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363. Individual variability in female and male mice in a test-retest protocol of the forced swim test/ **Kazavchinsky, Lydmila; Dafna, Anat; Einat, Haim.** Journal of Pharmacological and Toxicological Methods. ISSN:1056-8719 (2019) v.95 p.12-15 Journal of Pharmacological and Toxicological Methods

DOI: 10.1016/j.vascn.2018.11.007

Link: <http://www.sciencedirect.com/science/article/pii/S1056871918306993>

Abstract: Background The challenges to embody the complexity of symptoms and biological mechanism of affective disorders question the value of animal models as well as their reproducibility and validity. Validity is further hindered by large individual variability in many models. Whereas individual variability presents a challenge, it can also be used to study susceptibility and resistance. One of the frequently used models for screening antidepressants and interventions related to depression is the forced swim test (FST). The FST is typically performed only once. Methods The current study was designed with a number of objectives: (1) Examine the group effects of repeated FST (2) Examine the interaction between sex and repeated FST and (3) examine the consistency of individual variability across test and retest in the FST. We exposed ICR female and male mice to the FST 3 or 5 times with two days between exposures. Immobility time was analyzed across exposures at the group and the individual levels using repeated measures ANOVA as well as Pearson's correlations. Results As expected, repeated exposure to the FST resulted in increased immobility across exposures with no consistent effect of sex. At the level of individual mice, immobility time showed correlation across exposures. Discussion The current study demonstrates the effects of repeating the FST in both sexes with attention to individual variability. The results suggest that the FST can be used more than once and that mice show a consistent individual pattern of responding in the test.

Keyword: Bipolar disorder; Depression; Animal models; Antidepressants; Individual variability

364. Melanin-concentrating hormone in the Locus Coeruleus aggravates helpless behavior in stressed rats/ **Urbanavicius, Jessika; Fabius, Sara; Roncalho, Aline; Joca, Samia; Torterolo, Pablo; Scorza, Cecilia.** Behavioural Brain Research. ISSN:0166-4328 (2019) v.374 p.112120 Behavioural Brain Research

DOI: 10.1016/j.bbr.2019.112120

Link: <http://www.sciencedirect.com/science/article/pii/S016643281930765X>

Abstract: Animal studies have shown that antagonists of receptor 1 of Melanin-Concentrating Hormone (MCH-R1) elicit antidepressive-like behavior, suggesting that MCH-R1 might be a novel target for the treatment of depression and supports the hypothesis that MCHergic signaling regulates depressive-like behaviors. Consistent with the evidence that MCHergic neurons send projections to dorsal and median raphe nuclei, we have previously demonstrated that MCH microinjections in both nuclei induced a depressive-like behavior. Even though MCH neurons also project to Locus Coeruleus (LC), only a few studies have reported the behavioral and neurochemical effect of MCH into the LC. We studied the effects of MCH (100 and 200 ng) into the LC on coping-stress related behaviors associated with depression, using two different behavioral tests: the forced swimming test (FST) and the learned helplessness (LH). To characterize the functional interaction between MCH and the noradrenergic LC system, we also evaluated the neurochemical effects of MCH (100 ng) on the extracellular levels of noradrenaline (NA) in the medial prefrontal cortex (mPFC), an important LC terminal region involved in emotional processing. MCH administration into the LC elicited a depressive-like behavior evidenced in both paradigms. Interestingly, in the LH, MCH (100) elicited a significant increase in escape failures only in stressed animals. A significant decrease in prefrontal levels of NA was observed after MCH microinjection into the LC. Our results demonstrate that increased

MCH signaling into the LC triggers depressive-like behaviors, especially in stressed animals. These data further corroborate the important role of MCH in the neurobiology of depression.

Keyword: Forced swimming test; Prefrontal cortex; Learned helplessness; Noradrenaline

365. In vivo magnetic resonance imaging reveals the effect of gonadal hormones on morphological and functional brain sexual dimorphisms in adult sheep/ **Barrière, David André; Ella, Arsène; Adriaensen, Hans; Roselli, Charles E.; Chemineau, Philippe; Keller, Matthieu.** Psychoneuroendocrinology. ISSN:0306-4530 (2019) v.109 p.104387Psychoneuroendocrinology

DOI: 10.1016/j.psyneuen.2019.104387

Link: <http://www.sciencedirect.com/science/article/pii/S0306453019300939>

Abstract: Sex differences in the brain and behavior are produced by the perinatal action of testosterone, which is converted into estradiol by the enzyme aromatase in the brain. Although magnetic resonance imaging (MRI) has been widely used in humans to study these differences, the use of animal models, where hormonal status can be properly manipulated, is necessary to explore the mechanisms involved. We used sheep, a recognized model in the field of neuroendocrinology, to assess brain morphological and functional sex differences and their regulation by adult gonadal hormones. To this end, we performed voxel-based morphometry and a resting-state functional MRI approach to assess sex differences in gonadally intact animals. We demonstrated significant sex differences in gray matter concentration (GMC) at the level of the gonadotropic axis, i.e., not only within the hypothalamus and pituitary but also within the hippocampus and the amygdala of intact animals. We then performed the same analysis one month after gonadectomy and found that some of these differences were reduced, especially in the hypothalamus and amygdala. By contrast, we found few differences in the organization of the functional connectome between males and females either before or after gonadectomy. As a whole, our study identifies brain regions that are sexually dimorphic in the sheep brain at the resolution of the MRI and highlights the role of gonadal hormones in the maintenance of these differences.

Keyword: Sheep; Sex differences; Gonadectomy; Resting state fMRI; Voxel-based morphometry

366. What's in a name? Consumer perceptions of in vitro meat under different names/ **Bryant, Christopher J.; Barnett, Julie C..** Appetite. ISSN:0195-6663 (2019) v.137 p.104-113Appetite

DOI: 10.1016/j.appet.2019.02.021

Link: <http://www.sciencedirect.com/science/article/pii/S0195666318310948>

Abstract: In vitro meat (IVM) grown from animal cells is approaching commercial viability. This technology could enable consumers to circumvent the ethical and environmental issues associated with meat-eating. However, consumer acceptance of IVM is uncertain, and is partly dependent on how the product is framed. This study investigated the effect of different names for IVM on measures of consumer acceptance. Participants (N = 185) were allocated to one of four conditions in an experimental design in which the product name was manipulated to be 'clean meat', 'cultured meat', 'animal free meat', or 'lab grown meat'. Participants gave word associations and measures of their attitudes and behavioural intentions towards the product. The results indicated that those in the 'clean meat' and 'animal free meat' conditions had significantly more positive attitudes towards IVM than those in

the 'lab grown meat' condition, and those in the 'clean meat' condition had significantly more positive behavioural intentions towards IVM compared to those in the 'lab grown meat' condition. Mediation analyses indicated that the valence of associations accounted for a significant amount of the observed differences, suggesting that anchoring can explain these differences. We discuss these results in the context of social representations theory and give recommendations for future research.

Keyword: Meat; Consumer behaviour; Cultured meat; In vitro meat; Nomenclature; Social representations theory

367. Vector-borne bacteria in blood of camels in Iran: New data and literature review/ **Sazmand, Alireza; Harl, Josef; Eigner, Barbara; Hodžić, Adnan; Beck, Relja; Hekmatimoghaddam, Seyedhossein; Mirzaei, Mohammad; Fuehrer, Hans-Peter; Joachim, Anja.** Comparative Immunology, Microbiology and Infectious Diseases. ISSN:0147-9571 (2019) v.65 p.48-53 Comparative Immunology, Microbiology and Infectious Diseases

DOI: 10.1016/j.cimid.2019.04.004

Link: <http://www.sciencedirect.com/science/article/pii/S0147957119300736>

Abstract: Despite close association between camels and humans, molecular based studies on vector-borne pathogens infecting camels are scarce compared to other animals in Iran. The current study was carried out to investigate the occurrence of vector-borne bacteria in the blood of dromedaries by molecular tools. A total of 200 peripheral blood samples were collected from apparently healthy animals. Microscopic examination was performed on Giemsa-stained blood smears, and drops of blood were spotted on Whatman FTA® cards for molecular analyses. Genomic DNA was extracted from the cards, and PCR amplification followed by sequencing of positive samples was carried out for the detection of Anaplasmataceae, spotted fever group (SFG) rickettsiae, Bartonella spp. and Borrelia spp. Intra-cytic forms of any blood pathogens could not be detected by light microscopy. PCR results revealed 30 animals (15%) to be infected with Anaplasmataceae bacteria. Analyses of sequences revealed a strain of Anaplasma sp. identical to Candidatus Anaplasma camelii isolated from camels, cattle and deer in Asia and Africa. Neither SFG rickettsiae, nor Borrelia or Bartonella species were found. Further studies for determining epidemiological role of camels and its zoonotic potential are recommended. This paper reviews the current knowledge on camels' tickborne bacteria including microscopy, serology and molecular studies.

