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Systematic Review

Bovine Ehrlichiosis Prevalence: A Systematic Review and Meta-Analysis of Molecular Studies

Bonilla-Aldana DK, Quintero-Rada K, Montoya-Posada JP, Soler-Tovar D, Barato P, Arteaga-Livias K, Zambrano LI, Faccini-Martínez AA and Rodriguez-Morales AJ✉.

World Vet. J. 11(1): 01-15, 2021; pii:S232245682100001-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj1>

ABSTRACT: While some *Ehrlichia* species, such as *E. ruminantium* and *E. minasensis*, are not popular even among veterinarians, they can infect cattle. The current study aimed to review studies on *Ehrlichia* spp. to evaluate its worldwide molecular prevalence, given the lack of information about bovine ehrlichiosis and the lack of previous systematic reviews and meta-analyses on this subject. In order to determine the molecular prevalence of *Ehrlichia* spp. in cattle, a systematic review of the literature was conducted in three databases. A meta-analysis with a random-effects model was performed to calculate the pooled prevalence with 95% confidence intervals (95% CI) and measures of heterogeneity were reported. Subgroup analyses were performed in terms of *Ehrlichia* species, country, and regions. The literature search yielded 1051 papers until August 1, 2019, with 71 studies entirely eligible for review. The pooled molecular prevalence for *Ehrlichia* at the individual level (N = 6232) was 2.3% (95% CI: 1.7-2.9%) with the highest value of 82.4%. Studies identified the highest pooled molecular prevalence of 6.6% (95% CI: 0.6-12.7%) for *E. canis*, followed by *E. ruminantium* (n = 4695, 75.33%) 52 studies, with 1.7% (95% CI: 1.1-2.3%) and *E. chaffeensis* with 1.5% (95% CI: 0.0-0.3%). Moreover, the obtained result was indicative of only one study addressing *E. minasensis*. As the findings suggested, heartwater (*E. ruminantium* infection) is a notifiable disease of domestic and wild ruminants, recorded by the World Organization for Animal Health. There is a possible risk of endemic heartwater in the Americas due to the climatic features. Furthermore, *E. minasensis*, *E. chaffeensis*, and *E. canis* were observed in cattle although the two last species could be a molecular misidentification with regard to their phylogenetic relationships with *E. minasensis*.

Keywords: Bacteria, Bovine, *Ehrlichia*, Systematic review, Tick-borne

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Review

Uses of Immunoglobulins as an Antimicrobials Alternative in Veterinary Medicine

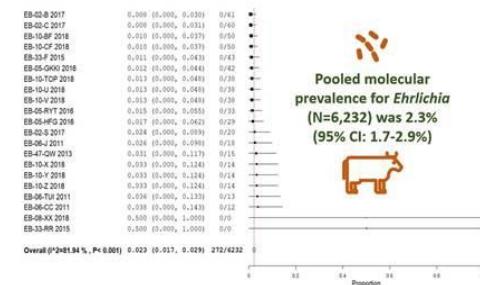
Abd El-Ghany WA✉.

World Vet. J. 11(1): 16-22, 2021; pii:S232245682100002-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj2>

ABSTRACT: As a result of increasing the resistance to antimicrobials in the field of veterinary medicine that reflects on human health, there is a great demand to use some drug alternatives. The application of avian immunoglobulins (IgY) is regarded as an important alternative strategy. The IgYs have been produced by several techniques and applied for animals using different methods. In addition, egg yolk IgYs have many advantages over blood type ones. There are many uses of IgYs in veterinary medicine. They have been used for the prophylaxis and treatment of different infections especially the enteric ones in cattle, pigs, rabbits, dogs, rats, mice, and fish species. Moreover, several studies showed the importance of IgY for competing for the *in vivo* enteric pathogens in poultry and the *in vitro* foodborne pathogen. Therefore, it is important to put a spotlight on applications of egg yolk immunoglobulins IgY in veterinary medicine to overcome the problems of antimicrobials' resistance as well as the tissue residues that adversely affect human health.

Keywords: Advantages, Animals, Poultry, Production, Yolk antibodies

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Bonilla-Aldana DK, Quintero-Rada K, Montoya-Posada JP, Soler-Tovar D, Barato P, Arteaga-Livias K, Zambrano LI, Faccini-Martínez AA and Rodriguez-Morales AJ (2021). Bovine Ehrlichiosis Prevalence: A Systematic Review and Meta-Analysis of Molecular Studies. *World Vet. J.*, 11 (1): 01-15.



Abd El-Ghany WA (2021). Uses of Immunoglobulins as an Antimicrobials Alternative in Veterinary Medicine. *World Vet. J.*, 11 (1): 01-22.

Research Paper

Changes of Body Condition Scores, Serum Biochemistry and Liver Triacylglycerol in Periparturient Holstein Friesian Dairy Cows Raised in a Small-Holder Farm

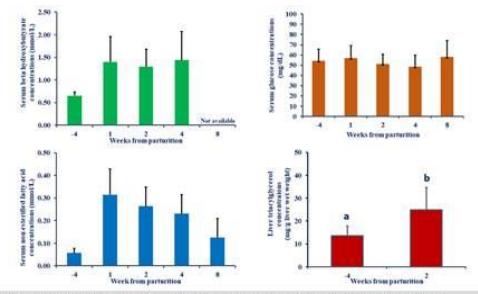
Triwutanon S and Rukkwamsuk Th✉.

World Vet. J. 11(1): 23-28, 2021; pii:S232245682100003-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj3>

ABSTRACT: This Negative energy balance (NEB) inevitably occurs in periparturient dairy cows. Its consequences are related to reduced cows' performances. Most studies concerning the NEB are performed in dairy cows of large-scale farms, particularly raised under non-tropical climate. The current study aimed to investigate the changes in body condition score, serum biochemical parameters, and liver triacylglycerol (TAG) accumulation in periparturient Holstein Friesian dairy cows raised by a small-holder farm. In this regard, 10 healthy pregnant dairy cows in a small-holder farm were recruited for the study. At 4 weeks before and 1, 2, 4, and 8 weeks after calving, blood samples were collected for determination of glucose, non-esterified fatty acid (NEFA), β -hydroxybutyrate (BHBA), and insulin-like growth factor-I (IGF-I) concentrations. BCS was evaluated at 4 weeks before and 2 weeks after calving. Liver samples were collected 4 weeks before and 2 weeks after calving to determine TAG concentration. Results revealed that serum NEFA and liver TAG concentration were elevated postpartum. Serum BHBA concentrations increased postpartum and the concentration indicated that dairy cows entered NEB condition as type I ketosis with a longer period. Serum IGF-I concentrations and BCS did not differ between before and after calving. In conclusion, dairy cows raised under small-holder tropical conditions suffered from serious NEB, though the cows had low milk production, as compared with the commercial non-tropical condition.

Keywords: Blood biochemistry, Dairy cow, Liver triacylglycerol, Negative energy balance, Small-holder farm

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Triwutanon S and Rukkwamsuk Th (2021). Changes of Body Condition Scores, Serum Biochemistry and Liver Triacylglycerol in Periparturient Holstein Friesian Dairy Cows Raised in a Small-Holder Farm. *World Vet. J.*, 11 (1): 23-28.

Research Paper

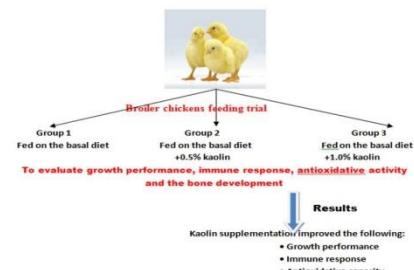
Growth Performance and Health Status of Broiler Chickens Treated with Natural Kaolin

EIHag S, Motelib AA, Soltan MA✉ and Gawad MA.

