

Wang G, Kang S, Yin Z, et al [Therapeutic effect of Chinese patent medicine "Wuhuanghu" on porcine infectious pleuropneumonia and its acute and subchronic toxicity as well as evaluation of safety pharmacology.](#) Environ Toxicol Pharmacol. 2015 Sep;40(2):388-96.

Chinese patent medicines play an important role in veterinary clinical use. The aim of this study is to research the anti-infection effect of Chinese patent medicine "Wuhuanghu" for the treatment of porcine infectious pleuropneumonia and to evaluate the safety of "Wuhuanghu" in order to provide a comprehensive understanding of its toxicity. The anti-infection results showed that the treatment with "Wuhuanghu" could significantly inhibit pneumonia and decrement of the pneumonia in high, medium and low doses of "Wuhuanghu" groups were 70.97%, 61.29% and 58.06% respectively. The acute toxicity test showed that rats in the highest group (5000mg/kg) had no death and no abnormal response, suggesting the LD50 of "Wuhuanghu" was more than 5000mg/kg. The subchronic toxicity study showed that hematology indexes in all groups had no obvious differences; blood biochemical index, only albumin and total cholesterol in middle and low doses of "Wuhuanghu" groups were significantly decreased when compared with control group. The clinical pathology showed that the target organ of "Wuhuanghu" was liver. The safety pharmacology study indicated that "Wuhuanghu" had no side effects on rats. In conclusion, "Wuhuanghu" has therapeutic and protective effects to porcine infectious pleuropneumonia in a dose-dependent manner and "Wuhuanghu" is a safe veterinary medicine.

Maneewan C1, Mekbungwan A, Chareerntantanakul W et al [Effects of dietary Centella asiatica \(L.\) Urban on growth performance, nutrient digestibility, blood composition in piglets vaccinated with Mycoplasma hyopneumoniae.](#) Anim Sci J. 2014 May;85(5):569-74.

To investigate the effects of *Centella asiatica* (L.) on growth performance, nutrient digestibility and blood composition in piglets, 32 nursery pigs were fed 0.0, 0.5, 1.0 and 2.0% dietary *C. asiatica* (L.) from 15 to 90 kg BW. At 30 kg BW, nutrient digestibility was measured and at 35 kg BW piglets were vaccinated with *Mycoplasma hyopneumoniae*. Hematological parameters were checked at 40 and 80 kg BW. Compared with the control, growth performance was not affected. The ether extract, ash and calcium digestibility were lower at 0.5%, and dry matter, crude protein, crude fat, phosphorus and energy digestibility were lower at 1.0% ($P < 0.05$). On hematological values, at 40 kg hematocrit, total white blood cells, neutrophils, eosinophils, basophils, monocytes and lymphocytes were higher at the 2.0% level ($P < 0.05$). Most of these values except basophils and monocytes continued until at 80

kg, at which total white blood cells, neutrophils, eosinophils and lymphocytes were higher even at 1.0% ($P < 0.05$); neutrophil-to-lymphocyte ratio tended to be higher at 2.0% ($P < 0.03$). Cholesterol, triglycerides and antibody levels against *M. hyopneumoniae* did not differ except that at 40 kg the cholesterol of 0.5% was lower ($P < 0.05$) and *M. hyopneumoniae*-specific antibodies tended to be higher with increasing levels of *C. asiatica* (L.) ($P < 0.07$). The result that *C. asiatica* (L.) could not improve growth performance but increased values of serum hematocrit and white blood cells, and mycoplasma immunity to *M. hyopneumoniae* might suggest that *C. asiatica* (L.) has no function to elevate body weight but has the potential to enhance innate immunity.

Frankic T1, Salobir K, Salobir J. [The comparison of in vivo antigenotoxic and antioxidative capacity of two propylene glycol extracts of *Calendula officinalis* \(marigold\) and vitamin E in young growing pigs.](#) *J Anim Physiol Anim Nutr (Berl)*. 2009 Dec;93(6):688-94.