Keyword: Anaplasma; Dromedary; Review; Tick-borne; Vector-borne

368. Spirulina microalgae improves memory deficit induced by scopolamine in male pup rats: Role of oxidative stress/ **Ghanbari, A.; Vafaei, Abbas A.; Naghibi nasab, F.S.; Attarmoghaddam, M.; Bandegi, A.R.; Moradi- Kor, N..** South African Journal of Botany. ISSN:0254-6299 (2019) v.127 p.220-225 South African Journal of Botany

DOI: 10.1016/j.sajb.2019.08.045

Link: <http://www.sciencedirect.com/science/article/pii/S0254629919307574>

Abstract: Objective Memory is one of the most complicated behaviors in humans and animals. Oxidative stress plays an important role in impairment of memory. The aim of this study was to evaluate if Spirulina plathensis could prevent memory deficit induced by scopolamine through suppressing oxidative stress. Materials and methods In the present study 54 male pup wistar rats (30 days old) were used. Animals randomly were divided into 9 groups [Saline + Saline (Control), Saline + Scopolamine 1 mg/kg, Saline + Scopolamine 2 mg/kg, Spirulina

100 mg/kg + Scopolamine 2 mg/kg, Spirulina 200 mg/kg + Scopolamine 2 mg/kg, Spirulina 400 mg/kg + Scopolamine 2 mg/kg, Spirulina 100 mg/kg + Saline, Spirulina 200 mg/kg + Saline, Spirulina 400 mg/kg + Saline] with 6 in each group. To detecting memory, inhibitory avoidance (IA) task (0.5 mA, 3 s footshock) was used. Immediately after training, scopolamine (or saline in control group) was injected intraperitoneally and 24 latter memory retention tests were recorded. Within 14 days prior to training, Spirulina plathensis or saline were used intragastrically. Biochemical tests were included Malondialdehyde (MDA) and total antioxidant capacity of serum measurement using thiobarbituric acid and Ferric reducing ability of plasma (FRAP) respectively. Results Scopolamine (2 mg/kg) significantly ($P < .05$) impaired memory retention compared to control group. Spirulina significantly ($P < .05$) improved scopolamine-induced memory deficit. Scopolamine (2 mg/kg) significantly ($P < .05$) increased MDA level, but Spirulina (200 mg/kg) significantly ($P < .001$) reversed MDA level toward its control level. Conclusion Spirulina improves scopolamine induced-memory deficit through inhibiting oxidative stress probably. Oxidative stress inhibition occurs through reducing MDA level.

Keyword: Oxidative stress; Scopolamine; Memory deficit; Pup rat; Spirulina plathensis

369. DNA based method for determining source country of the short beaked echidna (*Tachyglossus aculeatus*) in the illegal wildlife trade/ **Summerell, A.E.; Frankham, G.J.; Gunn, P.; Johnson, R.N.**. Forensic Science International. ISSN:0379-0738 (2019) v.295 p.46-53Forensic Science International

DOI: 10.1016/j.forsciint.2018.11.019

Link: <http://www.sciencedirect.com/science/article/pii/S0379073818305024>

Abstract: The illegal trade in wild animals being sold as ‘captive bred’ is an emerging issue in the pet and zoo industry and has both animal welfare and conservation implications. DNA based methods can be a quick, inexpensive, and definitive way to determine the source of these animals, thereby assisting efforts to combat this trade. The short beaked echidna (*Tachyglossus aculeatus*) is currently one of the species suspected to be targeted in this trade. As this species is distributed throughout Australia and in New Guinea (currently comprising of five recognised sub-species), this project aimed to develop a DNA based method to definitively determine the source country of an echidna and explore the use of non-invasive sampling techniques. Here we use non-invasively sampled echidna quills and demonstrate the extraction of mitochondrial DNA and amplification of a region of the mitochondrial genome. Phylogenetically informative markers for analysis of a 322bp segment of the D-loop region were developed, and subsequently validated, using animals with known source locations allowing us to reliably distinguish between echidnas from New Guinea, and Australia. This research presents the first validated forensic protocols for short beaked echidnas and will be an integral tool in understanding the movement of animals in this emerging trade.

Keyword: DNA; Echidna; Geographic provenance; Illegal wildlife trade; Non-invasive sampling; Wildlife forensics

370. Analysis of inequality aversion in mice using stress-induced hyperthermia/ **Watanabe, Shigeru.** Learning and Motivation. ISSN:0023-9690 (2019) v.68 p.101601Learning and Motivation

DOI: 10.1016/j.lmot.2019.101601

Link: <http://www.sciencedirect.com/science/article/pii/S0023969018302832>

Abstract: Humans have a sense of fairness and consequently have an aversion to inequality condition. Recently, animal researchers have suggested that some non-human animals also exhibit an aversion to inequality. This experiment used stress-induced hyperthermia (SIH) to examine inequality aversion in mice. Aversion was analyzed using inequitable restraint stress in Experiment 1. The mice that were restrained, but had free cage mates (disadvantageous inequality) displayed SIH. In contrast, free mice that had restrained cage mates (advantageous inequality) did not show SIH. Inequitable food delivery was used to induce SIH in Experiment 2. Food deprived mice who were surrounded by cage mates who were consuming food (disadvantageous inequality) displayed SIH. The mice that received food and were surrounded by food-deprived cage mates (advantageous inequality) also showed some increase in body temperature, but the increase was not significantly higher than that in the equality condition (where all mice received food). Pre-feeding of the test mice attenuated SIH in the disadvantageous condition suggesting that satisfied mice do not display disadvantageous inequality aversion. These results showed disadvantageous inequality aversion in mice in both negative (restraint) and positive (food) situations but not advantageous inequality aversion.

Keyword: Stress; Empathy; Fairness; Hyperthermia

371. Detection of estrous biomarkers in the body exudates of Kangayam cattle (*Bos indicus*) from interplay of hormones and behavioral expressions/ **Ramachandran, R.; Vinothkumar, A.; Sankarganesh, D.; Suriyakalaa, U.; Suriya, A.; Kamalakkannan, S.; Nithya, V.; Angayarkanni, J.; Archunan, G.; Akbarsha, M.A.; Achiraman, S.** Domestic Animal Endocrinology. ISSN:0739-7240 (2019) v. p.106392 Domestic Animal Endocrinology

DOI: 10.1016/j.domaniend.2019.106392

Link: <http://www.sciencedirect.com/science/article/pii/S0739724019300700>

Abstract: Behavioral expressions and biochemical composition of body exudates are significantly altered in concert with the endocrine status, which are all clear indicators of physiological conditions of animals. In this study, we sought to infer about the reproductive physiological status of Kangayam cattle (*Bos indicus*) by analyzing behaviors, endocrine pattern, and body exudates and further to discover estrous biomarkers so as to facilitate timely artificial insemination/mating and to aid in aspects of conservation of the species. Therefore, in this study, we followed Kangayam cow through preestrous to postestrous phases to correlate the endocrine dependence of biochemical constituents in urine and cervical mucus and sought to identify estrous biomarkers. Behavioral estrus was confirmed in 10 cows, from which urine samples were collected and subjected to determination of LH, FSH, estrogens, progesterone, proteins, and lipids. Furthermore, urinary fatty acids and proteins were profiled using gas chromatography and SDS-PAGE, respectively. The volatile compounds in the urine and cervical mucus were identified by gas chromatography–mass spectrometry analysis. The data revealed that LH, FSH, and estrogen levels increased significantly in estrous urine compared with nonestrous urine, whereas progesterone status was vice versa ($P < 0.05$). The lipid content was also significantly higher in estrous urine than in pre- and post-estrous urines ($P < 0.05$). There were also cyclical variations of volatiles and fatty acid profiles across phases of the estrous cycle. More acidic compounds were present in estrous urine, rendering it more acidic, than in pre- and post-estrous urines. Interestingly, oleic acid, which was present as a fatty acid in estrous- and post-estrous urines, appeared to be a volatile in postestrous urine and estrous cervical mucus. In addition, octanoic and butanoic acids were specific to both estrous urine and cervical mucus, indicating their possible candidature as estrous biomarkers. SDS-PAGE analysis showed pronounced expression of a 98 kDa protein in postestrous urine, which in matrix-assisted laser desorption ionization-time of flight mass spectrometry was identified as albumin. Our results demonstrate multiple biomarkers in estrous urine and specific volatiles in cervical mucus that offer scope to develop viable estrus detection kits for Kangayam cow.

Keyword: SDS-PAGE; FSH; Biomarkers; Estrogen; GC-MS; LH

372. Ecosystem changes following the eradication of invasive species: Evaluation of various eradication scenarios by computer simulation/ **Yoshida, Katsuhiko; Hata, Kenji; Kawakami, Kazuto; Hiradate, Syuntaro; Osawa, Takeshi; Kachi, Naoki.** Ecological Modelling. ISSN:0304-3800 (2019) v.413 p.108831 Ecological Modelling

DOI: 10.1016/j.ecolmodel.2019.108831

Link: <http://www.sciencedirect.com/science/article/pii/S0304380019303394>

Abstract: The decline of the natural ecosystem on the Ogasawara Islands caused by invasive species has been an important environmental problem and projects for eradicating invasive species are currently underway. Some invasive species have proliferated in the host environment and are affecting the material cycle in the ecosystem. If the invasive species were removed from the environment, the material cycle of the ecosystem may be altered and native species that should be protected may be negatively affected. After the introduction of invasive alien species, namely goats and rats, the vegetation declined on Nakoudojima Island, an island that belongs to the Ogasawara Islands. Therefore, in this study, a mathematical model was developed to simulate and analyze the ecosystem changes that occurred following the eradication of goats and rats. When only rats were eradicated, the island's vegetation changed to grassland but revegetation was delayed and the biomass of the native animal species did not recover significantly. When only goats were eradicated, the vegetation recovered and the biomass of the native animal species increased; however, the island became forested and many native herbaceous plant species became extinct. When goats and rats were eradicated simultaneously, the vegetation recovered and the biomass of the native animal species increased; however, the ecosystem became very unstable and two extreme results were obtained – the vegetation of the entire island changed to either forest or grassland. The results of this study suggest that instead of simply eradicating invasive species, it is necessary to monitor post-eradication changes in the ecosystem and take adaptive measures as required.