World Vet. J. 11(1): 29-36, 2021; pii:S232245682100004-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj4>

ABSTRACT: The use of Kaolin as an inert ingredient in feed has been very common in the poultry industry. The present study aimed to investigate the effects of different inclusion rates of Egyptian kaolinite in broiler chickens' diet on growth performance, immune response, some blood serum changes, and bone development. A total of 240 unsexed one-day-old Avian 48 breed chickens were used in this experiment. The chickens were individually weighed and randomly allotted into 3 equal groups (80 chickens per each group) and each group was subdivided into 4 replicates (20 chickens per replicate), which received one of the three experimental diets (0.0, 0.5, and 1.0% kaolin for groups 1, 2, and 3, respectively) during the experimental period (6 weeks). The obtained data revealed that kaolin addition at the dose of 0.5 or 1.0% in broiler chickens' diet insignificantly increased final body weight by 4.5% and 4.4%, respectively. On the other hand, it respectively decreased total feed intake by 1.0% and 1.8% and significantly improved the average feed conversion ratio and efficiency of energy utilization throughout the whole experimental period compared to the control. Moreover, kaolin addition had no adverse effect on the serum lipid profile and improved antioxidative activity through reduced nitric oxide and lipid peroxidase (malondialdehyde) concentrations or increased the activities of Glutathione peroxide, Catalase, and Superoxide dismutases in serum or liver tissues. Lysosomal and bactericidal activities were increased with kaolin addition at both levels in the broiler chickens' diets. The present results suggested that the broiler chickens' fed with kaolin-enriched diets improved growth, antioxidant activity, bone mineralization, and immune response.

Keywords: Antioxidant activity, Broiler chicken, Growth performance, Kaolin, Silicification, Strength



EIHag S, Motelib AA, Soltan MA and Gawad MA (2021). Growth Performance and Health Status of Broiler Chickens Treated with Natural Kaolin. *World Vet. J.*, 11 (1): 29-36.

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Research Paper

Occurrence of Beta-Lactamases Genes in Beta-Lactam Resistant Bacteria Isolated from Milk of Goats with Sub-Clinical Mastitis in Thika Sub-County, Kenya

Okoko IM, Kagira J✉, Kiboi D, and Maina N.

World Vet. J. 11(2): 37-44, 2021; pii:S232245682100005-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj5>

ABSTRACT: For decades, beta-lactam antibiotics have played a critical role in the control of mastitis in animals. However, the emergence of beta-lactam-resistant bacteria poses a challenge to both human and veterinary medicine. In this regard, bacterial isolates from milk samples collected from dairy goats with sub-clinical mastitis from Thika Sub-county, Kenya, were used in the current study to interrogate the occurrence of beta-lactamases genes in bacterial isolates (*Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Acinetobacter* spp., and Coagulase-negative *Staphylococci*) with known phenotypic resistance profiles to penicillin G, cephalaxin, cefoxitin, and cefotaxime. Four target genes, *bla_{TEM}*, *bla_{SHV}*, *bla_{CTX}*, *bla_{OXA}*, and *bla_{KPC}* were amplified using a polymerase chain reaction, and compared with *Escherichia coli* American Type Culture Collection 35218 and non-standard *Klebsiella pneumonia* positive controls. Out of the 46 samples, 44 samples (95.7%) harbored *bla_{TEM}* with two samples of the 44 bacterial isolates, also possessing the *bla_{SHV}* gene. Only one isolate of *Klebsiella pneumonia* and *Acinetobacter* spp had a combination of *bla_{TEM}* and *bla_{SHV}*. None of the bacteria had *bla_{CTX}*, *bla_{OXA}*, and *bla_{KPC}* genes. The data indicated that sub-clinical mastitis in dairy goats in Thika Sub-county is associated with the bacteria carrying beta-lactamases genes, suggesting that the use of beta-lactam antibiotics for the treatment of sub-clinical mastitis may result in the treatment failure and potential transfer of the infectious bacteria to humans and other animals. The current study recommends the use of an alternative class of antibiotics for the management of beta-lactam-resistant bacteria.

Keywords: Bacteria, Beta-lactam resistance, Beta-lactamases, Sub-clinical mastitis.

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Research Paper

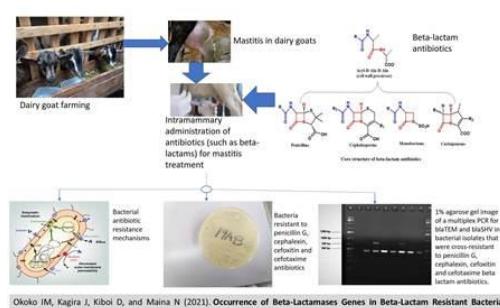
Vaccination of Algerian Local Rabbits with Precocious Strains of *Eimeria magna* and *Eimeria media*

Bachene MS✉, Temim S, Ainbaziz H, and Bachene A.

World Vet. J. 11(1): 45-50, 2021; pii:S232245682100006-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj6>

ABSTRACT: The present study was conducted to assess the safety and the efficacy of a vaccine containing the Algerian precocious strains of *Eimeria magna* and *Eimeria media* used separately or together against rabbit coccidiosis. The samples consisted of 56 young rabbits reared in specific pathogen-free conditions. Following the challenge inoculation, statistically significant decreases in oocyst excretion were noticed in the vaccinated rabbits with the precocious strain of *Eimeria magna*, *Eimeria media*, and both species leading to a good immune response acquired by the vaccination associated with a good growth rate. Moreover, there was a statistically significant increase in oocyst output following the challenge in all challenged groups. Unlike the vaccinated groups, the challenged groups showed poor weight gains. More than 50% of the young rabbits from all the challenged groups presented diarrhea. Consequently, these precocious strains constitute good candidates for mono or polyvalent anticoccidial vaccines in the future.

Keywords: Precocious strain, Rabbits, Vaccination, Wild strain.



Okoko JM, Kagira J, Kiboi D, and Maina N (2021). Occurrence of Beta-Lactamases Genes in Beta-Lactam Resistant Bacteria Isolated from Milk of Goats with Sub-Clinical Mastitis in Thika Sub-County, Kenya. World Vet. J., 11 (1): 37-44.

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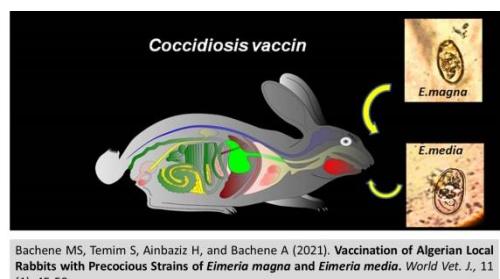
Research Paper

Impact of Offspring Sex and Dam's Pre-partum Vaccination on Colostrum Composition and Blood Hormones in Egyptian Buffaloes

Salah El-Din Ali M✉, Mikhail WZA, Salama MAM and Hafez YM.