The objective of the study was to evaluate the protective effect of *Calendula officinalis* propylene glycol extracts against oxidative DNA damage and lipid peroxidation induced by high polyunsaturated fatty acid (PUFA) intake in young growing pigs. Forty young growing pigs were assigned to five treatment groups: control; oil (linseed oil supplementation); *C. officinalis* 1 and 2 groups (linseed oil plus 3 ml/day of *C. officinalis* propylene glycol extracts); and vitamin E group (linseed oil plus 100 mg/kg of vitamin E). Lymphocyte DNA fragmentation and 24-h urinary 8-hydroxy-2'-deoxyguanosine (8-OHdG) excretion were measured to determine DNA damage. Lipid peroxidation was studied by analysing plasma and urine malondialdehyde (MDA), and urine isoprostane concentrations (iPF2 α -VI), total antioxidant status of plasma and glutathione peroxidase (GPx) assays. *C. officinalis* 1 (extract from petals) effectively protected DNA from oxidative damage. It indicated a numerical trend towards the reduction of plasma MDA and urinary iPF2 α -VI excretion. Its effect was comparable with that of vitamin E. *C. officinalis* 2 (extract from flower tops) showed less antioxidant potential than the extract from petals. We can conclude that the amount of *C. officinalis* extracts proposed for internal use by traditional medicine protects the organism against DNA damage induced by high PUFA intake.

van Krimpen MM1, Binnendijk GP, Borgsteede FH, Gaasenbeek CP. [Anthelmintic effects of phytogetic feed additives in *Ascaris suum* inoculated pigs.](#) *Vet Parasitol*. 2010 Mar 25;168(3-4):269-77.

Two experiments were performed to determine the anthelmintic effect of some phytogetic feed additives on a mild infection of *Ascaris suum* in growing and finishing pigs. Usually, an infection of *A. suum* is controlled by using conventional synthetic drugs. Organic farmers, however, prefer a non-pharmaceutical approach to worm control. Therefore, phytotherapy could be an appropriate alternative. In the first experiment, a commercial available organic starter diet was supplemented with 3% of a herb mixture, adding 1% *Thymus vulgaris*, 1% *Melissa officinalis* and 1% *Echinacea purpurea* to the diet, or with 4% of a herb mixture, thereby adding the mentioned herbs plus 1% *Camellia sinensis* (black tea). A negative control group (no treatment) and a positive control group (treatment with conventional synthetic drug flubendazole) were included. In the second experiment, the anthelmintic properties against *A. suum* of three individual herbs, *Carica papaya*, *Peumus boldus* and *Artemisia vulgaris*, each in a dose of 1%, were tested. Pigs were infected with 1000 infective worm eggs each. Each experiment was performed with 32 individually housed growing pigs (8 replicates/treatment), which were monitored for 67 days. It was hypothesized that the herbs would block the cycles of the larvae, thereby preventing the development of adult worms. Therefore, phytogetic feed additives were not supplied during the whole experimental period, but only from the start until D39. Pigs were inoculated with infective worm eggs during five consecutive days (D17-D21). At D67 all pigs were dissected, whereafter livers were checked for the presence of white spots. Also numbers of worms in the small intestine were counted. In experiment 1, the numbers of worm-infected pigs were similar for both the herb supplemented (groups 3 and 4) and the unsupplemented (group 1) treatments (5-6 pigs of 8), while the treatment with flubendazole (group 2) resulted in 0 infected pigs. In experiment 2, herb addition (groups 2-4) did not significantly reduce the number of worm-infected pigs compared to the negative control (group 1). It can be concluded that the tested herb mixtures and individual herbs in the diets of growing and finishing pigs did not decrease the number of pigs which were infected with *A. suum*, although the herb mixture without black tea and also boldo leaf slightly ($P < 0.10$) reduced the number of worms in the intestinal tract. The tested herb mixtures and individual herbs did not affect the performance of the pigs.

Kim HB¹, Lee CY², Kim SJ³, et al [Have Medicinal herb extracts ameliorate impaired growth performance and intestinal lesion of newborn piglets challenged with the virulent porcine epidemic diarrhea virus.](#) J Anim Sci Technol. 2015 Oct 8;57:33.

The objective of this study was to evaluate effects of a combined use of extracts of medicinal herbs *Taraxacum mongolicum*, *Viola yedoensis* Makino, *Rhizoma coptidis*, and *Radix isatidis* (MYCI) on porcine epidemic diarrhea (PED). Twenty-two 3-day-old piglets received an oral challenge with $3 \times 10^{3.5}$ TCID₅₀ of the virulent PED virus (PEDV) in PBS or PBS only and daily oral administration of 60 mg of the MYCI mixture suspended in milk replacer or the vehicle for 7 days in a 2×2 factorial arrangement of