Keyword: Computer simulation; Ecosystem change; Eradication; insular ecosystem; Invasive species; Scenario evaluation

373. Invited review: A systematic review of the effects of prolonged cow–calf contact on behavior, welfare, and productivity/ **Meagher, Rebecca K.; Beaver, Annabelle; Weary, Daniel M.; von Keyserlingk, Marina A.G..** Journal of Dairy Science. ISSN:0022-0302 7(2019) v.102 p.5765-5783 Journal of Dairy Science

DOI: 10.3168/jds.2018-16021

Link: <http://www.sciencedirect.com/science/article/pii/S0022030219304369>

Abstract: ABSTRACT Separation of calves from cows within hours or days of birth is common on dairy farms. Stakeholders have conflicting perspectives on whether this practice is harmful or beneficial for the animals' welfare and production. Our objective was to critically evaluate the scientific evidence for both acute and long-term effects of early separation versus an extended period of cow–calf contact. The outcomes investigated were the behavior, welfare (excluding physical health), and performance (milk yield and growth, respectively) of dairy cows and calves. Primary research papers were found through targeted Web of Science searches, the reference lists of recent reviews for each topic, and the reference lists of papers identified from these sources. Studies were included if they were published in English, the full text was accessible, and they compared treatments with and without contact between

dairy cows and calves for a specified period. Early separation (within 24 h postpartum) was found to reduce acute distress responses of cows and calves. However, longer cow–calf contact typically had positive longer-term effects on calves, promoting more normal social behavior, reducing abnormal behavior, and sometimes reducing responses to stressors. In terms of productivity, allowing cows to nurse calves generally decreased the volume of milk available for sale during the nursing period, but we found no consistent evidence of reduced milk production over a longer period. Allowing a prolonged period of nursing increased calf weight gains during the milk-feeding period. In summary, extended cow–calf contact aggravates the acute distress responses and reduces the amount of saleable milk while the calves are suckling, but it can have positive effects on behaviors relevant to welfare in the longer term and benefit calf growth. The strength of these conclusions is limited, however, given that relatively few studies address most of these effects and that experimental design including timing of contact and observations are often inconsistent across studies. Few studies presented indicators of long-term welfare effects other than abnormal and social behavior of the calves.

Keyword: growth; animal behavior; animal welfare; maternal care; public attitudes

374. Thermoneutral temperature reduces liver volume but increases fat content in a mammalian hibernator/ **Wang, Xingyi; Watt, Christine F.; Sinclair, Kevin J.; McKenzie, Charles A.; Staples, James F.; MacCannell, Amanda D.V..** Journal of Thermal Biology. ISSN:0306-4565 (2019) v.83 p.172-177Journal of Thermal Biology

DOI: 10.1016/j.jtherbio.2019.05.015

Link: <http://www.sciencedirect.com/science/article/pii/S0306456518305618>

Abstract: Hibernators survive challenging winters by entering torpor, which lowers body temperature (T_b) to $\sim 5^\circ\text{C}$ for 12–14 days, followed by spontaneous arousals where T_b increases to $\sim 37^\circ\text{C}$ for 10–12 h before entering another torpor bout. This T_b cycle is accompanied by significant fluctuations in metabolic rate. Little is known about the role of the liver in lipid metabolism during hibernation. In this study we measured the effect of ambient temperature on liver volume and lipid content in 13-lined ground squirrels (*Ictidomys tridecemlineatus*). We housed animals at thermoneutral (25°C) or cold (5°C) ambient temperatures, with the same photoperiod (12 h light:12 h dark) for an entire year. We determined volume and water-fat ratio of the liver using magnetic resonance imaging (MRI). Ambient temperature significantly affected both liver volume and fat content. From October to August squirrels housed at 25°C had 25% smaller livers compared to the squirrels housed at 5°C , but their average lipid content (13.3%) was 37% higher. Because the squirrels housed at 25°C appeared to continue feeding throughout the winter but did not enter extended torpor, more carbohydrates may have been diverted to lipid stores. By contrast, animals housed at 5°C did not appear to feed, and carbohydrates would likely be preferentially stored in the liver as glycogen to supply glucose for brain metabolism. These results suggest that the fat burden caused by hibernators preparing for winter can lead to symptoms of metabolic syndrome, but that these symptoms are reversible in the spring.

Keyword: MRI; Ground squirrel; Hibernation; Lipid

375. Feeding strategies and shade type for growing cattle grazing endophyte-infected tall fescue/ **Johnson, K.A.; Busdieker-Jesse, N.; McClain, W.E.; Lancaster, P.A..** Livestock Science. ISSN:1871-1413 (2019) v.230 p.103829Livestock Science

DOI: 10.1016/j.livsci.2019.103829

Link: <http://www.sciencedirect.com/science/article/pii/S1871141319308819>

Abstract: Two experiments were conducted to determine animal performance of alternative feeding strategies to heifers grazing endophyte-infected tall fescue during summer months. In Experiment 1, 40 Limousin heifers (261 (40) kg initial BW) were stratified by weight and assigned to 1 of 4 treatments in a 2 × 2 factorial arrangement of treatments. Diet factors were either a spring harvested tall fescue silage diet fed ad libitum in grass traps (Silage) or grazing endophyte-infected tall fescue pasture with grain supplement (Grain; 2.1 kg DM hd⁻¹ d⁻¹), and shade factors were either natural (NAT; trees) or artificial (ART; 13.38 m²/pasture of 80% shade cloth) shade for 80 days. In Experiment 2, 40 Limousin heifers (277 (44) kg initial BW) were stratified by weight and assigned to 1 of 4 treatments in a 2 × 2 factorial arrangement of treatments. Diet factors were either a traditional grain supplement (Control) or feather-meal supplement (FM) while grazing endophyte-infected tall fescue pasture, and shade factors were either NAT or ART shade for 98 days. Control and FM supplements provided an estimated 56 and 175 mg metabolizable arginine/kg BW, respectively. Heifers were weighed on two consecutive days at the start and end of each experiment. In Experiment 1, weight gain of heifers was greater ($P < 0.05$) in Grain than Silage treatments (0.55 vs. 0.13 kg/d) and was greater ($P < 0.05$) for NAT than ART shade (0.39 vs. 0.29 kg/d). Cost of gain was greater ($P < 0.05$) for heifers fed Silage than Grain (7.26 vs. 1.56 \$/kg of gain). In Experiment 2, there was no difference ($P > 0.10$) in weight gain or cost of gain between Control and FM supplements. Heifers with NAT shade had a greater ($P < 0.05$) weight gain (0.74 vs. 0.65 kg/d) and lower ($P < 0.05$) cost of gain (2.01 vs. 2.27 \$/kg of gain) than ART shade. In conclusion, feeding early-spring harvested tall fescue silage or a supplement with high metabolizable arginine did not improve performance, and current recommendations for design of artificial shade structures may not be adequate for cattle grazing endophyte-infected tall fescue during summer.

Keyword: Beef cattle; Arginine; Ergot alkaloids; Shade; Tall fescue

376. The place cell activity is information-efficient constrained by energy/ Wang, Yihong; Xu, Xuying; Wang, Rubin. Neural Networks. ISSN:0893-6080 (2019) v.116 p.110-118Neural Networks

DOI: 10.1016/j.neunet.2019.04.001

Link: <http://www.sciencedirect.com/science/article/pii/S0893608019300991>

Abstract: Spatial representation is a crucial function of animal's brain. However, there is still no uniform explanation of how the spatial code is formed in different dimensional spaces to date. The main reason why place cell exhibits unique activity pattern is that the animal needs to retrieve and process spatial information. In this paper, we constructed a constrained optimization model based on information theory to explain the place field formation across species in different dimensional spaces. We proposed the following question that, using only limited amount of neural energy, how to organize the spiking locations (place field) in the available environment to obtain the most efficient spatial information representation? We solved this conditional functional extremum problem by variational techniques. The results showed that on the condition of limited neural energy, the place field will comply with a Gaussian-form distribution automatically to convey the largest amount information per spike. We also found that the animal's natural habitat property and locomotion experience statistics affected the symmetry of spatial representation in different dimensions. These findings not only reconcile the argument of whether the spatial codes of place cell are isotropic, but also provide an explanation of place field formation by an information-theoretic approach. Furtherly, this research revealed the energy economical and information efficient properties underlie the spatial representation system of the brain.

Keyword: Constrained optimization of functional; Place cell; Place field; Spatial information

377. Hydroxytyrosol influences exercise-induced mitochondrial respiratory complex assembly into supercomplexes in rats/ **Casuso, Rafael A.; Al-Fazazi, Saad; Hidalgo-Gutierrez, Agustín; López, Luis Carlos; Plaza-Díaz, Julio; Rueda-Robles, Ascensión; Huertas, Jesus R.** Free Radical Biology and Medicine. ISSN:0891-5849 (2019) v.134 p.304-310Free Radical Biology and Medicine

DOI: 10.1016/j.freeradbiomed.2019.01.027

Link: <http://www.sciencedirect.com/science/article/pii/S0891584918314709>

Abstract: Hydroxytyrosol (HT) has been demonstrated to improve mitochondrial function, both in sedentary and in exercised animals. Herein, we assessed the effects of two different doses of HT on exercise-induced mitochondrial respiratory complex (C) assembly into supercomplexes (SCs) and the relation of the potential results to OPA1 levels and oxidative stress. Wistar rats were allocated into six groups: sedentary (SED), sedentary consuming 20 mg/kg/d of HT (SED-20), sedentary consuming 300 mg/kg/d of HT (SED-300); exercised (EXE), exercised consuming 20 mg/kg/d of HT (EXE-20) and exercised consuming 300 mg/kg/d of HT (EXE-300). Animals were exercised and/or supplemented for 10 weeks, and assembly of SCs, mitochondrial oxidative status and expression of OPA1 were quantified in the gastrocnemius muscle. Both EXE and EXE-20 animals exhibited increased assembly of CI into SCs, but this effect was absent in EXE-300 animals. Levels of CIII2 assembled into SCs were only increased in EXE-20 animals. Notably EXE-300 animals showed a decreased relative expression of s-OPA1 isoforms. Therefore, HT exerted dose-dependent effects on SC assembly in exercised animals. Although the mechanisms leading to SCs assembly in response to exercise and HT are unclear, it seems that a high HT dose can prevent SCs assembly during exercise by decreasing the expression of the s-OPA1 isoforms.

