 2.0 g/L probiotic B. subtilis from the age of 1 day old. Supplemented 14-day-old broiler chickens were challenged with only E. coli O157: H7 (4.5×1012 CFU/mL) and S. Typhimurium (1.2×107 CFU/mL). A total of 2461 samples (256 microbial-probiotic mixtures, 315 sera, 315 duodenal swabs, and 1575 organs) were collected. Results: The in vitro results revealed highly significant ($p<0.001$) killing rates at all-time points in 2.0 g/L B. subtilis: 99.9%, 90.0%, 95.6%, and 98.8% against E. coli, S. Typhimurium, C. albicans, and T. mentagrophytes, respectively. Broilers supplemented with 1.5 and 2.0 g/L B. subtilis revealed highly significant increases ($p<0.01$) in body weights, weight gains, carcass weights, edible organs' weights, immune organs' weights, biochemical profile, and immunoglobulin concentrations, as well as highly significant declines ($p<0.01$) in total bacterial, Enterobacteriaceae, and Salmonella counts. Histopathological photomicrographs revealed pronounced improvements and near-normal pictures of the livers and hearts of broilers with lymphoid hyperplasia in the bursa of Fabricius, thymus, and spleen after supplementation with 2.0 g/L B. subtilis. Conclusion: The studies revealed that 1.5-2.0 g of probiotic B. subtilis at a concentration of 5×106 CFU/g/L water was able to improve performance, enhance immunity, and tissue architecture, and produce direct antimicrobial actions.

Title: Prophylactic Impact of Nano-Selenium on Performance, Carcasses Quality, and Tissues' Selenium Concentration Using Reversed-Phase High-Performance Liquid Chromatography during Microbial Challenge in Broiler Chickens.

Authors: Soliman, E. S., Mahmoud, F. F., Fadel, M. A., & Hamad, R. T.

Journal: *Veterinary World.* **Date:** 2020.

DOI: http://www.doi.org/10.14202/vetworld.2020.1780-1797

Background and Aim: Nano-selenium (NS) supplementation contributes in improving productivity, performance, and meat quality while reducing public health concern. Influence of NS and inorganic selenium (Se) water additive on performance, carcass quality, immunoglobulin concentration, intestinal microbiota, Se tissue concentrations, and tissue architecture was studied. Materials and Methods: Two-hundred and sixty 1-day-old Hubbard chicks were randomly grouped into five groups (5×52) and supplemented with 0.5 and 1.0 mL of NS and inorganic Se (100 mg.L-1). G1, G2, G3, and G4 were challenged with Escherichia coli O157: H7 2.6×108 on the 14th day. A total of 2250 samples, including 250 sera, 250 intestinal swabs, and 1500 organ and tissue samples as liver, spleen, heart, bursa, intestine, and breast muscles, and 250 eviscerated carcasses were collected. Results: The results revealed a highly significant increase ($p<0.01$) in live body weights, weight gains, performance indices, carcasses, and organs weights, whereas immunoglobulin G and M concentrations in broilers treated with 0.5 and 1.0 mL NS, respectively, synchronized reveal a highly significant decline ($p<0.01$) in total bacterial and Enterobacteriaceae counts of intestinal swabs and breast muscles, final pH24, and drip loss in broilers treated with 0.5 and 1.0 mL NS, respectively. Meanwhile, water holding capacity revealed no significant differences between all groups. Reversed-phase high-performance liquid chromatography examination revealed the earlier disappearance of NS residues than inorganic Se from the broiler's liver and muscles. Histopathological photomicrographs of the liver, spleen, bursa of Fabricius, and intestine, as well as, the immunohistochemistry of intestinal sections revealed superior tissue architecture in broilers treated with NS contrary to inorganic Se. Conclusion: The study showed significant stimulation actions of NS on performance, immunity, carcass and meat quality, intestinal and muscles' bacterial load as well as short withdrawal period and nearly normal cellular architecture compared to inorganic Se.

Title: Effect of a Mineral–Microbial Deodorizing Preparation on the Functions of Internal Organs and the Immune System in Commercial Poultry.

Author: Tykałowski, B., Śmiałek, M., Stenzel, T., Dziewulska, D., & Koncicki, A.

Journal: *Animals.* **Date:** 2021.