treatments. Average daily gain (ADG) increased ($p < 0.05$) in response to the MYCI treatment in the PEDV-challenged piglets (-18 vs. 7 g for the vehicle- vs. MYCI-administered group), but not in unchallenged animals (27 vs. 28 g). Diarrhea score and fecal PEDV shedding, however, were not influenced by the MYCI treatment. The PEDV challenge caused severe intestinal villus atrophy and crypt hyperplasia, both of which were alleviated by administration of the MYCI mixture as indicated by an increase in the villus height and a decrease in the crypt depth due to the treatment. Overall, medicinal herb extracts used in this study ameliorated impaired growth performance and intestinal lesion of newborn piglets challenged with the virulent PEDV. Therefore, our results suggest that the MYCI mixture could be used as a prophylactic or therapeutic agent against PED.

Stelter K1, Frahm J, Paulsen J et al [Effects of oregano on performance and immunomodulating factors in weaned piglets](#). Arch Anim Nutr. 2013 Dec;67(6):461-76.

Many health effects can be attributed to the Mediterranean herb oregano (*Origanum vulgare* L.) and several studies demonstrated the improving effect on performance, changes in blood count, antibacterial, antifungal and immunomodulating abilities. The majority of these investigations were carried out with processed essential oil, while whole plant material was only used in a few studies. Thus, the aim of the present experiment was to test the effect of increasing proportions of dried oregano in piglet feed on health and performance, with a special focus on immune modulation. A total of 80 male castrated weaned piglets (body weight [BW] 7.9 kg \pm 1.0 kg) were used in a feeding experiment lasting 5 weeks. They were assigned to 4 experimental groups: a control diet, and three diets with an oregano supplementation at 2 g, 4 g and 8 g per kg feed, respectively, corresponding to 23.5 mg, 46.9 mg and 93.9 mg carvacrol/kg DM. After 3 weeks, half of each group was challenged with 5 μ g lipopolysaccharides (LPS) per kg BW. Blood samples were collected 2 h after LPS stimulation and analysed for T-cell phenotypes, granulocyte activity, clinical-chemistry as well as white and red blood count. The results indicate no effects of oregano on performance. In contrast, oregano altered the lymphocyte proportion and the ratio of CD4(+) and CD8(+) T-cells as well as the triglyceride concentration in the serum of non-stimulated and in LPS-stimulated piglets. In conclusion, whole plant supplementation of oregano to piglet feed altered immune-related parameters, but did not modulate the acute inflammatory response induced by LPS stimulation.

Malo C1, Gil L, Cano R, Martínez F, Galé I. [Antioxidant effect of rosemary \(*Rosmarinus officinalis*\) on boar epididymal spermatozoa during cryopreservation](#). Theriogenology. 2011 Jun;75(9):1735-41

The objective of the present study was to evaluate the ability of rosemary to protect epididymal boar spermatozoa from freeze-thaw damage. Testis from eight boars were collected at the slaughterhouse in two trials. In the laboratory, sperm from epididymis were recovered by flushing and cryopreserved in lactose-egg yolk solution supplemented with various concentrations (low; medium; high) of rosemary. After thawing, total motility, viability, acrosome integrity, response to hypoosmotic swelling test (HOST) and malonaldehyde (MDA) concentration were assessed. The results showed that there was an increase in motility at 1, 2 and 3 h in the presence of rosemary. The addition of this herb provided a significant beneficial effect on viability at 2 h of incubation, compared to the control group. Conversely, acrosome status was not affected by any extender. Higher concentration of rosemary produced significant improvement in percentages of positive HOST at 0 and 1 h, whereas no impact was observed at the end of incubation. Considering membrane lipid peroxidation, a greater decrease in MDA production was observed when rosemary content was raised. Rosemary-enriched freezing extender improved the post-thaw epididymis boar spermatozoa quality, showing a significant correlation between rosemary concentration and concentration of MDA. Further studies are needed to define the active component in rosemary that prevents peroxidation.