Keyword: Exercise; Oxidative phosphorylation; Skeletal muscle; Mitochondria; Polyphenols

378. Evaluation of the protective effects of a nanogel-based vaccine against rabbit hepatitis E virus/ **Park, Byung-Joo; Ahn, Hee-Seop; Han, Sang-Hoon; Go, Hyeon-Jeong; Lee, Joong-Bok; Park, Seung-Yong; Song, Chang-Seon; Lee, Sang-Won; Paik, Hyun-Jong; Choi, Yang-Kyu; Choi, In-Soo.** Vaccine. ISSN:0264-410X 40(2019) v.37 p.5972-5978Vaccine

DOI: 10.1016/j.vaccine.2019.08.029

Link: <http://www.sciencedirect.com/science/article/pii/S0264410X1931093X>

Abstract: Infection with hepatitis E virus (HEV) has raised serious public health concerns worldwide. In this study, a nanogel-based vaccine encapsulating the capsid protein of rabbit HEV was developed and its protective efficacy was compared with a subunit vaccine. A total of 23 rabbits were divided into 5 groups: (1) negative control (n = 4), (2) positive control (n = 4), (3) nanogel control (n = 5), (4) nanogel vaccine (n = 5), and (5) subunit vaccine (n = 5). Rabbits were vaccinated two times, at weeks 0 and 1, with nanogel and subunit vaccines, respectively, and challenged with rabbit HEV at week 4. By week 11, rabbits vaccinated with the nanogel vaccine produced higher antibodies than those vaccinated with the subunit vaccine. Fecal viral shedding and viremia were identified in rabbits of the positive and nanogel control groups at weeks 6–10. However, there was no viral shedding and viremia in rabbits immunized with both the nanogel and subunit vaccines. Alanine aminotransferase and aspartate aminotransferase levels were not elevated in any rabbit. However, histopathological examination revealed much less hepatic inflammation in rabbits of the nanogel vaccine group compared to the positive and nanogel control groups. Significant increases in IL-12 and

IFN- γ levels were identified from rabbits immunized with the nanogel vaccine. Collectively, these results indicate that the newly developed nanogel vaccine induced sufficient immunity leading to complete protection from HEV infection in rabbits. Application of this vaccine should be considered as a preventive measure against HEV infection in other animal species and humans.

Keyword: Vaccine; Rabbit; HEV; Nanogel; Subunit

379. Copper modulates sex-specific fructose hepatotoxicity in non-alcoholic fatty liver disease (NALFD) Wistar rat models/ **Morrell, Austin; Tripet, Brian P.; Eilers, Brian J.; Tegman, Megan; Thompson, Damon; Copié, Valérie; Burkhead, Jason L.** The Journal of Nutritional Biochemistry. ISSN:0955-2863 (2019) v. p.108316The Journal of Nutritional Biochemistry

DOI: 10.1016/j.jnutbio.2019.108316

Link: <http://www.sciencedirect.com/science/article/pii/S0955286319307259>

Abstract: This study aimed to characterize the impact of dietary copper on the biochemical and hepatic metabolite changes associated with fructose toxicity in a Wistar rat model of fructose-induced liver disease. Twenty-four male and twenty-four female, 6-weeks old, Wistar rats were separated into four experimental dietary treatment groups (6 males and 6 females per group) as follows: (1) A control diet: containing no fructose with adequate copper (i.e., CuA/0% Fruct); (2) a diet regime identical to the control and supplemented with 30% w/v fructose in the animals' drinking water (CuA/30% Fruct); (3) a diet identical to the control diet but deficient in copper content (CuD/0% Fruct); and (4) a diet identical to the control diet but deficient in copper content and supplemented with 30% w/v fructose in the drinking water (CuD/30% Fruct). The animals were fed the four diet regimens for five weeks, followed by euthanization and assessment of histology, elemental profiles and identification and quantitation of liver metabolites. Results from ¹H NMR metabolomics revealed mechanistic insights into copper modulation of fructose hepatotoxicity through identification of distinct metabolic phenotypes that were highly correlated with diet and sex. This study also identified previously unknown sex-specific responses to both fructose supplementation and restricted copper intake, while the presence of adequate dietary copper promoted most pronounced fructose-induced metabolite changes.

Keyword:

380. Role of orexin-1 and -2 receptors within the nucleus accumbens in the acquisition of sensitization to morphine in rats/ **Assar, Nasim; Mahmoudi, Dorna; Mousavi, Zahra; Zarrabian, Shahram; Haghparast, Abbas.** Behavioural Brain Research. ISSN:0166-4328 (2019) v.373 p.112090Behavioural Brain Research

DOI: 10.1016/j.bbr.2019.112090

Link: <http://www.sciencedirect.com/science/article/pii/S0166432819302128>

Abstract: It has been reported that orexins A and B are involved in the mediation of drug reward. In addition, the nucleus accumbens (NAc) has an important role in the development of morphine-conditioned place preference (CPP) and morphine sensitization. In the present study, we aimed to evaluate the role of orexin receptors within the NAc in morphine sensitization using CPP paradigm. Adult male Wistar rats were used and were bilaterally implanted by two cannulae in the NAc. The animals received intra-accumbal administration of OX1 or OX2 receptor antagonists,

SB-334867 (0.1, 1, and 10 nM/side) or TCS OX2 29 (2, 10, and 20 nM/side), 10 min before morphine injection during the sensitization period, during which the animals received repeated administration of morphine (5 mg/kg; s.c.) once daily for three days followed by 5 morphine injection-free days. Then the CPP paradigm was conducted for the evaluation of morphine rewarding properties by injecting a sub-threshold dose of morphine (0.5 mg/kg; s.c.). The results showed that bilateral administration of OX1 receptor antagonist into the NAc reduced acquisition of morphine sensitization in a dose-dependent manner, but OX2 receptor antagonist produced similar effect only at its highest dose, indicating that OX1 and OX2 receptors within the NAc are involved in the acquisition of morphine sensitization.

Keyword: Rat; Morphine; Sensitization; Nucleus accumbens; Orexin system

381. How much do ecosystem engineers contribute to landscape evolution? A case study on Tatra marmots/ **Ballová, Zuzana; Pekárik, Ladislav; Píš, Vladimír; Šibík, Jozef.** CATENA. ISSN:0341-8162 (2019) v.182 p.104121CATENA

DOI: 10.1016/j.catena.2019.104121

Link: <http://www.sciencedirect.com/science/article/pii/S0341816219302632>

Abstract: Important influences of burrowing animals on ecosystems are reported from several environments. However, the impact of burrowing on alpine meadows has only been poorly studied. The largest and most widespread burrowing animals living in an alpine region are marmots. We tried to answer the following questions: Do marmots cause structural and compositional changes in alpine plant communities? Do marmots have a significant effect on soil properties? Do vegetation types differ according to their dependency on the functional utilization of the burrow? On a colony scale marmots significantly increased cover of herbs on next-to-burrow mound plots as opposed to on burrow and control plots, while they decreased cover of graminoids, lichens, and litter, which were the highest on sites without marmot activities. Equitability increased gradually in direction from controls, next-to-burrow mound plots to burrow plots. Simultaneously, marmots increased N, Mg and K on next-to-burrow mound plots as opposed to on burrow and control plots. Biopedturbation by marmots contributes to creating the gradient of vegetation between marmot free meadows and disturbed habitats. Tatra marmots encourage settlement of moisture and light-demanding plants with larger requirements for soil depth on their burrow mounds. On next-to-burrow mound plots they support acidophilous vegetation with grazing- and trampling-resistant or grazing-tolerant species. A considerable higher content of P was present directly on the mounds compared to next-to-burrow mound plots. Marmot activities alter soil properties, reduce the dominance of common species and thereby enhance community diversity. Their effects, depending on the volume and nature of their activities, are the strongest on hibernation and maternal burrows and their surroundings. Our results demonstrate the key role of environment-marmot interactions in alpine ecosystems and landscape development.

Keyword: Animal-plant interactions; Burrowing rodent's impact; Ecosystem engineers; Ecosystem processes; Geomorphic agents; Soil disturbance; Zoogeomorphology

382. Experimental infection in mice with *Erwinia persicina*/ **Mohamaden, Walaa I.; Zhen-fen, Zhang; Hegab, Ibrahim M.; Shang-li, Shi.** Microbial Pathogenesis. ISSN:0882-4010 (2019) v.130 p.38-43Microbial Pathogenesis

DOI: 10.1016/j.micpath.2019.01.050

Link: <http://www.sciencedirect.com/science/article/pii/S0882401018312324>

Abstract: *Erwinia persicina* (*E. persicina*) is a plant pathogenic bacterial species that was previously isolated from a case of human infection. This study aimed to create an experimental infection protocol for *E. persicina* in laboratory mice. Seventy-two adult mice were divided into four groups (18 animal/group): the control group (G1), the group infected with *E. persicina* (G2), the group immune-suppressed with cyclophosphamide (G3) and the group immune-suppressed with cyclophosphamide and infected with *E. persicina* (G4). G2 and G4 were injected with 200 µL of (1×10^{13} cfu/ml) concentration intraperitoneally. Clinical signs, such as diarrhoea, apathy and mortality were observed only in G2 and G4 animals. *E. persicina* was not detected in blood. Necropsies of the G2 and G4 animals showed lesions in the intestine, liver, kidney and lung tissue. These lesions were characterized by infiltration of inflammatory cells, hyperaemia and focal areas of tissue necrosis in the liver. The results of the pro-inflammatory cytokines analysis revealed a significant increase in the levels of TNF- α and IL1- β in the liver tissue of the G4 group. *E. persicina* is an emerging bacterium that can cause pathological lesions into mammalian tissue, which warrants further investigation.