DOI: https://doi.org/10.3390/ani11092592

Simple Summary: Poultry production generates the largest volumes of atmospheric ammonia and greenhouse gases such as methane, nitrogen oxide, and hydrogen sulfide. These gases have a negative impact on the health of living humans and animals. In our study, we evaluated the influence of one deodorizing biopreparation on the functions of organs and the immune system in poultry.

The obtained results show no effect on a preparation on the physiological status of chickens and turkeys, although the improvement of housing conditions and reducing gas emissions which was confirmed by other authors.AbstractAnimal production is identified as one of the main sources of high concentrations of odours, which are related to air pollution, health problems of living organisms and indirect negative impact on production results. One common method for reducing emissions of ammonia is using preparations containing probiotics and hygroscopic or disinfecting compounds. This study was undertaken in order to determine the impact of innovative mineral–microbial deodorizing preparation, which reduces odorous gases, applying to the litter once a week in poultry houses on the physiological status of breeder chickens, broiler chickens and turkeys. Samples were collected after slaughter and analyzed using ELISA tests, flow cytometry and biochemical methods. Biochemical markers of the liver and kidney profile (ALT, AST, LDH, ALP, CK, TP, CALC, PHOS) and the titers of specific antibodies against AEV, aMPV, AAvV-1, IBDV, HEV, BA were analyzed in serum samples. The percentage contribution of T and B lymphocyte subpopulations was determined in the samples of tracheal mucosa, blood, and spleen. No significant differences were found between the control and experimental group with regard to all the analyzed parameters, with some exceptions for biochemistry. The results of our study indicated that mineral–microbial deodorizing preparation did not affect the physiological status of birds.

Title: The Feasibility of Fermented Litter as a Feed Ingredient for Ruminant Livestock.

Authors: Utama, C. S., & Christiyanto, M.

Journal: *Journal of Advanced Veterinary and Animal Research.* **Date:** 2021.

DOI: https://doi.org/10.5455/javar.2021.h517

Objective: The feasibility of fermented litter as an alternative feed material for ruminant livestock is measured by organoleptic quality, fiber profile, heavy metal contamination, and the presence of worm eggs. This study aimed to examine the influence of broiler chicken litter fermentation with different fermentation lengths on organoleptic quality, and contents of cuprum (Cu), lead (Pb), worm eggs, fiber fractions including hemicellulose, cellulose, neutral detergent fiber (NDF), acid detergent fiber (ADF), lignin, and fermented litter fiber profile through analysis of scanning electron microscope-energy dispersive X-ray (SEM-EDX). Materials and Methods: This study used a complete randomized design of a unidirectional pattern with four treatments and four repeats with long fermentation treatments of 0, 3, 6, and 9 weeks. Result: The results showed a real influence ($p < 0.05$) of fermentation length on organoleptic quality, NDF, ADF, lignin, hemicellulose, and fiber profile with SEM-EDX observations, with no presence of worm eggs and heavy metal content is still at a safe level for feed materials. Conclusion: This study concluded that the processing of broiler chicken litter with 6 weeks of fermentation gave the best results on organoleptic observations, fiber profile, no presence of worm eggs, and heavy metal contamination that is safe for livestock.

Title: Nutritional Impact of Mycotoxins in Food Animal Production and Strategies for Mitigation.

Authors: Xu, R., Kiarie, E. G., Yiannikouris, A., Sun, L., & Karrow, N. A.

Journal: *Journal of Animal Science and Biotechnology*. **Date:** 2022.

DOI: https://doi.org/10.1186/s40104-022-00714-2

Mycotoxins are toxic secondary metabolites produced by filamentous fungi that are commonly detected as natural contaminants in agricultural commodities worldwide. Mycotoxin exposure can lead to mycotoxicosis in both animals and humans when found in animal feeds and food products, and at lower concentrations can affect animal performance by disrupting nutrient digestion, absorption, metabolism, and animal physiology. Thus, mycotoxin contamination of animal feeds represents a significant issue to the livestock industry and is a health threat to food animals. Since prevention of mycotoxin formation is difficult to undertake to avoid contamination, mitigation strategies are needed. This review explores how the mycotoxins aflatoxins, deoxynivalenol, zearalenone, fumonisins and ochratoxin A impose nutritional and metabolic effects on food animals and summarizes mitigation strategies to reduce the risk of mycotoxicity.