Chang CH1, Chen YS, Chiou MT et al [Have Application of Scutellariae radix, Gardeniae fructus, and Probiotics to Prevent Salmonella enterica Serovar Choleraesuis Infection in Swine.](#) Evid Based Complement Alternat Med. 2013;2013:568528

Salmonella enterica serovar Choleraesuis, a host-adapted pathogen of swine, usually causes septicemia. Lactic acid bacteria (LAB) strains have been widely studied in recent years for their probiotic properties. In this study, a mouse infection model first screened for potential agents against infection, then a pig infection model evaluated effects of LAB strains and herbal plants against infection. Scutellariae radix (SR) and Gardeniae fructus (GF) showed abilities to reduce bacteria shedding and suppressing serum level of TNF- α induced by infection in swine. Bioactivities of SR and GF were enhanced by combining with LAB strains, which alone could speed up the bacteria elimination time in feces and boost immunity of infected pigs. Baicalein and genipin exhibited stronger cytotoxicity than baicalin and geniposide did, as well as prevent Salmonella from invading macrophages. Our study suggests LAB strains as exhibiting multiple functions: preventing infection, enhancing immunity to prepare host defenses against further infection, and adjusting intestinal microbes' enzymatic activity in order to convert herbal compounds to active compounds. The SR/GF-LAB strain mixture holds potential infection-prevention agents supplied as feed additives.

Alfajaro MM1, Kim HJ, Park JG et al [Have Anti-rotaviral effects of Glycyrrhiza uralensis extract in piglets with rotavirus diarrhea.](#) Virol J. 2012 Dec 18;9:310.

Since rotavirus is one of the leading pathogens that cause severe gastroenteritis and represents a serious threat to human and animal health, researchers have been searching for cheap, safe, and effective anti-rotaviral drugs. There is a widespread of interest in using natural products as antiviral agents, and among them, licorice derived from *Glycyrrhiza* spp. has exerted antiviral properties against several viruses. In this study, anti-rotaviral efficacy of *Glycyrrhiza uralensis* extract (GUE) as an effective and cheaper remedy without side-effects was evaluated in colostrums-deprived piglets after induction of rotavirus diarrhea. Colostrums-deprived piglets were inoculated with porcine rotavirus K85 (G5P[7]) strain. On the onset of diarrhea, piglets were treated with different concentration of GUE. To evaluate the antiviral efficacy of GUE, fecal consistency score, fecal virus shedding and histological changes of the small intestine, mRNA expression levels of inflammation-related cytokines (IL8, IL10, IFN- β , IFN- γ and TNF- α), signaling molecules (p38 and JNK), and transcription factor (NF κ B) in the small intestine and spleen were determined. Among the dosages (100-400 mg/ml) administered to animals, 400 mg/ml of GUE cured diarrhea, and markedly improved small intestinal lesion score and fecal virus shedding. mRNA expression levels of inflammation-related cytokines (IL8, IL10, IFN- β , IFN- γ and TNF- α), signaling molecules (p38 and JNK), and transcription factor (NF κ B) in the small intestine and spleen were markedly increased in animals with RVA-induced diarrhea, but dose-dependently decreased in GUE treated animals after RVA-induced diarrhea. GUE cures rotaviral enteritis by coordinating antiviral and anti-inflammatory effects. Therapy of this herbal medicine can be a viable medication for curing rotaviral enteritis in animals and humans.

Yan C1, Wang K, Chen L, He YM, Tang ZX. [Effects of feeding an herbal preparation to sows on immunological performance of offspring.](#) J Anim Sci. 2012 Nov;90(11):3778-82.

The objective of this study was to determine the effects of feeding Chinese herbal ultra-fine (CHU) powder to sows during the last week of gestation and during the lactation period on immunological performance of the offspring. In this experiment, 15 pregnant sows (mean BW = 235.6 \pm 3.7 kg) were randomly assigned to 1 of 3 treatments including no additive (Control), 0.75% CHU powder (Group A), or 1.5% CHU powder (Group B) added to a maize- and soybean meal-based diet. Blood from 10 piglets per group was collected at d 7, d 14, or d 21 of age to measure serum metabolites, lymphocyte proliferating activity, and serum antibody and cytokine concentrations. Dietary supplementation of sows with CHU powder increased ($P <$

0.05) serum concentrations of total protein, albumin, and triglycerides of offspring, whereas the concentration of glucose was reduced ($P < 0.05$) compared with Controls. The CHU powder enhanced ($P < 0.05$) serum concentrations of IgG in Group B offspring on d 7 and IgM in Group A offspring on d 7 and d 14, increased IL-10 in Group A offspring on d 7, as well as IL-2 in offspring from Groups A and B on all days of determination. The CHU powder increased interferon gamma in Group A offspring on d 14 and in Group B offspring on d 14 and d 21, and increased tumor necrosis factor alpha in offspring of Group A on d 14 and in Group B on all days surveyed. Compared with Controls, a greater number ($P < 0.05$) of T lymphocyte subpopulations were detected in Group A and B offspring including CD4+ cells in Group A on d 7 and d 21, CD4+ cells in Group B on d 14 and d 21, and CD8+ cells in Group A on d 7 and d 14. Collectively, these findings indicate a beneficial effect of CHU powder treatment of sows in later gestation and during lactation on serum metabolism and cellular and humoral immune responses of their offspring.