World Vet. J. 11(1): 51-59, 2021; pii:S232245682100007-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj7>

ABSTRACT: The aim of the present research was to determine the effect of both the gender of the new-born calf and the pre-partum vaccination status of the dam (ScourGuard-4K) on the chemical composition and some biological parameters of the colostrum. Blood serum was collected from four groups of pregnant dams (four animals in each group) during the dry period (vaccinated buffalo dams pregnant with a male fetus, vaccinated buffalo dams pregnant with a female fetus, unvaccinated buffalo dams pregnant with a male fetus, and unvaccinated buffalo dams pregnant with a female fetus), in the pregnancy period, at the giving-birth period and after 24 hours of postpartum. The levels of insulin-like growth factor hormone (IGF-1) and immunoglobulin G (IgG) were calculated in the maternal blood serum at the assigned periods. Colostrum samples were collected at the birth time and 6, 12, 24, 48, and 72 hours after birth for measuring the chemical composition of the colostrum, as well as levels of IgG and IGF-1. Results of the current study showed that colostrum of dams that gave birth to male fetus had a richer content of IgG and



Bachene MS, Temim S, Ainbaziz H, and Bachene A (2021). Vaccination of Algerian Local Rabbits with Precocious Strains of *Eimeria magna* and *Eimeria media*. World Vet. J., 11 (1): 45-50.



IGF-1 levels and a higher percentage of total solids, solids-not-fat, total protein, fat, and lactose. Additionally, vaccination improved the same colostrum components except for IGF-1, which was not positively influenced by the vaccination. Generally, colostrum components were the highest at the birth time, then it decreased gradually up to 72 hours after the birth except that for the percentage of fat and lactose which showed gradual increases up to 72 hours to reach the normal composition of milk.

Keywords: Blood hormones, Colostrogenesis, Egyptian buffaloes, Offspring sex, ScourGuard-4k

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Research Paper

Tekelan Leaves (*Chromolaena odorata*) Infusion and 10% Povidone-Iodine on Incision Wound Healing Process of Mice (*Mus musculus*) Infected with *Staphylococcus aureus*

Budi AC, Hamid IS and Legowo D.

World Vet. J. 11(1): 60-65, 2021; pii:S232245682100008-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj8>

ABSTRACT: Skin is considered to be the most prone organ to injury and infection compared to other body organs. Skin infections are most commonly caused by *Staphylococcus aureus*. The most commonly used synthetic drugs to overcome skin problems is Povidone-iodine. Considering the Indonesian traditional method, injuries could be cured by dripping Tekelan leaves (*Chromolaena odorata*) infusion on the wounded skin area. This study aimed to compare the treatment effects of Tekelan leaves (*Chromolaena odorata*) infusion and povidone-iodine in the wound healing process of mice skin. The subjects of this study were 25 mice (*Mus musculus*) which were incised and infected with *Staphylococcus aureus* in 5 groups, namely, P0 (without treatment), P1 (povidone-iodine 10%), P2 (Tekelan infusion 5%), P3 (Tekelan infusion 10%), and P4 (Tekelan infusion 20%). Observations were made microscopically on wound conditions based on a total assessment of the four observed parameters (epithelialization, inflammation rate, connective tissue proliferation, and angiogenesis). The results showed that the total observation value in the P0 and P2 groups was lower than the other groups. The P1 group obtained the highest score. The Kruskal-Wallis test showed a significant difference among the treatment groups ($p < 0.05$). While the Mann Whitney test indicated P1 had a significant difference with P0, P2, and P3, it had no significant difference with P4. It can be concluded that the Tekelan Leaves (*Chromolaena odorata*) infusion can be used as an alternative of povidone-iodine with an optimal concentration of 20%.

Keywords: Chromolaena odorata, Histopathology, Povidone-iodine, Skin, Wound healing

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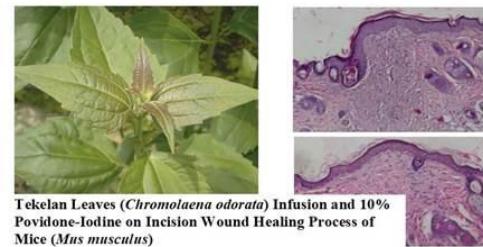
Research Paper

Reproductive Characteristics, Serum Metabolites, and Oxidative Status in Female Guinea Pigs (*Cavia porcellus*) Fed with Ethanolic Extract of *Dichrostachys glomerata* Fruit

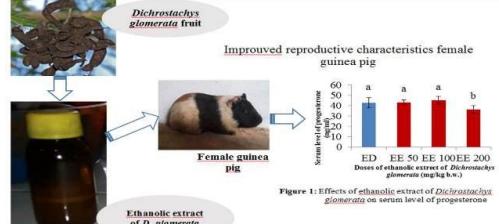
Djiussi NM, Ngoula F , Kouamo J, Vemo NB, Nono MFS, Lontio AF, Tchoffo H, and Dongmo AN.

World Vet. J. 11(1): 66-72, 2021; pii:S232245682100009-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj9>

ABSTRACT: *Dichrostachys glomerata* (*D. glomerata*) is an aromatic plant which is used as a spice in cooking and Cameroonian traditional medicine to treat infertility in men. This work was designed to highlight the effects of the ethanolic extract of *D. glomerata* on oxidative status, serum metabolites and reproductive characteristics in female guinea pigs (*Cavia porcellus*). A total of 48 primiparous female guinea pigs, aged 4 months old with the body weight of 400 ± 10 g, were divided into four groups with two replications per group (6 guinea pigs each). During 90 days of trial, Group 1 (control group) orally received 1 ml/kg b.w. of distilled water daily, and groups 2, 3, and 4 received *D. glomerata* ethanolic extract once a day at doses of 50, 100, and 200 mg/kg b.w. using the same method of administration, respectively, for 90 days, including 60 days of gestation. After the first 30 days of treatment, mating was done by placing one non-treated male into cages containing six treated females. At the end of the treatment, data were collected on reproductive characteristics, serum metabolites, and oxidative stress markers. The results revealed that the ethanolic extract of *D. glomerata* induced a significant decrease in the number of post-implantation resorption and ovaries weight. Groups 3 and 4 showed a significant increase in the number of fetuses per dam and viable fetuses as well as placenta weight, compared to the control group. The serum level of progesterone significantly decreased in the group treated with 200 mg/kg *D. Glomerata*, compared to the other treated groups. The extract at 100 mg/kg body weight showed a significant increase in fetuses weight and fetuses crown-rump length, compared to the control group. Catalase activity significantly increased in the control group than *D. glomerata* treated groups. In conclusion, ethanolic extract of *D. glomerata* minimized reproductive



Budi AC, Hamid IS, and Legowo D (2021). Tekelan Leaves (*Chromolaena odorata*) Infusion and 10% Povidone-Iodine on Incision Wound Healing Process of Mice (*Mus musculus*) Infected with *Staphylococcus aureus*. World Vet. J., 11 (1): 60-65.



Djiussi NM, Ngoula F, Kouamo J, Vemo NB, Nono MFS, Lontio AF, Tchoffo H, and Dongmo AN (2021). Reproductive Characteristics, Serum Metabolites, and Oxidative Status in Female Guinea Pigs (*Cavia porcellus*) Fed with Ethanolic Extract of *Dichrostachys glomerata* Fruit. World Vet. J., 11 (1): 66-72.

stress and subsequently improved the reproductive performance of guinea pigs.

Keywords: *Dichrostachys glomerata*, Guinea Pig, Oxidative Stress, Reproduction, Serum Metabolites

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Review

Current Evidence on Using Platelet Rich Plasma as a Therapeutic Modality for Veterinary Orthopedic Conditions

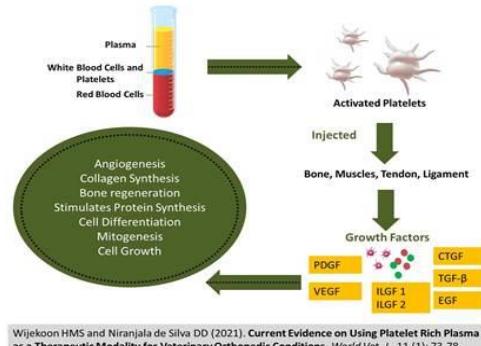
Wijekoon HMS✉ and Niranjala de Silva DD.