Keyword: Mice; Histopathology; Clinical signs; IL1- β ; TNF- α

383. Fatal lancehead pit viper (*Bothrops* spp.) envenomation in horses/ **Machado, Mizael; Wilson, Tais Meziara; Ribeiro de Sousa, Davi Emanuel; Lopes Câmara, Antônio Carlos; Furlan, Fernando Henrique; Silva Almeida e Macêdo, Juliana Targino; Pupin, Rayane Chitolina; Amaral de Lemos, Ricardo Antônio; Armién, Anibal G.; Barros, .** *Toxicon*. ISSN:0041-0101 (2019) v.170 p.41-50 *Toxicon*

DOI: 10.1016/j.toxicon.2019.09.002

Link: <http://www.sciencedirect.com/science/article/pii/S0041010119304441>

Abstract: Snake bite envenomations in farm animals are generally overestimated as the cause of mortality in rural areas in Latin America. However, most cases are based only on anecdotal information and assumptions, and lack diagnostic evidence. There are few proven reports of envenomation and death in horses caused by snakebites from members of the *Bothrops* genus (lancehead pit vipers). This study presents epidemiological and clinical-pathological findings of fatal bothropic envenomation in horses from Central Western Brazil in order to contribute to the correct diagnosis of this condition. A survey of the records of equine necropsies from the Veterinary Pathology Laboratories of the University of Brasilia, Federal University of Mato Grosso and Federal University of Mato Grosso do Sul, from January 2010 to February 2018, was performed. Five fatal cases of bothropic snakebite were identified in 755 necropsies of horses, corresponding to 0.66% of these cases, ranging annually from 0.33% to 0.89%. The main necropsy findings were marked swelling and diffuse subcutaneous hemorrhage, and identification of the fang marks in 2 out of five horses. Hemorrhage in most organs and tissues was the pathological hallmark of systemic envenomation. Myonecrosis, dermonecrosis, and moderate to severe kidney degeneration and necrosis were also observed. Fatal *Bothrops* snakebites in horses have a low occurrence in Central Western Brazil and most cases occur in the rainy season. The diagnosis of this condition may be substantiated by clinical signs and pathological findings. Local hemorrhage and necrosis, systemic hemorrhagic disorders and injuries related to acute kidney injury are the predominant clinical signs. These findings should be considered in the diagnosis and therapeutic management of these envenomations.

Keyword: Horses; Acute kidney injury; Coagulopathy; Endothelial injury; Snake; Snakebite

384. The relationship between volatile compounds, metabolites and sensory attributes: A case study using lamb and sheep meat/ **Grabež, Vladana; Bjelanović, Milena; Rohloff, Jens; Martinović, Aleksandra; Berg, Per; Tomović, Vladimir; Rogić, Biljana; Egelanddal, Bjørg.** Small Ruminant Research. ISSN:0921-4488 (2019) v.181 p.12-20Small Ruminant Research

DOI: 10.1016/j.smallrumres.2019.09.022

Link: <http://www.sciencedirect.com/science/article/pii/S0921448819301828>

Abstract: The aim of this study was to use a flavoromics approach to identify key compounds responsible for sensory flavor of lamb and sheep meat. The investigation was confined to volatile compounds from adipose tissue and metabolites in lean meat using headspace-gas chromatography/mass spectrometry (HS-GC/MS) and solvent extraction-GC/MS, respectively. Partial least square regression analysis supported with variable selection were used to correlate identified compounds to sensory attributes. Several metabolites involved in energy production via Krebs cycle and Embden-Meyerhof-Parnas pathway contributed to gamy and grass flavor. Gamy flavor was strongly and positively correlated with aspartic acid, cyclo-leucine, gluconic, citric and pyruvic acid. Gluconic and pyruvic acid together with formic acid, β -caryophyllene, 3-methylphenol, 2-ethylfuran showed strong positive correlation with grass flavor. Sugars (glucose, mannose-6-phosphate and myo-inositol) were negatively correlated with gamy and grass flavor, suggesting a role in suppression of off-flavors in lamb and sheep meat. Bitter flavor was strongly correlated with hypotaurine and (E)-2-pentenal. Metallic flavor and bitterness were influenced by almost the same compounds. Acidic flavor was not explained by any compound identified, while rancidity was not detected by panelists. Finally, the flavor components describing grass and bitter flavor could be used to discriminate animals from different production systems.

Keyword: Sheep; Adipose tissue volatiles; Lean meat metabolites; Sensory attributes

385. Hematological and biochemical parameters in Sea turtles (*Caretta caretta*) after stranding/ **Pagano, M.; Vazzana, I.; Gentile, A.; Caracappa, G.; Faggio, C.** Regional Studies in Marine Science. ISSN:2352-4855 (2019) v.32 p.100832Regional Studies in Marine Science

DOI: 10.1016/j.rsma.2019.100832

Link: <http://www.sciencedirect.com/science/article/pii/S2352485519302075>

Abstract: The turtle *Caretta caretta* is the most abundant of sea turtles that reproduces in the Mediterranean Sea. *Caretta caretta* is also classified as a vulnerable species and the Mediterranean population in the past years has been in decline. The danger for these marine organisms is linked to the anthropization of the coasts, to marine traffic, to the pollution of the sea, above all due to the presence of plastic debris and threats related to fishing. The aim of this study was to document the state of health of these animals after stranding. We examined whether hematological and biochemical parameters determine the survival of the individual or not. We highlighted how anthropic pressure continues to alter the typical ecosystems of the Mediterranean Sea. Turtles that cannot survive after stranding show altered hematological and biochemical parameters compared to surviving individuals. This highlights the presence in these animals of severe anemia, kidney damage (evidenced by increased level of uric acid and alanine transferase) and cellular necrosis in various tissues (high levels of aspartate aminotransferase and Lactate dehydrogenase). The results obtained show that the hematological and biochemical parameters can be a good tool to evaluate the possibility of survival of stranded turtles.

Keyword: Biochemical parameters; Hematological parameters; Mediterranean sea; Sea turtle

386. Saffron (*Crocus sativus*) aqueous extract reverses the hypothalamus-pituitary-adrenal axis activity in rat model of post-traumatic stress disorder/ **Asalgoo, Sara; Pirzad Jahromi, Gila; Hatef, Boshra; Sahraei, Hedayat; Raouf Sarshoori, Javad; Sadr, Seyed Shahabeddin; Meftahi, Gholam Hossein.** Revista Brasileira de Farmacognosia. ISSN:0102-695X 4(2019) v.29 p.470-476Revista Brasileira de Farmacognosia

DOI: 10.1016/j.bjp.2019.01.011

Link: <http://www.sciencedirect.com/science/article/pii/S0102695X18305258>

Abstract: *Crocus sativus* L., Iridaceae, has been used worldwide in traditional medicine for treatment of some neurological disorders such as depression. Post-traumatic stress disorder is a mental disorder developed in people who experience stressful events. Since stress has been proposed to cause the hypothalamic-pituitary-adrenal axis malfunction in post-traumatic stress disorder patients, this study aimed at investigating the effect of saffron aqueous extract on hypothalamic-pituitary-adrenal axis activity in rats of post-traumatic stress disorder model. Here, Post-traumatic stress disorder animals received an acute electro foot shock; however, 5 min before the stress session, these animals received an intra-cerebral-ventricular (10 µg/rat) infusion of either saffron aqueous extract or saline. Twenty one days later, they were re-exposed to the stress box without inducing stress, and then were examined for their freezing behavior. The impact of stress and saffron aqueous extract on serum corticosterone, corticotrophin releasing hormone gene expression in hypothalamus and glucocorticoid receptor gene expression in pituitary gland were then evaluated on day 28. Intra-cerebral-ventricular injection of saffron aqueous extract resulted in an increase in serum corticosterone level and reduced symptoms of freezing behavior, and corticotrophin releasing hormone and glucocorticoid receptor gene expression in post-traumatic stress disorder groups. Saffron administration could improve the symptoms of stress-induced post-traumatic stress disorder, possibly through the adjustment of hypothalamic-pituitary-adrenal axis function.

Keyword: Post traumatic stress disorder; Corticosterone; corticotrophin releasing hormone; freezing behavior; glucocorticoid receptor; Saffron aqueous extract

387. Protective effect of resveratrol against hepatic damage induced by heat stress in a rat model is associated with the regulation of oxidative stress and inflammation/ **Cheng, Kang; Yan, Enfa; Song, Zhihua; Li, Simian; Zhang, Hao; Zhang, Lili; Wang, Chao; Wang, Tian.** Journal of Thermal Biology. ISSN:0306-4565 (2019) v.82 p.70-75Journal of Thermal Biology

DOI: 10.1016/j.jtherbio.2019.03.012

Link: <http://www.sciencedirect.com/science/article/pii/S0306456519300257>

Abstract: Heat stress jeopardizes humans and animals health, and results in enormous economic loss in public health care and livestock production. The aim of this study was to investigate the effects of resveratrol on hepatic oxidative stress and inflammation in heat-stressed rats. Male Sprague-Dawley rats were orally fed with 100 mg resveratrol/kg body weight/day prior to heat stress (40 °C per day for 1.5 h) exposure for 3 consecutive days. Serum and liver samples were collected for the analysis of hepatic injury, redox status and immune response. The results showed that the heat-stress-induced increased aspartate aminotransferase activities in the serum, aberrant hepatic histology, excessive hepatic malondialdehyde and tumor necrosis factor alpha concentrations, and up-regulation of heat shock protein 70, superoxide dismutase 1, glutathione peroxidase 1, toll-like receptor 4 and interleukin

10 mRNA expression in the liver were mitigated by oral resveratrol treatment. Collectively, the beneficial effects of resveratrol on hepatic damage induced by heat stress were associated with the regulation of oxidative stress and inflammation.

Keyword: Liver; Oxidative stress; Inflammation; Rats; Heat stress; Resveratrol

388. Semen Characteristics and Hematology of Nigerian Local Cocks Fed Varying Dietary Levels of Ethiopian Pepper Fruit Meal/ **Uzochukwu, I.E.; Amaefule, B.C.; Aba, C.N.; Nnajiofor, N.W.; Machebe, N.S.; Foleng, H.N.** Journal of Applied Poultry Research. ISSN:1056-6171 4(2019) v.28 p.1106-1114Journal of Applied Poultry Research

DOI: 10.3382/japr/pfz073

Link: <http://www.sciencedirect.com/science/article/pii/S1056617119322755>

Abstract: SUMMARY This study evaluated the effect of Ethiopian pepper (*Xylopi aethiopica*) fruit meal (EPFM) on the semen quality and hematology of Nigerian light ecotype local cocks. A total of 90 mature cocks (weighing about 1.4 ± 1.00 kg) were randomly assorted into 5 treatments groups: T1, T2, T3, T4, and T5 with 18 cocks per treatment in a completely randomized design. The birds in T1, T2, T3, T4, and T5 were fed basal diets containing EPFM at the levels of 0, 2, 4, 6, and 8 g/kg diet, respectively. Semen was collected twice per week using the abdominal massage method, while blood samples were collected at the eighth week of study for hematological analysis. Sperm concentration, sperm motility, live sperm cells, normal sperm cells, and total sperm count were higher in birds fed 2 and 4 g EPFM compared to the control group. At and above 6 g/kg diet, EPFM was observed to significantly decrease semen quality. The hematology results showed no significant differences among the different treatments in the considered indices. From these findings, we conclude that addition of EPFM up to 4 g/kg diet could be used to improve semen quality of cocks without detrimental effects on the physiological status of the birds.