Kang SN1, Chu GM, Song YM et al [The effects of replacement of antibiotics with by-products of oriental medicinal plants on growth performance and meat qualities in fattening pigs](#). Anim Sci J. 2012 Mar;83(3):245-51.

The effect of by-products of oriental medicinal plants (OMP; T1) containing 0.03% herb extracts (T2) or 0.1% aminolevulinic acid (T3) on the production performance of swine during the finishing period and on its meat quality were investigated. No significant differences were found in the weight gain, feed intake and feed conversion rate among the tested groups ($P > 0.05$). But the treated group showed higher ($P < 0.05$) moisture and ash and lower protein than the control group. The T3 group showed a lower meat cholesterol content (38.42 mg/100 g) compared to the other groups ($P < 0.05$). The vitamin E content of the muscle in the treated groups was higher compared to the control group. No antibiotic content was detected in all treated and control samples. The values of the volatile basic nitrogen (VBN) and thiobarbituric acid reactive substance (TBARS) of the treated groups were significantly lower ($P < 0.01$) than the control group. The treated groups had significantly better ($P < 0.05$) sensory-test scores for color, flavor, off-flavor and total acceptability compared to the control group.

Guo KJ1, Xu SF, Yin P et al [Active components of common traditional Chinese medicine decoctions have antioxidant functions](#). J Anim Sci. 2011 Oct;89(10):3107-15

Many traditional Chinese medicine (TCM) decoctions are proven to have multiple functions in animal production. These decoctions are seldom recognized by the international scientific community because the mechanisms of action are not clearly elucidated. According to TCM theory, Cortex Phellodendri (COP), Rhizoma Atractylodes (RA), Agastache Rugosa (AR), and Gypsum Fibrosum (GF) can be used to formulate a medicinal compound that prevents or cures animal disease caused by heat stress. The aim of this research was to study the regulatory functions of the active components of TCM and to elucidate the effects of different TCM decoctions on antioxidant activity and lipid peroxide content, using in vitro and in vivo models of heat stress. For in vitro experiments, intestinal crypt-like epithelial cell line-6 (IEC-6) cells were employed to evaluate the effects of the active components of COP, RA, AR, and GF. For in vivo experiments, forty-eight 2-mo-old Chinese experimental mini-pigs (7.20 ± 0.02 kg) were randomly assigned to 4 groups: a normal-temperature group (NTG); a high-temperature group (HTG); HTG treated with COP, RA, AR, and GF (1:1:1:1, TCM1); and HTG treated with COP, RA, AR, and GF (1:1:1:0.5, TCM2). Results showed that the active components of the COP, RA, AR, and GF increased ($P < 0.05$) the proliferation and viability of heat-stressed IEC-6 cells and that the most effective treatment doses of COP alkaloid, RA Aetherolea, Herba Agastachis Aetherolea, and GF water extract were 200, 100, 100, and 200 $\mu\text{g}/\text{mL}$, respectively. All 4 active components increased ($P < 0.05$) superoxide dismutase, glutathione peroxidase activities, and glutathione content, and decreased ($P < 0.05$) malondialdehyde content with respect to the heat-stressed group to concentrations similar to those seen in NTG. In vivo experiments demonstrated that TCM1 and TCM2 improved ($P < 0.05$) the poor growth performance seen in HTG pigs. The superoxide dismutase, glutathione peroxidase activities, and malondialdehyde content in porcine jejunum treated with TCM1 and TCM2 were not different ($P > 0.05$) from those seen in the NTG and were better ($P < 0.05$) than results seen in the HTG. Overall, it appeared that TCM2 was more effective than TCM1 in ameliorating the effects of heat stress in pigs. In conclusion, this study revealed that the active components of common TCM decoctions have antioxidant functions.

Yeh HS1, Weng BC, Lien TF [Effects of Chinese traditional herbal medicine complex supplementation on the growth performance, immunity and serum traits of pigs.](#) Anim Sci J. 2011 Dec;82(6):747-52.