World Vet. J. 11(2): 73-78, 2021; pii:S232245682100010-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj10>

ABSTRACT: This review evaluates the findings of available clinical literature on the use of platelet-rich plasma (PRP) to develop evidence-based recommendations for treating various musculoskeletal issues that arise in veterinary practice. The use of PRP-based treatments for various orthopedic conditions is rapidly evolving as a promising treatment modality; however, its true effectiveness has yet to be elucidated. Application of PRP has been reported in humans for a variety of orthopedic conditions. Although the majority of the veterinary literature on PRP reports its use in equine patients, there is a dearth of evidence addressing its use in canine patients. Nevertheless, evidence of the efficacy of PRP has appeared to be highly variable depending on its specific indication, particularly in musculoskeletal disorders. This review aims to present the available information on the efficacy of PRP therapy in veterinary orthopedic conditions and describes factors influencing its use, the limitations of PRP therapy, and future directions of PRP research and therapy.

Keywords: Musculoskeletal diseases, Orthopedic, Platelet-rich plasma, Veterinary

[Full text-PDF] [XML] [Google Scholar]



Wijekoon HMS and Niranjala de Silva DD (2021). Current Evidence on Using Platelet Rich Plasma as a Therapeutic Modality for Veterinary Orthopedic Conditions. World Vet. J., 11 (1): 73-78.

Research Paper

Examination of *Escherichia coli* Bacteria in Blood Cockle Satay (*Anadara granosa*) Sold at Surabaya Traditional Market, Indonesia

Khasanah U, Mahasri G✉, and Kusdarwati R.

World Vet. J. 11(2): 79-84, 2021; pii:S232245682100011-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj11>

ABSTRACT: Cockle satay is one of the Surabaya local food made from the blood cockle (*Anadara granosa*). Blood cockle, commonly known as a filter feeder, is found in many Surabaya traditional markets. However, it potentially accumulates pollutant substances, both heavy metal or microbial so that improper handling and processing can cause pathogenic bacteria contamination. The present study aimed to investigate the contamination of *Escherichia coli* (*E. coli*) bacteria in blood cockle satay (*Anadara granosa*) sold at Surabaya traditional market. The current study used a descriptive observational research design with a quantitative approach. A total of 11 samples were employed using cluster sampling. The obtained data were compared with those of Bergey's manual of determinative bacteriology and Indonesian national standard. Based on the obtained results, five samples included *E. coli* with negative Methyl Red (MR) characteristics, negative Voges-Proskauer (VP) negative citric and positive indole. The Most Probable Number test for six samples indicated a value of <3.0 mpn/gr for one sample, 3.0 mpn/gr for two samples, and 3.6 mpn/gr for three samples. It can be concluded that the blood cockle satay samples sold at Surabaya traditional market (Indonesia) were contaminated with *E. coli* bacteria.

Keywords: Blood Cockle, *Escherichia coli*, Food product, Indonesia.



Khasanah U, Mahasri G, and Kusdarwati R (2021). Examination of *Escherichia coli* Bacteria in Blood Cockle Satay (*Anadara granosa*) Sold at Surabaya Traditional Market, Indonesia. World Vet. J., 11 (1): 79-84.

[Full text-PDF] [XML] [Google Scholar]

Research Paper

Prevalence and Faecal Egg Counts of Gastrointestinal Parasites of Merino Sheep in Lesotho

Mahlehla MA✉, Molapo MS, Phoofolo MW, Matebesi PA, Phalatsi M, and Moiloa MJ.

World Vet. J. 11(1): 85-91, 2021; pii:S232245682100012-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj12>

ABSTRACT: The present study aimed to evaluate the effect of the agroecological zone, host age, and gender on the prevalence and faecal egg load of gastrointestinal parasites (GIPs) for six months (July to December) in the Maseru and Quthing districts, Lesotho. A total of 1919 faecal samples were examined using the McMaster technique. The data were analyzed through generalized estimating equations (GEE) under the binary logistic regression model to determine the significant differences for the GIPs prevalence. Moreover, faecal egg counts (FEC) data were analyzed for repeated measures using GEE. In total, three types of GIPs, namely nematodes, coccidia, and cestodes were identified in this study. The overall prevalence rates of nematodes, coccidia, and cestodes were 53.9%, 46.5%, and 4.3% in the Maseru district, respectively. Furthermore, the Quthing district indicated the prevalence rates of 65.0%, 38.2%, and 0.9% for nematodes, coccidia, and cestodes, respectively. In the Maseru district, the overall faecal egg counts for nematodes, coccidia, and cestodes were within the ranges of 0-20.3, 0-90, and 0-600 eggs per gram, respectively. Additionally, the faecal egg counts in the Quthing district ranged from 0 to 8.000, 6.700, and 2.000 eggs per gram for nematodes, coccidia, and cestodes, respectively. The majority of the Merino sheep (>69%) in both districts had lower faecal egg counts (100-800) per gram. The agroecological zone affected the nematode infestation in both districts. Coccidia in the Quthing was higher in the mountain areas. In the Maseru district, the nematode infestation was not age-dependent; however, in the Quthing district, the prevalence was higher in juveniles, compared to adults. Age and gender did not affect the prevalence and faecal egg counts of nematodes and coccidia. The coccidian faecal egg loads were higher in females, compared to males. Merino sheep in Lesotho are mostly infected with gastrointestinal nematodes and protozoal coccidia, which could have a tremendous impact on their health and productivity. It is, therefore, of significant importance to develop a deworming strategy for sheep of different age and gender groups in different agroecological zones.

Keywords: Age, Agroecological zones, Gastrointestinal parasites, Gender, Lesotho, Prevalence

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Research Paper

Western Blot Analysis to Detect Cross-reaction in *Toxocara vitulorum* Protein with Anti-*Mecistocirrus digitatus* Serum

Anggraini DM, Kusnoto IH✉, and Sarudji S.

World Vet. J. 11(1): 92-97, 2021; pii:S232245682100013-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj13>

ABSTRACT: Worm infections are found in livestock and can be transmitted to humans. *Toxocara vitulorum* is a worm species which commonly infected people. Cross-reaction among worms can generate false positive to establish helminthiasis diagnosis through antibody inspection. This study aimed to determine specific proteins that caused cross-reaction between *Toxocara vitulorum* antigen and anti-*M. digitatus* serum by using the western blot technique. In the present study, the whole worms extracted of *T. vitulorum* and *M. digitatus* have been used to make polyclonal antibodies from *M. digitatus* with Wistar rats as hosts. The cross-reaction between whole worm extract of *T. vitulorum* protein and anti-*M. digitatus* serum obtained 12 protein bands that each relative molecular mass (Mr) valued of 176, 124, 92, 68, 59, 47, 31, 29, 26, 16, 12, and 10 kDa. Cross-reaction occurred between *T. vitulorum* protein and anti-*M. digitatus*.