Title: Rumen Fermentation of Feed Mixtures Supplemented with Clay Minerals in a Semicontinuous in Vitro System.

Authors: Amanzougarene, Z., & Fondevila, M.

Journal: *Animals.* **Date:** 2022.

DOI: https://doi.org/10.3390/ani12030345

Simple Summary: Mineral clays are included in the diets of ruminants to maintain health and improve productive performances. The inclusion of several types of mineral clay (zeolite, Z; bentonite, B; and sepiolite, S) in diets with different concentrate-to-forage proportions (65:35, HC, and 35:65, HF) was tested in vitro. In HC diets, the effect of Z manifested in a higher pH in the first part of fermentation, which can be related to a more stable rumen environment. The extent of substrate fermentation was lowest with S when added to the HC diet but was lowest with B when added to the HF diet. The response of the rumen environmental conditions and the extent of fermentation depends on the interaction between the type of clay and the proportion of concentrate and forage in an animal's diet.AbstractInterest in using clays in the diets of ruminants to improve health and performance is increasing. The microbial fermentation of 65:35 (HC) or 35:65 (HF) concentrate:forage feeds, alone or with zeolite (Z), bentonite (B), or sepiolite (S), was studied in an in vitro semicontinuous culture system. The medium pH was allowed to drop for the first 6 h and was gradually buffered thereafter. For the HC diet, the medium pH was higher with Z throughout incubation (p 0.05) were observed in dry matter disappearance, microbial mass, or volatile fatty acids. However, the inclusion of B in HC reduced the ammonia concentration at 6 and 12 h with respect to C ($p < 0.05$). The inclusion of zeolite as an additive in the diets of ruminants stabilizes the rumen environment during the first stages of fermentation in terms of pH and ammonia concentration, especially in high-concentrate diets. The buffering effect of bentonite and sepiolite

was lower, and both might reduce ruminal microbial fermentation, depending on the concentrate proportion.

Title: Effect of Nanosilica and Bentonite as Mycotoxins Adsorbent Agent in Broiler Chickens' Diet on Growth Performance and Hepatic Histopathology.

Authors: Ghazalah, A. A., Abd-Elsamee, M., Kout Elkloub, M. E. M., Mohamed, A. K., & Rehan, A. A. A.

Journal: *Animals.* **Date:** 2021.

Doi: https://doi.org/10.3390/ani11072129

Simple Summary: Mycotoxins cause significant economic losses in feed ingredients, nutritional value, feed palatability, and the poultry industry. Thus, there is a need for ways to eradicate or inactivate mycotoxins in chicken feed. The present feeding trial aims to evaluate the use of nanosilica and bentonite to prevent the harmful effects of a mycotoxin-contaminated diet on broiler performance, histopathological, and carcass traits. The obtained results revealed significant improvements in broiler growth performance resulting from the addition of nanosilica at 0.20% and bentonite at 0.50%. Additionally, the hepatoprotective efficacy of nanosilica was evident at different dose levels. Consequentially, it could be used in broiler's contaminated diets without negatively affecting birds' health.AbstractMycotoxins are toxic secondary metabolites produced by different strains of fungi, such as aspergillus, fusarium, and penicillium that can contaminate feed ingredients or the entire feed of poultry and animals. Mycotoxins can cause many serious complications to both humans and animals due to carcinogenic, mutagenic, and immunosuppressive disorders. Therefore, the present experiment aims to investigate the effect of broiler chickens' diets supplemented with different levels of nanosilica (NS) as an adsorbent agent of mycotoxins on their growth performance and hepatic histopathology. Detectable levels of toxins were present in the feed before feeding, and all levels of mycotoxins were above the normal limit. A total of 180 one-day-old male Arbor Acres broiler chickens were allocated randomly to six treatment groups with three replicates per group, including ten chickens per replicate. The experiment lasted for five weeks, and dietary treatments included control diet and diets with four levels of nanosilica as 0.05%, 0.10%, 0.15%, and 0.20% as well as 0.50% bentonite (fixfin® Dry) diet. Bodyweight, body weight gain, average daily feed intake, and feed conversion ratio were measured weekly. At the end of the fifth week, six chickens per treatment were sacrificed to investigate the effects of NS and bentonite on carcass characteristics and hepatic histopathology. The results showed that providing broiler chickens' diets with an adsorbent agent, such as NS or bentonite, can reduce the side effects of mycotoxins and enhance their growth performance. The best record was achieved with NS at 0.20%, compared with the control group and other dietary treatment groups. Accordingly, 0.20% of NS could be used in broiler chickens' diets to minimize the harmful effects of mycotoxins.