Keyword: chicken; semen quality; artificial insemination; hematology

389. Arachidonic acid-rich ARASCO oil has anti-inflammatory and antidiabetic actions against streptozotocin + high fat diet induced diabetes mellitus in Wistar rats/ **Gundala, Naveen K.V.; Das, Undurti N.** Nutrition. ISSN:0899-9007 (2019) v.66 p.203-218Nutrition

DOI: 10.1016/j.nut.2019.05.007

Link: <http://www.sciencedirect.com/science/article/pii/S0899900718311705>

Abstract: Objectives The aim of this study was to investigate the effects of arachidonic acid (AA)-rich ARASCO oil on high-fat diet (HFD) + streptozotocin (STZ)-induced diabetes mellitus in male Wistar rats and its possible mechanisms of action. Methods Male Wistar rats with HFD + STZ-induced diabetes were employed in the present study. ARASCO oil was administered orally for the first 7 d consecutively, followed by once weekly throughout the study (14 wk). At various time points, blood glucose and body weight and oral glucose tolerance tests were measured. At the end of the study, animals were sacrificed to collect plasma and various organs and stored at -80°C . Plasma insulin, tumor necrosis factor- α , interleukin-6, and lipoxin A4 were measured. Expression of the following genes was determined: nuclear factor- κB (NF- κB), cyclooxygenase-2 (COX-2), 12-lipoxygenase (12-LOX) in pancreas and lipocalin 2 (LPCLN2) in adipose tissue. Various antioxidants were measured in the plasma and other tissues. Area under the curve and insulin sensitivity index were assessed by computing homeostatic model of assessment for insulin resistance,

quantitative insulin check index, Matsuda, and Belfiore indices. Results ARASCO oil treatment decreased hyperglycemia, restored insulin sensitivity, suppressed inflammation, enhanced plasma lipoxin A4 levels, and reversed altered antioxidant status to near normal in animals with HFD + STZ-induced diabetes. Conclusion These results suggest that ARASCO, a rich source of AA, can prevent HFD + STZ-induced diabetes in Wistar rats owing to its anti-inflammatory action. It remains to be seen whether ARASCO oil is useful in preventing or postponing the development of type 2 diabetes mellitus in humans.

Keyword: High-fat diet; Type 2 diabetes mellitus; antioxidant; arachidonic acid; ARASCO oil; lipoxin A4; Polyunsaturated fatty acid

390. Ileal digestibility of amino acids in corn condensed distiller's solubles and whole stillage for pigs/ **Yang, X.; Kim, J.; Pangeni, D.; Tekeste, A.; Ren, P.; Manu, H.; Baidoo, S.K.**. Animal Feed Science and Technology. ISSN:0377-8401 (2019) v.255 p.114202Animal Feed Science and Technology

DOI: 10.1016/j.anifeedsci.2019.114202

Link: <http://www.sciencedirect.com/science/article/pii/S0377840116303091>

Abstract: The immense growth in global bioethanol production has greatly increased the supply of by-products such as whole stillage and condensed distiller's solubles, which could be potentially used for animal feeding. The objective of this experiment was to determine apparent ileal digestibility coefficients (AID) and standardized ileal digestibility coefficients (SID) of crude protein and amino acids in corn condensed distiller's solubles (CCDS) and corn whole stillage (CWS) when fed to pigs. A total of 18 finishing barrows with an average initial body weight 79.4 ± 4.5 kg and a simple T cannula in the distal ileum were used in this experiment. Two test diets were formulated with CCDS or CWS as the sole source of amino acids, and a nitrogen free diet was used for estimation of basal ileal endogenous losses of crude protein and amino acids. The direct procedure was employed for calculation of AID and SID in the two by-products. Compared with CWS, CCDS had higher SID of crude protein (0.864 vs. 0.796; $P = 0.03$) and lysine (0.821 vs. 0.743, $P = 0.10$), but lower SID of methionine (0.730 vs. 0.831, $P = 0.009$), and similar SID of threonine (0.762 vs. 0.710, $P = 0.26$), tryptophan (0.862 vs. 0.863, $P = 0.98$), and cysteine (0.675 vs. 0.686, $P = 0.74$). The information generated from this experiment can be used for formulation of swine diets containing these two ethanol by-products.

Keyword: Digestibility; Pig; Amino acids; Corn condensed distiller's solubles; Corn whole stillage

391. Blunted hyperphagic and c-Fos immunoreactivity responsiveness to an orexigen, butorphanol tartrate, in aged rats/ **Olszewski, Pawel K.; McColl, Laura K.; Herisson, Florence M.; Klockars, Anica; Levine, Allen S.**. Neuroscience Letters. ISSN:0304-3940 (2019) v.711 p.134409Neuroscience Letters

DOI: 10.1016/j.neulet.2019.134409

Link: <http://www.sciencedirect.com/science/article/pii/S0304394019305129>

Abstract: Administration of the mixed opioid agonist-antagonist butorphanol tartrate (BT) has been shown to robustly increase food intake in rodent models utilizing adult and young animals. BT at orexigenic doses increases c-Fos-immunoreactivity (IR) in brain areas associated with feeding for energy as well as for reward, including the paraventricular nucleus of the hypothalamus, central nucleus of the amygdala and nucleus of the solitary tract. Interestingly, aged rats given standard chow show a diminished feeding response to BT. It is not known, however,

whether this weakened orexigenic response in aged animals extends to palatable tastants and whether it is accompanied by changes in brain activation. In the current study, we injected adult (11–12 months) and aged (26–27 months) rats with BT and studied the effect on intake of chow and palatable ingestants (liquid and solid). We found that BT produced only a moderate increase in consumption of bland or palatable chow as well as sweet solutions (both caloric and non-caloric) in aged rats, and that higher BT doses are required to generate such eating in old animals compared to adults. This blunted hyperphagia after BT is accompanied by diminished c-Fos IR in the central and basolateral amygdala, regions that process emotional aspects of behaviors, including food intake. Thus, aged rats exhibit diminished responsiveness to the feeding effects of BT, independent of the type of diet; and it appears to be due, in part, to diminished neural activity in central circuits involved in emotional behavior.

Keyword: Feeding; Hypothalamus; Palatability; Opioids; Appetite

392. Drivers of water and land use embodied in international soybean trade/ **Taherzadeh, Oliver; Caro, Dario.** Journal of Cleaner Production. ISSN:0959-6526 (2019) v.223 p.83-93Journal of Cleaner Production

DOI: 10.1016/j.jclepro.2019.03.068

Link: <http://www.sciencedirect.com/science/article/pii/S0959652619307590>

Abstract: International trade of soybeans has increased substantially over recent decades. Its environmental toll is routinely linked to deforestation and biodiversity loss. However, soybean trade also imposes a huge demand on water and land resources, in individual countries and globally. Such a burden, and its underlying sectoral drivers, is frequently overlooked within the current research and policy agenda around sustainable soybean supply chains. This study evaluates the Virtual Water Trade (VWT) and Virtual Land Trade (VLT) of global soybean trade and reveals which countries and sectors are responsible. Soybean-related VWT and VLT are estimated by combining physical import and export data and associated resource use information from 166 countries during the period 2000–2016. Over this period global virtual soybean-related virtual water and land trade grew by 298% and 250% respectively. In 2016, 812 Gm³ of water use and 41 Mha of land use was directly embodied in international soybean trade. This corresponds to one-third of water and land used to grow soybean globally. Soybean-related VWT and VLT was mainly driven by demand in China, the Netherlands and Mexico, for soybean grown in the US, Brazil and Argentina. Animal feed is responsible for around three-quarters of this resource use. A reduction in the consumption of animal products or switching to direct human consumption of soybeans would reduce the overall demand for soybean production and associated resource use. Although welcome, calls for deforestation-free soybean supply chains do not go far enough to reduce the large, global water and land demand of soybean trade. The research and policy agenda around soybean trade warrants a broader focus on water and land use and whether this represents an efficient, and logical, allocation of resources within the context of food provision and national resource security.

Keyword: Animal feed; International soybean trade; Sectoral responsibility; Virtual land trade; Virtual water trade

393. Salient Spin Images : an application to archaeozoology for bones recognition/ **H'roua, Jihad; Roy, Michaël; Mansouri, Alamin; Mammass, Driss; Bouzit, Ali; Méniel, Patrice; Bekkari, Aissam.** Procedia Computer Science. ISSN:1877-0509 (2019) v.148 p.590-599THE SECOND INTERNATIONAL CONFERENCE ON INTELLIGENT COMPUTING IN DATA SCIENCES, ICDS2018

DOI: 10.1016/j.procs.2019.01.032

Link: <http://www.sciencedirect.com/science/article/pii/S1877050919300328>

Abstract: Archaeozoology or zooarchaeology is the scientific field that aims to rebuild natural and cultural relations between human and animals. To reach that objective, archaeozoologists study faunal remains, such as bones. In this regard, a 3D representation is put into place. This would allow a better understanding of the initial spatial positions of the animals in the pits, and would make it possible to examine in a more rigorous manner the explanatory hypotheses by manipulating the 3D view of the pit and bones. This manipulation invokes the use of computer vision techniques, including 3D object recognition methods. In this work we present a novel approach to recognize 3D bones in occluded and cluttered scenes inspiring from a state of the art method called spin images. We combine this method with saliency concept to improve the robustness to occlusions and clutters significantly and also to decrease the complexity of the algorithm.