Key words: Cross-reaction, *Mecistocirrus digitatus*, Specific protein, *Toxocara vitulorum*, Western blot

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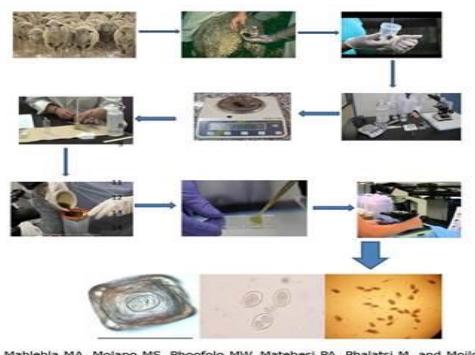
Research Paper

Phenotypic Study on the Bacterial Isolates from Equine with Respiratory Disorders regarding Antimicrobial Drug Resistance

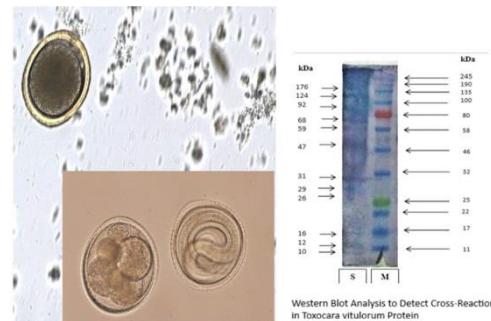
Nehal MF, Osman KM, Azza NF, Shaimaa RAA, Soumaya SAS✉, Shahein MA and Ibraheem EM.

World Vet. J. 11(1): 98-109, 2021; pii:S232245682100014-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj14>

ABSTRACT: Upper respiratory tract infection and pneumonia in foals are primarily caused by a bacterial infection. Gram-negative bacteria are commonly found in neonatal pneumonia although gram-positive and mixed infections could be accompanied. The current study aimed to detect the different pathogens causing respiratory disorders in the equine, describe the antimicrobial resistance in these pathogens, and determine the types of antimicrobial isolates. A total of 203 different samples were collected from 42 horse foals, 5 adult horses, and 4 donkey foals from June 2019 to April 2020. All samples were subjected to bacteriology analysis and isolated bacteria were analyzed using susceptibility test for different antibacterial agents. The findings indicated that 38 (74.5%) animals were positive for the isolation of bacteria causing



Mailehla MA, Molapo MS, Phoofofo MW, Matebesi PA, Phalatsi M, and Molopo MJ (2021). Prevalence and Faecal Egg Counts of Gastrointestinal Parasites of Merino Sheep in Lesotho. World Vet. J., 11 (1): 85-91.



Anggraini DM, Kusnoto IH, and Sarudji S (2021). Western Blot Analysis to Detect Cross-reaction in *Toxocara vitulorum* Protein with Anti-*Mecistocirrus digitatus* Serum. World Vet. J., 11 (1): 92-97.

respiratory disorders. The most predominant isolates were *Klebsiella pneumoniae* subsp. *Pneumoniae* followed by *Staphylococcus aureus*, *Streptococcus equi*, *Pseudomonas aeruginosa*, *Streptococcus zooepidemicus*, *Proteus mirabilis*, *Rhodococcus equi*, *Stenotrophomonas maltophilia*, and *Streptococcus mitis*. *Stenotrophomonas maltophilia* is isolated from all organs, including the lungs. All *K. pneumoniae* isolates were sensitive to lomefloxacin, cefotaxime, meropenem, enrofloxacin, neomycin, and chloramphenicol. The *Pseudomonas aeruginosa* (*P. aeruginosa*) is sensitive to aztreonam and 20% of isolates sensitive to Piperacillin-tazobactam. All *Proteus mirabilis* were sensitive to ampicillin-sulbactam, piperacillin-tazobactam, and cefoperazone. *Stenotrophomonas maltophilia* was only sensitive to oxytetracycline and lomefloxacin. *Staphylococcus aureus* was susceptible to Piperacillin-tazobactam (50%), 25% to lomefloxacin; *Streptococcus equi* were sensitive to vancomycin 33.3% while 16.7% to erythromycin and doxycycline, *Streptococcus zooepidemicus* (100%) were sensitive to cefotaxime, meropenem, and doxycycline. All isolates of *Enterococcus* species were sensitive to penicillin, piperacillin-tazobactam, and lomefloxacin. Moreover, *Rhodococcus equi* (one isolate) was only sensitive to clarithromycin. The antimicrobial susceptibility test illustrated the presence of multidrug-resistant and pan-drug resistant isolates which proved the indiscriminate and extensive use of antibiotics. In conclusion, resistance monitoring data and risk assessment identified several direct and/or indirect predisposing factors to be potentially associated with MDR development in the equine health sector of Egypt. The predisposing factors may be attributed to insufficient veterinary healthcare, monitoring, and regulatory services, in addition to the intervention of animal health service providers, and/ or farmers' lack of knowledge about drugs. The misuse and overuse of antibiotics have led to the evolution of antibiotic-resistant bacteria in equine in Egypt.

Keywords: Antimicrobial agents, *Klebsiella pneumoniae*, *Streptococcus zooepidemicus*.

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Research Paper

Non-specific Bacterial Profiles in Reproductive Tract of Dairy Cattle during Artificial Insemination

Andriani AI, Madyawati SP✉, and Sabdoningrum EK.

World Vet. J. 11(1): 110-114, 2021; pii:S232245682100015-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj15>

ABSTRACT: One of the causes of low reproductive efficiency in dairy cattle is the presence of reproductive disorders caused by a non-specific bacterial infection. The aim of the present study was to isolate and identify the genus of non-specific bacteria in the reproductive tract of dairy cattle during artificial insemination. A total of 10 samples in the form of mucus attached to the plastic sheath used after artificial insemination in dairy cattle were collected in the study. The samples were subjected to bacterial isolation and identification. The obtained results of the study indicated that *Staphylococcus* was the dominant genus found (90%). On the other hand, other genera were *Escherichia* (60%) and *Corynebacterium* (20%).

Keywords: Artificial Insemination, Dairy Cattle, Non-Specific Bacteria, Reproductive Tract

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Case Report

An Urban Case of Canine Visceral Leishmaniasis in the Municipality of Pereira, Colombia

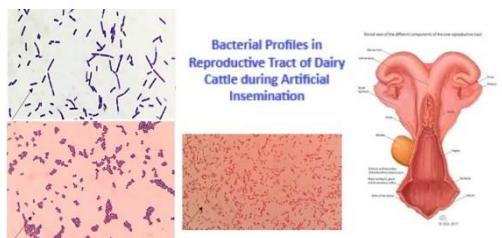
González-Colonia LV, Bonilla-Aldana DK, Álvarez-Serrano MP, Granados-Hincapie LY, Pinilla-Ticora LC, and Rodríguez-Morales AJ✉.

World Vet. J. 11(1): 115-118, 2021; pii:S232245682100016-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj16>

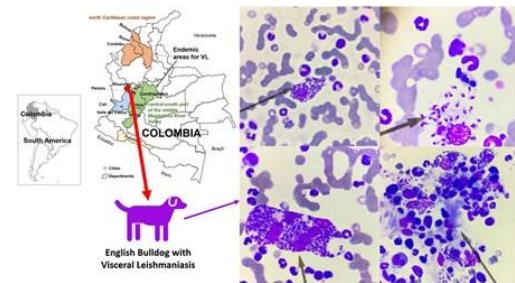
ABSTRACT: American visceral leishmaniasis (VL) is caused by *Leishmania infantum/chagasi*, transmitted by the sandflies *Lutzomyia longipalpis* and *Lu. evansi*. Dogs are the main reservoir and source for zoonotic infections in humans. Therefore, it is of utmost importance to diagnose such diseases in domestic animals to maintain public health. In 2019, the authors of the present study observed intracellular amastigotes in Giemsa-stained bone marrow smear using a real-time qPCR (parasite load was 484,336 DNA copies/mL), a canine visceral leishmaniasis (CVL) case caused by *L. infantum/chagasi*, in a 22-month-old male, English bulldog from Pereira, Colombia, a municipality not previously considered endemic for CVL nor human VL. Therefore, further field studies are necessary to determine if there is a low-grade



Nehal MF, Osman KM, Azza NF, Shaimaa RAA, Soumaya SAS, Shahein MA and Ibraheem EM (2021). Phenotypic Study on the Bacterial Isolates from Equine with Respiratory Disorders regarding Antimicrobial Drug Resistance. *World Vet. J.* 11 (1): 98-109.