The purpose of this study was to investigate the effects of a traditional Chinese herbal medicine complex supplementation on the growth performance, immunity and serological traits of pigs, and the feasibility of its use as a substitute for antibiotics. Thirty-six weaned pigs LYD with average initial body weight of 10 ± 0.55 kg were randomly divided into three treatments with three replicates. These constituted the control, the antibiotics group (chlortetracycline 100 $\mu\text{g}/\text{kg}$, oxytetracycline 100 $\mu\text{g}/\text{kg}$), and 0.3% Chinese herbal medicine complex group (CHM). Experiment results

indicated that the CHM group exhibited significantly increased average feed intake and peripheral blood CD3(+)CD8(+) T cell percentage as compared with those of the antibiotics group ($P < 0.05$). High-density lipoprotein (HDL) level was greater while low-density lipoprotein + very low-density lipoprotein (LDL + VLDL) level was lower in the CHM group than the control group ($P < 0.05$). The in vitro results indicated that peripheral blood mononuclear cells (PBMC) stimulated by Con-A produced a greater interleukin (IL)-6 level in the CHM group and IL-6 level stimulated by lipopolysaccharide was greater than the antibiotics groups ($P < 0.05$). Above all, this study has indicated that the addition of Chinese traditional herbal complex to pigs' diets has beneficial results.

Huang CW1, Lee TT, Shih YC, Yu B. [Effects of dietary supplementation of Chinese medicinal herbs on polymorphonuclear neutrophil immune activity and small intestinal morphology in weanling pigs.](#) J Anim Physiol Anim Nutr (Berl). 2012 Apr;96(2):285-94.

The purpose of this study was to evaluate the effects of dietary Chinese medicinal herbs (CMH) supplementation composed of Panax ginseng, Dioscoreaceae opposite, Atractylodes macrocephala, Glycyrrhiza uralensis, Ziziphus jujube and Platycodon grandiflorum, on the performance, intestinal tract morphology and immune activity in weanling pigs. Two hundred and forty weaned pigs were assigned randomly to four dietary groups including the negative control (basal diet), 0.1% CMH, 0.3% CMH and 0.114% antibiotic (Chlortetracycline calcium Complex, Sulfathiazole and Procaine Penicillin G) supplementation groups for a 28-day feeding trial. Results indicated that both CMH supplementation groups had a better gain and feed/gain than control group (CT) during the first 2 weeks of the experimental period. The 0.3% CMH had a significant decrease in the diarrhoea score in first 10 days of experimental period when compared with other groups. The CMH supplementation groups had a higher villous height, increased lactobacilli counts in digesta of ileum and decreased coliform counts in colon compared with CT. The immune activities of polymorphonuclear leucocytes (PMNs), including the respiratory burst and Salmonella-killing ability, were significantly enhanced in CMH supplementation groups at day 7 of experiment period. The CMH and antibiotic supplementations increased the nutrient digestibility such as dietary dry matter, crude protein and gross energy in weanling pigs. In conclusion, the dietary CMH supplementation improved intestinal morphology and immune activities of PMNs, thus giving rise to nutrient digestibility and reduce diarrhoea frequency in weanling pigs.

Liu JQ1, Lee TF, Miedzyblocki M et al [Effects of tanshinone IIA, a major component of *Salvia miltiorrhiza*, on platelet aggregation in healthy newborn piglets.](#) J Ethnopharmacol. 2011 Sep 1;137(1):44-9.

Tanshinone IIA (STS), an active ingredient of the Chinese herb Danshen (*Salvia miltiorrhiza*) for angina and stroke in adults, has been reported to inhibit platelet function. However, its effect on platelet and underlying mechanism remain largely unknown, particularly in neonates. To investigate the effect of STS on the platelet aggregation and its interaction with various platelet activation pathways, platelet aggregatory function was studied in whole blood stimulated by collagen (2-10 µg/ml) *ex vivo* in newborn piglets receiving intravenous STS (0.1-10mg/kg, n=8) and *in vitro* in whole blood from newborn piglets (n=6) incubated with STS (0.1-100 µg/ml). The respective morphological changes of platelets were also examined by scanning electron microscopy. Plasma levels of nitrite/nitrate (NO_x) and thromboxane B(2) (TxB(2)), matrix metalloproteinase (MMP)-2 and -9 activities were also examined. To further delineate the mechanistic pathway, the effect of STS on endothelial microparticles release from cultured human umbilical vein endothelial cells (HUVECs) was quantified by flow cytometry. STS impaired the *ex vivo*, but not *in vitro*, collagen-stimulated platelet aggregation. Infusion of STS elevated the plasma level of TxB(2) at 10mg/kg. However, STS had no effect on NO_x level. Incubating cultured HUVECs with STS (1 and 10 µg/ml) caused a significant release of endothelial microparticles. Morphologically, STS elicited platelet activation *in vivo*, but not *in vitro*. STS impairs the *ex vivo* whole blood platelet aggregatory function by activating platelet *in vivo* in healthy newborn piglets. It implies that STS may elicit its effects by stimulating endothelial microparticles production and eicosanoid metabolism pathway.