Keyword: performance; 3D object; archaeozoology; clutters; complexity; occlusions; recognition; recognition rate; spin

394. Effects of the duration of transcutaneous CO₂ application on the facilitatory effect in rat fracture repair/ Oda, Takahiro; Iwakura, Takashi; Fukui, Tomoaki; Oe, Keisuke; Mifune, Yutaka; Hayashi, Shinya; Matsumoto, Tomoyuki; Matsushita, Takehiko; Kawamoto, Teruya; Sakai, Yoshitada; Akisue, Toshihiro; Kuroda, Ryosuke; Niikura, Takahiro. Journal of Orthopaedic Science. ISSN:0949-2658 (2019) v. p. Journal of Orthopaedic Science

DOI: 10.1016/j.jos.2019.09.017

Link: <http://www.sciencedirect.com/science/article/pii/S0949265819302921>

Abstract: Background Carbon dioxide therapy has been reported to be effective in treating certain cardiac diseases and skin problems. Although a previous study suggested that transcutaneous carbon dioxide application accelerated fracture repair in association with promotion of angiogenesis, blood flow, and endochondral ossification, the influence of the duration of carbon dioxide application on fracture repair is unknown. The aim of this study was to investigate the effect of the duration of transcutaneous carbon dioxide application on rat fracture repair. Methods A closed femoral shaft fracture was created in each rat. Animals were randomly divided into four groups: the control group; 1w-CO₂ group, postoperative carbon dioxide treatment for 1 week; 2w-CO₂ group, postoperative carbon dioxide treatment for 2 weeks; 3w-CO₂ group, postoperative carbon dioxide treatment for 3 weeks. Transcutaneous carbon dioxide application was performed five times a week in the carbon dioxide groups. Sham treatment, where the carbon dioxide was replaced with air, was performed for the control group. Radiographic, histological, and biomechanical assessments were performed at 3 weeks after fracture. Results The fracture union rate was significantly higher in the 3w-CO₂ group than in the control group ($p < 0.05$). Histological assessment revealed promotion of endochondral ossification in the 3w-CO₂ group than in the control group. In the biomechanical assessment, all evaluation items related to bone strength were significantly higher in the 3w-CO₂ group than in the control group ($p < 0.05$). Conclusions The present study, conducted using an animal model, demonstrated that continuous carbon dioxide application throughout the process of fracture repair was effective in enhancing fracture healing.

Keyword:

395. Exploration of potential triggers for self-directed behaviours and regurgitation and reingestion in zoo-housed chimpanzees/ **Wallace, Emma K.; Herrelko, Elizabeth S.; Koski, Sonja E.; Vick, Sarah-Jane; Buchanan-Smith, Hannah M.; Slocombe, Katie E.** Applied Animal Behaviour Science. ISSN:0168-1591 (2019) v.221 p.104878Applied Animal Behaviour Science

DOI: 10.1016/j.applanim.2019.104878

Link: <http://www.sciencedirect.com/science/article/pii/S0168159119301388>

Abstract: The unique challenges faced by animals living in zoos can lead to the production of anxiety-related behaviours. In this study we aimed to understand what specific factors may cause chimpanzees to display these behaviours. In non-human primates, displacement behaviours, such as self-scratching and yawning, are considered markers of anxiety and stress, and Regurgitation and Reingestion (R/R) is considered an abnormal behaviour with negative consequences for physical health. We examined the possible triggers of R/R, scratching, and yawning in a group of zoo-housed chimpanzees and followed this up with an analysis of long-term data to examine further aspects of R/R behaviour. In the first study we conducted focal observations on 18 adult chimpanzees at Edinburgh Zoo, UK, in addition to all occurrence sampling of visitors using flash photography, screaming and banging on the glass in the exhibit. 158 h of data were analysed and Generalised Linear Mixed Models revealed that yawning was significantly more likely if there was a long period of time since the last feed and when there were moderate numbers of visitors in the zoo. There were trends that yawning was more likely to occur if children screamed and that scratching was more likely to occur if visitors used flash photography. R/R occurred most often within 40 min of a feed, but was not affected by the inter-feed interval preceding that feed, positive or negative social interactions, or visitor numbers or behaviour. As there was no obvious daily trigger for R/R, an analysis of long-term data (2009 to 2015) was conducted to investigate if social or dietary factors affected rates of R/R over a larger timescale. It was found that R/R rates in the months before a significant diet change were not different from R/R rates in the months after, but it was found that R/R rates decreased over the five-year period. Lastly, we found no evidence that the introduction of individuals engaging in R/R lead to resident chimpanzees habitually adopting the behaviour, despite considerable opportunities to observe it. These findings have implications for welfare interventions aimed to reduce R/R and/or anxiety behaviours in captive populations and for the translocation of individuals that are known to engage in R/R between groups.

Keyword: Animal welfare; Anxiety-related behaviour; Chimpanzees; Regurgitation and reingestion; Scratching; Yawning

396. Effect of fish oil supplementation and restricted feeding on body fat distribution and blood lipid profile in a rabbit model of castration-induced obesity/ **Grigorova, N.; Ivanova, Zh.; Bjorndal, B.; Vachkova, E.; Penchev, G.; Berge, R.; Ribarski, S.; Georgieva, T. Mircheva; Yonkova, P.; Georgiev, I. Penchev.** Research in Veterinary Science. ISSN:0034-5288 (2019) v.124 p.99-105Research in Veterinary Science

DOI: 10.1016/j.rvsc.2019.02.012

Link: <http://www.sciencedirect.com/science/article/pii/S0034528818313079>

Abstract: This study investigates the effect of fish oil supplementation and restricted feeding on body fat distribution and blood lipid profile in experimentally induced obesity in rabbits. The trial was carried out with 30 male rabbits, divided into 5 groups of 6 animals each (NC – non-castrated, non-treated, full-diet fed; C100 – castrated, non-treated, full-diet fed; FO100 – castrated, treated with fish oil, full-diet fed; C50 – castrated, non-treated, 50% restricted fed; FO50 – castrated, treated with fish oil, 50% restricted fed). At the end of the experiment, plasma lipids measurement

and quantification of fat distribution was performed. The results of this study indicate that fish oil supplementation reduces obesity-associated abnormalities in lipid profile (high-density lipoprotein cholesterol to low-density lipoprotein cholesterol ratio and non-esterified fatty acids) and in body fat distribution in full-diet fed rabbits. Restricted feeding (C50) alone and the combination of restricted feeding and fish oil supplementation (FO50) in particular, has a detrimental effect on the lipid profile despite the marked reduction in intra-abdominal fat.

Keyword: Rabbit; Restricted feeding; Obesity; Blood lipid profile; Fat distribution; Fish oil

397. The effect of peripheral nervous system in growing bone biomechanics. An experimental study/ **Gkiatas, Ioannis; Kostas-Agnantis, Ioannis; Agathopoulos, Symeon; Papadopoulos, Dimitrios; Vekris, Marios; Gelalis, Ioannis; Gavrielatos, Vasilios; Korompilias, Anastasios.** Journal of Orthopaedics. ISSN:0972-978X 3(2019) v.16 p.289-292 Journal of Orthopaedics

DOI: 10.1016/j.jor.2019.05.003

Link: <http://www.sciencedirect.com/science/article/pii/S0972978X19301643>

Abstract: Objective There are several factors which affect bone growth. One of them is the peripheral nervous system whose effect on the biomechanics has not been extensively studied. The purpose of this study is to assess the effect of peripheral nervous system in bone biomechanics in an experimental rat model. Materials & methods 27 male Wistar rats were used. In all animals, the roots of the right brachial plexus were dissected and after that the animals were divided into three groups A, B and C. The animals were sacrificed six, nine, and twelve months respectively after the denervation. Both humerus were resected and biomechanical analysis was performed. Results According to the findings of the present study the denervated bones sustain less loading before fracture and they become also more elastic. Additionally, in greater time after denervation plastic deformity is noticed. Conclusion Apart from structural changes, the peripheral nerves are responsible for biomechanic changes in the bones such the greater elasticity of the bone and the reduced strength

Keyword: Biomechanics; Bone; Denervation; Peripheral nervous system

398. Adaptive responses in short-chain fatty acid absorption, gene expression, and bacterial community of the bovine rumen epithelium recovered from a continuous or transient high-grain feeding/ **Petri, R.M.; Wetzels, S.U.; Kumar, M.; Khiaosa-ard, R.; Zebeli, Q..** Journal of Dairy Science. ISSN:0022-0302 6(2019) v.102 p.5361-5378 Journal of Dairy Science