Andriani AI, Madyawati SP, and Sabdoningrum EK (2021). Non-specific Bacterial Profiles in Reproductive Tract of Dairy Cattle during Artificial Insemination. *World Vet. J.*, 11 (1): 110-114.



circulation of this parasite among dogs and other animal reservoirs in the area, also entomological surveys are of utmost importance, as well as highlighting the clinical suspicion of this disease in domestic animals and humans.

Keywords: Colombia, Dog, Leishmaniasis, Non-endemic area, Visceral, Zoonotic

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Research Paper

Evaluation of Sensory Quality and Nutritional Value of Fish Cakes (*Perkedel*) Made by Tuna Fish (*Euthynnus affinis*) and Milk Fish (*Chanos chanos*)

Prastica EE, Masithah ED✉, and Pursetyo KT.

World Vet. J. 11(1): 119-123, 2021; pii:S232245682100017-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj17>

ABSTRACT: Fish Cakes (*Perkedel*) is Indonesian fried patties, most commonly made from mashed potatoes mix with beef or chicken. This research was conducted to determine the sensory quality and the best nutritional value of the cakes which are composed of tuna fish and milkfish. The study used an experimental method with the main parameters of sensory quality (organoleptic test) and nutritional value (proximate analysis) in seven different cake treatments. The results showed that the composition of tuna fish and milkfish of fish cakes had a very significant effect on the color and aroma aspects, while the texture and taste aspects were not significantly different among the treatments. The findings indicated that the composition of tuna fish and milkfish only affected color and aroma. The best formulation of the fish cake was on *Perkedel* 7 (P7) which has a sufficiently good organoleptic color, aroma, texture, and taste with higher nutrient content, compared with other treatments. The nutritional content of P7 was Recommended Dietary Allowance (RDA) protein of 28.77%, RDA fat of 0.68%, and RDA carbohydrate of 7.41%. Moreover, it also produced energy of 162 kcal/100g. In conclusion, fish cake with great sensory quality and nutritional values was obtained with 45 g of tuna fish and 15 g of milkfish. The P7 formulation is a combination of 45 g of tuna fish and 15 g of milkfish. The RDA obtained from fish cakes in the best treatment *Perkedel* 7 (P7) was 28.77% for RDA protein, 0.68% for fat, and 7.41% for carbohydrates. The investigated fish cakes provide energy of 162 kcal/100 g at an affordable price.

Keywords: Milk fish, Organoleptic test, Proximate analysis, RDA nutrition, Tuna fish

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Research Paper

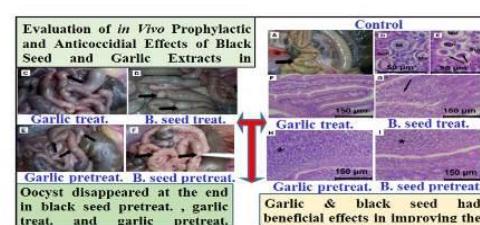
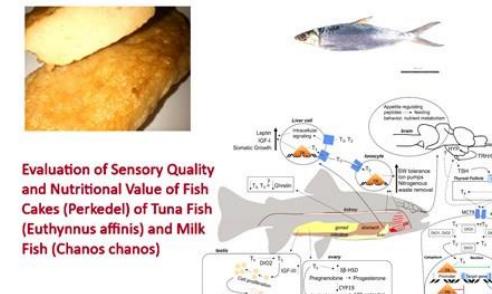
Evaluation of Prophylactic and Anticoccidial Effects of Black Seed and Garlic Extracts in Rabbits

Kuraa HMM✉, Nageib BR, El-Hendy AHM and Hassanin AAA.

World Vet. J. 11(1): 124-137, 2021; pii:S232245682100018-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj18>

ABSTRACT: The present study was carried out to discover the protective and curative effects of alcoholic extracts of garlic (*Allium sativum*) and black seeds (*Nigella sativa*) in rabbits experimentally infected by *Eimeria magna* using *in vivo*, *in vitro*, and histopathological examination. Overall oocysts number per gram was significantly lower in the garlic treatment and pretreatment groups, compared to the control positive, sulfadimidine treatment, and black seed treatment groups. At the end of the experiment, the oocyst disappeared in garlic pretreatment, garlic treatment, and black seed pretreatment groups. While oocyst counts of control positive and sulfadimidine groups were increasing oocysts similarly at the end of the experiment with repeated cycles. *In vitro* sporulation inhibition of garlic extract showed significant efficacy on *E. magna* oocysts in comparison with black seed extract and high significant efficacy of sporulation inhibition, compared to sulfadimidine. While black seed extract showed high significant efficacy of sporulation inhibition, compared to sulfadimidine. Body weight gain increased in control negative, garlic pretreatment, and garlic treatment groups in comparison with other groups. The results showed that there were no significant differences in erythrocytes counts in all experimental groups while leukocyte counts showed a significant decrease in control positive and sulfadimidine groups, compared to the other groups. Similarly, the histopathological examinations on days 14 and 28 post-infection revealed pathological changes in intestinal villi of the control positive group that appeared thickened and deformed with hypertrophied enterocytes containing numerous developmental stages of *E. magna*. Both garlic and black seed extract had beneficial effects on improving the lesions grossly and microscopically. The results obtained in the present study proved that garlic pretreatment had a better effect on a prophylaxis and treatment for coccidiosis than garlic treatment and both had more beneficial effects, compared to black seed extract. Therefore, it is recommended to use garlic as a natural feed additive in rabbit feeding as a prophylaxis and treatment for coccidiosis to minimize the economic losses caused by this parasite.

Keywords: Anticoccidial, *Allium sativum*, *E. magna*, *Nigella sativa*, Rabbit



Kuraa HMM, Nageib BR, El-Hendy AHM and Hassanin AAA (2021). Evaluation of Prophylactic and Anticoccidial Effects of Black Seed and Garlic Extracts in Rabbits. World Vet. J., 11 (1): 124-137.

Research Paper

Identification of Somatic Antigens of Adult *Fasciola gigantica* Isolated from Bali Cattle

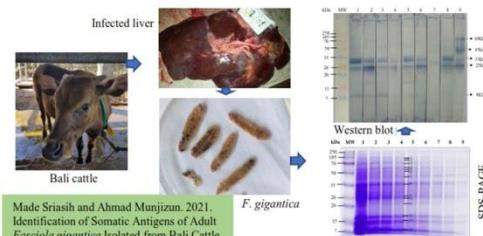
Sriasih M  and Munjizun A.