Title: Can Biochar Improve the Sustainability of Animal Production?

Authors: Graves, C., Kolar, P., Shah, S., Grimes, J., & Sharara, M.

Journal: *Applied Sciences* **Date:** 2021.

DOI: https://doi.org/10.3390/app12105042

Animal production is a significant contributor of organic and inorganic contaminants in air, soil, and water systems. These pollutants are present beginning in animal houses and impacts continue through manure storage, treatment, and land application. As the industry is expected to expand, there is still a lack of affordable, sustainable solutions to many environmental concerns in animal production. Biochar is a low-cost, sustainable biomaterial with many environmental remediation applications. Its physicochemical properties have been proven to provide environmental benefits via the adsorption of organic and inorganic contaminants, promote plant growth, improve soil quality, and provide a form of carbon sequestration. For these reasons, biochar has been researched regarding biochar production, and application methods to biological systems have a significant influence on the moisture content, pH, microbial communities, and carbon and nitrogen retention. There remain unanswered questions about how we can manipulate biochar via physical and chemical activation methods to enhance the performance for specific applications. This review article addresses the positive and negative impacts of biochar addition at various stages in animal production from feed intake to manure land application.

Title: Effects of Atmospheric CO2 and Temperature on Wheat and Corn Susceptibility to Fusarium Graminearum and Deoxynivalenol Contamination.

Authors: Hay, W. T., McCormick, S. P., & Vaughan, M. M.

Journal: *Plants.* **Date:** 2021.

DOI: https://doi.org/10.3390/plants10122582

This work details the impact of atmospheric CO_2 and temperature conditions on two strains of *Fusarium graminearum*, their disease damage, pathogen growth, mycotoxin accumulation, and production per unit fungal biomass in wheat and corn. An elevated atmospheric CO_2 concentration, 1000 ppm CO_2, significantly increased the accumulation of deoxynivalenol in infected plants. Furthermore, growth in cool growing conditions, 20 °C/18 °C, day and night, respectively, resulted in the highest amounts of pathogen biomass and toxin accumulation in both inoculated wheat and corn. Warm temperatures, 25 °C/23 °C, day and night, respectively, suppressed pathogen growth and toxin accumulation, with reductions as great as 99% in corn. In wheat, despite reduced pathogen biomass and toxin accumulation at warm temperatures, the fungal pathogen was more aggressive with greater disease damage and toxin production per unit biomass. Disease outcomes were also pathogen strain specific, with complex interactions between host, strain, and growth conditions. However, we found that atmospheric CO_2 and temperature had essentially no significant interactions, except for greatly increased deoxynivalenol accumulation in corn at cool temperatures and elevated CO_2. Plants were most susceptible to disease damage at warm and cold temperatures for wheat and corn, respectively. This work helps elucidate the complex interaction between the abiotic stresses and biotic susceptibility of wheat and corn to *Fusarium graminearum* infection to better understand the potential impact global climate change poses to future food security.

References

European Commission. Animal Disease Information System (ADIS). https://food.ec.europa.eu/animals/animal-diseases/animal-disease-information-system-adis_en (accessed ?).

Scopus https://www.scopus.com/results/results.uri?sort=plf-f&src=s&st1=Partially+Animal+Disease&sid=80da25a806e4e2467b7eeed1d4b69e28&sot=b&sdt=b&sl=39&s=TITLE-ABS-KEY%28Partially+Animal+Disease%29&origin=searchbasic&editSaveSearch=&yearFrom=Before+1960&yearTo=Present

ProQuest https://www.proquest.com/results/92A5F9AC41A8459CPQ/1?accountid=27806

Web of Science https://0510m4wot-y-https-www-webofscience-com.proxy.zendy.io/wos/woscc/summary/83d22467-1564-4b02-9a56-f93a479d6277-48cd4e3d/relevance/1