DOI: 10.3168/jds.2018-15691

Link: <http://www.sciencedirect.com/science/article/pii/S0022030219303558>

Abstract: ABSTRACT The feeding of high-grain diets to dairy cows commonly results in lowered pH and ruminal dysbiosis, characterized by changes in absorption dynamics of short-chain fatty acids (SCFA) across the reticuloruminal wall, epithelial function, and the epithelial bacteria community structure. Therefore, the present study evaluated the effect of high-grain feeding persistence on the absorption kinetics of reticuloruminal SCFA, gene expression in the rumen epithelium, and the associated shifts in the epithelial bacteria in cows recovering from either a long-term continuous high-grain feeding model or a long-term transient high-grain feeding model. In a crossover study design, 8 nonlactating Holstein cows were fed 60% concentrate either continuously for 4 wk (continuous) or

with a 1-wk break in the second week of the high-grain feeding (transient). After the high-grain feeding, all animals were fed a diet of 100% forage (recovery) for an additional 8 wk. Rumen papilla biopsies and SCFA absorption measurements were taken at the start of the trial (baseline), after the 4-wk high-grain feeding (49 d), after 2-wk recovery forage feeding (63 d), and after 8-wk recovery forage (105 d). Absorption of SCFA was determined in vivo using the washed and isolated reticulorumen technique. Rumen papillae biopsies were used for adherent bacterial DNA and host RNA extraction. The epithelial bacteria were determined using Illumina MiSeq (Microsynth AG, Balgach, Switzerland) sequencing of the 16S rRNA gene. No significant effects of the high-grain feeding model were seen for bacterial diversity. However, bacterial diversity increased with time spent in the recovery forage feeding period regardless of feeding model. The relative abundance of Acidobacteria phyla and Acetivibrio spp. increased when animals were fed a transient high-grain feeding model. A trend toward increased CLDN4 expression was observed in the continuous model. Furthermore, there were interactions between feeding model and sampling day for gene targets CD14, DRA, NHE2, NHE3, and MCT2. When comparing length of recovery, in the continuous model increased relative absorption of SCFA was sustained at 63 d but dropped to baseline measurements at 105 d. A similar pattern was found with the transient model but it did not reach significance. The only gene target that was found to significantly correlate to relative absorption of SCFA was DRA (correlation coefficient ≤ -0.41). Whereas, genera Alkalibaculum, Anaerorhabdus, Coprococcus, and Dethiobacter all showed positive correlations to gene targets for pH regulation (NHE2 and NHE3) and SCFA uptake (MCT1) but negative correlations to SCFA absorption. We conclude that while the rumen absorption and epithelial bacteria were able to recover to baseline levels after 8 wk of forage feeding, the time needed for re-establishment of homeostasis in host gene expression is longer, especially when high-grain feeding is interrupted.

Keyword: bacteria; gene expression; rumen epithelium; ruminal absorption

399. MicroRNA-Based Prophylaxis in a Mouse Model of Cirrhosis and Liver Cancer/ Callegari, Elisa; Domenicali, Marco; Shankaraiah, Ram Charan; D'Abundo, Lucilla; Guerriero, Paola; Giannone, Ferdinando; Baldassarre, Maurizio; Bassi, Cristian; Elamin, Bahaeldin K.; Zagatti, Barbara; Ferracin, Manuela; Fornari, Francesca; Altavilla, Gius. Molecular Therapy - Nucleic Acids. ISSN:2162-2531 (2019) v.14 p.239-250Molecular Therapy - Nucleic Acids

DOI: 10.1016/j.omtn.2018.11.018

Link: <http://www.sciencedirect.com/science/article/pii/S2162253118303147>

Abstract: Most hepatocellular carcinomas (HCCs) arise in the context of chronic liver disease and/or cirrhosis. Thus, chemoprevention in individuals at risk represents an important but yet unproven approach. In this study, we investigated the ability of microRNA (miRNA)-based molecules to prevent liver cancer development in a cirrhotic model. To this end, we developed a mouse model able to recapitulate the natural progression from fibrosis to HCC, and then we tested the prophylactic activity of an miRNA-based approach in the model. The experiments were carried out in the TG221 transgenic mouse, characterized by the overexpression of miR-221 in the liver and predisposed to the development of liver tumors. TG221 as well as wild-type mice were exposed to the hepatotoxin carbon tetrachloride (CCl₄) to induce chronic liver damage. All mice developed liver cirrhosis, but only TG221 mice developed nodular lesions in 100% of cases within 6 months of age. The spectrum of lesions ranged from dysplastic foci to carcinomas. To investigate miRNA-based prophylactic approaches, anti-miR-221 oligonucleotides or miR-199a-3p mimics were administered to TG221 CCl₄-treated mice. Compared to control animals, a significant reduction in number, size, and, most significantly, malignant phenotype of liver nodules was observed, thus demonstrating an important prophylactic action of miRNA-based molecules. In summary, in this article, we not only report a simple model of liver cancer in a cirrhotic background but also provide evidence for a potential miRNA-based approach to reduce the risk of HCC development.

Keyword: carbon tetrachloride; CCl₄; cirrhosis; HCC; hepatocellular carcinoma; microRNAs; prophylaxis; transgenic animals

400. Analysis of scientific production on glyphosate: An example of politicization of science/ **Sosa, Beatriz; Fontans-Álvarez, Exequiel; Romero, David; da Fonseca, Aline; Achkar, Marcel.** Science of The Total Environment. ISSN:0048-9697 (2019) v.681 p.541-550Science of The Total Environment

DOI: 10.1016/j.scitotenv.2019.04.379

Link: <http://www.sciencedirect.com/science/article/pii/S0048969719319242>

Abstract: Glyphosate is one of the most used herbicides worldwide. However there still exists a strong debate about its effects on the environment or people health. In this context, the metric analysis is a methodology increasingly used to quantify and evaluate the scope of the scientific production around a specific topic. The goal of this work was to characterize the context of knowledge generation about glyphosate. All the scientific production linked to glyphosate was analyzed in the period from 1974 to 2016, using the Web of Science (WOS) as a source of information and “glyphosate” as a search criterion. A total of 8174 records were found. The bibliographic production on this herbicide experienced a sustained increase. There was a concentration in knowledge generation led by the United States. Monsanto Company produced the largest number of articles during the first thirty years of the development of this topic. Research around glyphosate in South America gained importance as of the year 2000, with Brazil being the country with the highest production followed by Argentina. A large proportion of research was focused on agricultural science, while the analysis of toxicology or environmental effects did not begin until the year 2000, and it is still insufficient.

Keyword: Bibliometrics; Glyphosate; Knowledge generation; Politicization of sciences; Social debate

401. Intranasal nanoemulsion-adjuvanted HSV-2 subunit vaccine is effective as a prophylactic and therapeutic vaccine using the guinea pig model of genital herpes/ **Bernstein, David I.; Cardin, Rhonda D.; Bravo, Fernando J.; Hamouda, Tarek; Pullum, Derek A.; Cohen, Gary; Bitko, Vira; Fattom, Ali.** Vaccine. ISSN:0264-410X 43(2019) v.37 p.6470-6477Vaccine

DOI: 10.1016/j.vaccine.2019.08.077

Link: <http://www.sciencedirect.com/science/article/pii/S0264410X19311533>

Abstract: Genital herpes is a sexually transmitted disease representing a major global health concern. Currently, there is no approved vaccine and existing antiviral therapies exhibit limited efficacy. Herein, we describe an intranasal (IN) vaccine comprised of HSV-2 surface glycoproteins gD2 and gB2 formulated in a nanoemulsion adjuvant (NE01-gD2/gB2). Using the HSV-2 genital herpes guinea pig model, we demonstrate that IN NE01-gD2/gB2 induces higher levels of neutralizing antibody compared to a monovalent IN NE01-gD2 vaccine, but less than an intramuscular (IM) Alum/MPL-gD2 vaccine. Following intravaginal (IVag) challenge with HSV-2, the group immunized with IN NE01-gD2/gB2 exhibited significantly reduced acute and recurrent disease scores compared to placebo recipients. Significantly, latent virus was only detected in the dorsal root ganglia of 1 of 12 IN NE01-gD2/gB2-vaccinated animals compared to 11 of 12 placebo recipient. In the therapeutic model, IN NE01-gD2/gB2 immunized guinea pigs exhibited a significant reduction in the recurrent lesions scores (64%, $p < 0.01$), number of animal days with disease (64%, $p < 0.01$), number of animals with viral shedding (50%, $p < 0.04$) and reduction in virus positive vaginal swabs (56%,

$p < 0.04$), These data suggests that the treatment may be effective in treating chronic disease and minimizing virus transmission. These results warrant advancing the development of IN NE01-gD2/gB2 as both a prophylactic and therapeutic vaccine against HSV-2.

Keyword: Vaccine; Nanoemulsion; Genital herpes; Herpes simplex virus type 2; NanoVax

402. Toxicological screening and DNA sequencing detects contamination and adulteration in regulated herbal medicines and supplements for diet, weight loss and cardiovascular health/ **Crichton, Elly; Coghlan, Megan L.; Farrington, Rachael; Hoban, Claire L.; Power, Matthew W.P.; Nash, Christine; Mullaney, Ian; Byard, Roger W.; Trengove, Robert; Musgrave, Ian F.; Bunce, Michael; Maker, Garth.** Journal of Pharmaceutical and Biomedical Analysis. ISSN:0731-7085 (2019) v.176 p.112834 Journal of Pharmaceutical and Biomedical Analysis

DOI: 10.1016/j.jpba.2019.112834

Link: <http://www.sciencedirect.com/science/article/pii/S073170851931708X>

Abstract: Use of herbal medicines and supplements by consumers to prevent or treat disease, particularly chronic conditions continues to grow, leading to increased awareness of the minimal regulation standards in many countries. Fraudulent, adulterated and contaminated herbal and traditional medicines and dietary supplements are a risk to consumer health, with adverse effects and events including overdose, drug-herb interactions and hospitalisation. The scope of the risk has been difficult to determine, prompting calls for new approaches, such as the combination of DNA metabarcoding and mass spectrometry used in this study. Here we show that nearly 50% of products tested had contamination issues, in terms of DNA, chemical composition or both. Two samples were clear cases of pharmaceutical adulteration, including a combination of paracetamol and chlorpheniramine in one product and trace amounts of buclizine, a drug no longer in use in Australia, in another. Other issues include the undeclared presence of stimulants such as caffeine, synephrine or ephedrine. DNA data highlighted potential allergy concerns (nuts, wheat), presence of potential toxins (Neem oil) and animal ingredients (reindeer, frog, shrew), and possible substitution of bird cartilage in place of shark. Only 21% of the tested products were able to have at least one ingredient corroborated by DNA sequencing. This study demonstrates that, despite current monitoring approaches, contaminated and adulterated products are still reaching the consumer. We suggest that a better solution is stronger pre-market evaluation, using techniques such as that outlined in this study.

Keyword: Toxicology; Mass spectrometry; Contamination; Adulteration; Complementary and alternative medicine; Diet supplements; DNA metabarcoding; Herbal medicine; Next generation DNA sequencing; Pharmacovigilance

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