World Vet. J. 11(1): 138-145, 2021; pii:S232245682100019-11; DOI: <https://dx.doi.org/10.54203/scil.2021.wvj19>

ABSTRACT: In most tropical countries, such as Indonesia, fasciolosis is generally caused by *Fasciola gigantica* known as tropical liver fluke. However, most fasciolosis serodiagnostic tests have been developed solely for diagnosing fasciolosis caused by *Fasciola hepatica* (non-tropical liver fluke), and very few have been specifically designed for *F. gigantica*. The aim of this study was to determine the profile of antigenic proteins from the somatic extract of *F. gigantica* isolated from Bali cattle (*Bos javanicus*). The liver flukes were collected from a slaughtering house in Mataram, Indonesia. The somatic extracts were prepared by homogenizing in buffers containing 0.05 M NaCl, 0.02 M PMSF, and 0.05% Triton X-100. The characterization of the somatic extract proteins was performed using one-dimension gel electrophoresis and followed by

Western blotting to determine the profile of its antigenic proteins. There were 14 bands of the somatic extracts with an estimated molecular weight ranging from 8 to 105.8 kDa shown on the gel electrophoresis. The results of the Western blot show that there were five prominent protein bands. Three out of five prominent antigenic proteins with molecular weights of 8, 27, and 33 kDa are promising to enrich the existence of antigens that have immunodiagnostic value for fasciolosis. Therefore, further studies are required to examine more deeply the potency of those three antigenic somatic proteins of *F. gigantica*.

Keywords: Bali cattle, *F. gigantica*, Immunodiagnostic, Somatic extract, Western Blot



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Evaluation of Sensory Quality and Nutritional Value of Fish Cakes (*Perkedel*) Made by Tuna Fish (*Euthynnus affinis*) and Milk Fish (*Chanos chanos*)

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ABSTRACT

Fish Cakes (*Perkedel*) is Indonesian fried patties, most commonly made from mashed potatoes mix with beef or chicken. This research was conducted to determine the sensory quality and the best nutritional value of the cakes which are composed of tuna fish and milkfish. The study used an experimental method with the main parameters of sensory quality (organoleptic test) and nutritional value (proximate analysis) in seven different cake treatments. The results showed that the composition of tuna fish and milkfish of fish cakes had a very significant effect on the color and aroma aspects, while the texture and taste aspects were not significantly different among the treatments. The findings indicated that the composition of tuna fish and milkfish only affected color and aroma. The best formulation of the fish cake was on *Perkedel* 7 (P7) which has a sufficiently good organoleptic color, aroma, texture, and taste with higher nutrient content, compared with other treatments. The nutritional content of P7 was Recommended Dietary Allowance (RDA) protein of 28.77%, RDA fat of 0.68%, and RDA carbohydrate of 7.41%. Moreover, it also produced energy of 162 kcal/100g. In conclusion, fish cake with great sensory quality and nutritional values was obtained with 45 g of tuna fish and 15 g of milkfish. The P7 formulation is a combination of 45 g of tuna fish and 15 g of milkfish. The RDA obtained from fish cakes in the best treatment *Perkedel* 7 (P7) was 28.77% for RDA protein, 0.68% for fat, and 7.41% for carbohydrates. The investigated fish cakes provide energy of 162 kcal/100 g at an affordable price.

Keywords: Milk fish, Organoleptic test, Proximate analysis, RDA nutrition, Tuna fish

INTRODUCTION

Fish Cakes (*perkedel*) are a typical food product that is quite favored by people in some countries (Archana et al., 2016). Many cakes products experience diversification with the addition of chicken, beef, shrimp (Adesola Olayinka et al., 2009), other types of fish meat, and some processed animal protein. Moreover, the vegetable protein used is not only sourced from potatoes but sometimes also processed mushrooms and anchovies ingredients (Hwang et al., 2013). In addition, cakes are also consumed as popular daily food (Archana et al., 2016; Rahma et al., 2019).

For middle and lower-middle groups, this matter definitely cannot be reached, therefore the solution is to use fish meat to make delicious and nutritious cakes at more affordable and economical prices (Islam et al., 2018; Mottaleb et al., 2018). Currently, the use of surimi is an alternative to making burgers, ham, and other food products. It is because the price of surimi is cheaper than shrimp and beef and it has an appropriate nutritional value (Bashir et al., 2017).

Some fish species that can be used as fish cakes are tuna fish and milkfish because they are found easily in Indonesia. The reason why tuna fish and milkfish become selected ingredients for making fish cakes is because of the relatively high production volume. Tuna fish had a production volume of 230.580 tons in 2011 while milkfish had 631.125 tons in 2014. Tuna fish and milkfish have high protein and low-fat content. Most of the ingredients are essential and non-essential amino acids (Vasava et al., 2018), omega 3 (Rani et al., 2016), and unsaturated fats (Bayaga and Deveza, 2005). Milkfish has the highest protein content of 22.7% and the lowest fat content of 2% (Magondu et al., 2016) while the high protein and low-fat content of tuna fish are around 25% and 1.25%, respectively (Rani et al., 2016).

Milkfish is a kind of fish that mostly live in tropical freshwaters (Darmawan et al., 2019). Milkfish has a distinctive color, smell, taste, and texture (Villagonzalo, 2008; Hakim et al., 2019). Therefore, the composition of tuna fish and milkfish can produce fish cakes which have good sensory quality.

The experiments are carried out to increase the quality of fish cakes produced, either sensory quality or nutritional value. Thus, this research was performed to obtain the best sensory quality and nutritional value from the cakes which are composed of tuna fish and milkfish.

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MATERIALS AND METHODS

The experimental design was a combination of a completely randomized research design, by a single factor experiment in the form of different formulations of tuna fish and milkfish composition. Tuna fish and milkfish would be combined to obtain the best quality and nutritional values (Robinson et al., 2009). The performed method included seven treatments and four repetitions with the calculation of t ($n-1> 15$) (Kusuriningrum, 2008).

The independent variables used were tuna fish and milkfish, while the dependent variable was the sensory quality (color, aroma, texture, and taste) and physicochemical characteristics (water content, ash content, carbohydrate content, fat content, and protein content) of fish cakes. Moreover, control variables in this study were material size, making process, seasoning concentration, setting and cooking temperature, and heating time.

The first test was carried out using quantitative and qualitative parameters. The main test parameters were organoleptic, water content, ash content, protein content, fat content, and carbohydrate content. The supporting test parameters were the yield of raw materials and products, as well as analysis of Total Volatile Base (TVB) and histamine. Tests of organoleptic data from research results were processed using Kruskal-Wallis analysis. The Kruskal-Wallis analysis was used to determine the treatment rating for various product samples (Elamir, 2015).

Tuna fish and milkfish are common types of fish that can be obtained from traditional markets, among them in Surabaya City markets. Subsequently, batter is made by adding a high amount of water and low viscosity to Japanese breadcrumbs (Owens, 2001).

Table 1 presents the formulation of ingredients for making cakes with seven treatments using ingredients and dough in the same amount and composition. Tuna fish and milkfish are used as the meat that is separated from the thorns and skin through the steaming process. The fish meat that has been separated from the thorns and skin then made a composition of tuna fish: milkfish with ratios of 1:0, 0:1, 1:1, 1:2, 2:1, 1:3, and 3:1 as in Table 1. Then, the composition of fish meat is crushed manually so the meat will not be too crumbled (Fuchs et al., 2013)

Table 1. Ingredients formulation for Making Cakes (*Perkedel*)

Ingredients (g)	P1	P2	P3	P4	P5	P6	P7
Coconut (g)	20	20	20	20	20	20	20
Salt (g)	3	3	3	3	3	3	3
Sugar (g)	7	7	7	7	7	7	7
Pepper (g)	2	2	2	2	2	2	2
Shallot (g)	4	4	4	4	4	4	4
Garlic (g)	4	4	4	4	4	4	4
Tuna Fish (g)	60 (1)	0 (0)	30 (1)	20 (1)	40 (2)	15 (1)	45 (3)
Milkfish (g)	0 (0)	60 (1)	30 (1)	40 (2)	20 (1)	45 (3)	15 (1)

RESULTS

All treatments produce various organoleptic. One treatment and another will be compared according to the standard score that has been made. The other observations are also carried out on products that have the highest and lowest scores.

The results of the analysis of various colors and aromas in Table 2 showed that there were very significant different interactions ($p < 0.01$) between the concentration treatment of tuna fish and milkfish with the color of fish cakes. The color on P2 had the highest organoleptic score, while the color on P1 had the lowest organoleptic score. For various aroma formulas, P1 had the highest score, but P1 was not significantly different from P7. It was probably due to the content of tuna fish that was almost 100%.

The results of the variance analysis showed that there were no significant differences between the concentration treatment of tuna fish and milkfish on the texture and taste of fish cakes produced ($p > 0.05$). Organoleptic texture scores given by panelists ranged from 3.6 to 3.9 or slightly dense and fibrous. Formulations with the best texture were in P1 and P7. Meanwhile, the organoleptic test score for taste ranged from 3.0 to 3.4 (quite ideal). The best treatment for flavor formulations was on P7.

Results of proximate, recommended dietary allowance, and energy

Proximate analysis is performed to determine the nutritional content of fish cake products. Proximate analysis that is examined includes water, ash, protein, fat, and carbohydrate content. Fish cakes are prepared with several basic ingredients and each of which has a different nutritional contribution. Coconut contains 1% protein, 0.9% fats, and 14% carbohydrates in 20 grams. Pepper contains 11.5% proteins, 6.8% fats, and 64.4% carbohydrates in 2 g. Shallot contains 1.5% protein, 0.3% fat, and 0.2% carbohydrates in 3 grams. Garlic contains 4.5% proteins, 0.2% fats, and 23.1% carbohydrates in 2 grams. Eggs contain 12.8% proteins, 11.5% fats, and 0.7% carbohydrates in 3 grams (Rehault-Godbert et al., 2019).

After accumulating with a proximate analysis, all the ingredients that are mixed with a comparison of multi-variants tuna fish and milkfish produce different contents which are presented in Table 3. The results of the proximate analysis in 100 grams produce different contents. The highest water content was observed in treatment 5, and the lowest water content was in treatment 2. The highest protein content occurred in treatment 7, and the lowest protein content was in treatment 4. The highest fat content was reported in treatment 6, and the lowest fat content was in treatment 7. The highest carbohydrate content occurred at treatment 4, and the lowest carbohydrate content was estimated in treatment 1.

Proximate analysis in each formulation was carried out to determine the nutritional content of each on the results of fish cakes. By this proximate analysis, the RDA of different nutritional values was eventually obtained. Based on Table 4, the best treatment was at P7 for it had the highest protein RDA value and the lowest fat RDA value. The calorific value produced by fish cakes in the P7 formulation was every 100 grams contains 162 kcal. This value was obtained because every 1 gr of carbohydrate contained 4000 calories, while 1 gram of fat contained 9000 calories, and 1 gr of protein had 4 calories (Lagergren et al., 2013).

Table 2. Organoleptic test results on treatments

Organoleptic Test	Color	Aroma	Texture	Taste
Treatment 1	3.81	3.77	3.87	3.31
Treatment 2	4.71	3.43	3.66	3.17
Treatment 3	4.38	3.43	3.66	3.18
Treatment 4	4.48	3.31	3.66	3.16
Treatment 5	4.27	3.49	3.66	3.08
Treatment 6	4.57	3.52	3.63	3.18
Treatment 7	4.22	3.53	3.78	3.34

Table 3. Proximate analysis results (%)

Proximate values	Water content	Ash content	Protein content	Fat content	Carbohydrate content
Treatment 1	55.39	10.81	15.59	3.34	14.87
Treatment 2	54.37	7.48	13.95	3.13	21.07
Treatment 3	54.89	9.58	14.24	1.15	20.14
Treatment 4	54.88	5.24	8.55	2.10	29.23
Treatment 5	55.60	4.09	15.17	2.30	22.84
Treatment 6	55.47	4.98	14.88	3.38	21.29
Treatment 7	55.17	4.92	17.26	0.42	22.23

Table 4. Recommended dietary allowance value of fish cakes (*Perkedel*)

Recommended dietary allowance	Protein content*	Fat content*	Carbohydrate content*
Treatment 1	25.98	5.39	4.96
Treatment 2	23.25	5.05	7.02
Treatment 3	23.37	1.85	6.71
Treatment 4	14.25	3.39	9.74
Treatment 5	25.28	3.71	7.61
Treatment 6	24.80	5.45	7.10
Treatment 7	28.77	0.68	7.41

*: Refers to the percent of dry matter

DISCUSSION

Organoleptic testing performed is not just to get the impression of likes or dislikes of samples, but to determine whether the product is accepted by the panelist. The organoleptic test is a test performed based on the sensing process (Yi et al., 2016). The purpose of the organoleptic test is to find the differences between samples (one another), so as to obtain the best product results (Ana et al., 2017; Widyastuti et al., 2019). It is also performed to evaluate food, especially organoleptic properties of pastry products including aroma, taste, and texture.

The results of the data analysis showed that there were significant differences between treatments on color and aroma parameters, while texture and taste parameters were not significantly different. The best color of the inside of fish cakes was observed in treatment P2 since the fish composition in the fish cakes of P2 formulation was 100% milkfish so that the white structure was formed. Moreover, milkfish has a color attribute distribution of 44.90 (Villagonzalo, 2008). In a study conducted by Chen and Chow-Jen (2001), it was found that milkfish had a low myoglobin content so that when the warming or denaturation of globin was carried out, the color of the product would be even brighter.

The aroma parameter most favored by panelists is the P1 Treatment since P1 had 100% tuna fish (60 g). The score from the organoleptic test results for flavors was ranged from 3 to 3.4 (quite ideal). The formulation with the highest taste preference score is in the P7 treatment. It is probably due to a balanced mix of flavors.

Based on the proximate results in Table 3, the average water content produced by fish cakes in seven treatments was within the range of 54.37-55.60%. These levels can still be accepted by Indonesian National Standard (SNI) on products that have similar characteristics to fish cakes, namely nuggets. Meanwhile, the average protein content produced by fish cakes in seven formulations ranged from 8.55-17.26%. The lowest protein content is found in P4 formulation so that P4 is not included in the nutrient content of SNI 01-6683-2002 which states that the protein content must be at least 12%. Furthermore, P4 also does not meet the requirements for carbohydrate levels because it exceeds 25%.

Protein is needed by the body for the growth, development, maintenance, and repair of damaged body tissue. Water content and fat content in fish are quite fluctuating (Pal et al., 2018). The fat found in fish cakes is mostly a type of unsaturated fat that is good for health (Bayaga and Deveza, 2005). The carbohydrate content in fish cakes mainly comes from tapioca flour and bread flour with its carbohydrate content per 100 grams holds more than 75% or around 26 grams (Montes et al., 2015).

CONCLUSION

The best fish cakes with the highest sensory quality and nutritional value were observed in the P7 treatment. It had higher protein content than other treatments and a low-fat content (in accordance with SNI 01-6683-2002). The P7 treatment was a combination of 45 g of tuna fish and 15 g of milkfish. The Recommended Dietary Allowance (RDA) obtained from fish cakes was at its best in P7 treatment with 28.77% RDA protein, 0.68% fat, and 7.41% carbohydrates. The investigated fish cakes provide energy of 162 kcal / 100 g. For future studies, treatment with a high combination of 45 g of tuna fish and 15 g of milkfish is suggested.

DECLARATIONS

Authors' contributions

All authors approved the final draft of the manuscript for publication. Ethical issues (including plagiarism, consent to publish, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy) have been checked by the authors.

Competing interests

All authors declared no conflict of interests.

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