Kong X1, Wu G, Yin Y. [Roles of phytochemicals in amino acid nutrition.](#) Front Biosci (Schol Ed). 2011 Jan 1;3:372-84

Chinese herbal medicine (CHM) is often used as dietary supplements to maintain good health in animals and humans. Here, we review the current knowledge about effects of CHM (including ultra-fine Chinese herbal powder, *Acanthopanax senticosus* extracts, *Astragalus polysaccharide*, and *glycyrrhetic acid*) as dietary additives on physiological and biochemical parameters in pigs, chickens and rodents. Additionally, we propose possible mechanisms for the beneficial effects of CHM on the animals. These mechanisms include (a) increased digestion and absorption of dietary amino acids; (b) altered catabolism of amino acids in the small intestine and other tissues; (c) enhanced synthesis of functional amino acids (e.g., arginine, glutamine and proline) and polyamines; and (d) improved metabolic control of nutrient utilization through cell signaling. Notably, some phytochemicals and glucocorticoids share similarities in

structure and physiological actions. New research findings provide a scientific and clinical basis for the use of CHM to improve well-being in livestock species and poultry, while enhancing the efficiency of protein accretion. Results obtained from animal studies also have important implications for human nutrition and health.

Frydrychová S1, Opletal L, Macáková K et al [Effects of herbal preparation on libido and semen quality in boars](#). *Reprod Domest Anim*. 2011 Aug;46(4):573-8.

The objective of this study was to investigate the effects of a preparation from herbal extracts (PHE) on libido and semen quality in breeding artificial insemination boars. Ten fertile boars were divided into control and experimental groups according to significant difference of libido. There were no differences in semen quality between groups. Animals were fed a commercial feeding mixture for boars. The feeding mixture for the experimental group was enriched with PHE, which was prepared from *Eurycoma longifolia*, *Tribulus terrestris* and *Leuzea carthamoides*. Duration of the experiment was 10 weeks. Samples of ejaculate were collected weekly. Libido was evaluated according to a scale of 0-5 points. Semen volume, sperm motility, percentage of viable spermatozoa, sperm concentration, morphologically abnormal spermatozoa, daily sperm production and sperm survival were assessed. Amounts of mineral components and free amino acids were analysed in seminal plasma. Significant differences were found in these parameters: libido (4.05 ± 0.22 vs 3.48 ± 0.78 ; $p < 0.001$), semen volume (331.75 ± 61.91 vs 263.13 ± 87.17 g; $p < 0.001$), sperm concentration (386.25 ± 107.95 vs $487.25 \pm 165.50 \times 10^3$ /mm³); $p < 0.01$), morphologically abnormal spermatozoa (15.94 ± 11.08 vs $20.88 \pm 9.19\%$; $p < 0.001$) and Mg concentration (28.36 ± 11.59 vs 20.27 ± 13.93 mm; $p < 0.05$). The experimental group's libido was increased by 20% in comparison with the beginning of the experiment. Results of this study showed positive effect of PHE on libido and some parameters of boar semen quality.

Chen Q1, Liu Z, He JH [Achyranthes bidentata polysaccharide enhances immune response in weaned piglets](#). *Immunopharmacol Immunotoxicol*. 2009 Jun;31(2):253-60.

The acquired immunity is underdeveloped at 3-4 weeks of age when piglets are usually weaned on commercial farms, and weaning is associated with compromised immunity. Dietary supplementation with immunomodulatory phytochemicals may enhance immune responses in the weaned piglets. This study is conducted to investigate the effects of dietary supplemental *Achyranthes bidentata* polysaccharide

(ABP) on proliferation activity of lymphocytes, and production of antibodies, complements and cytokines in weaned piglets. Results showed that lymphocyte proliferation activity in piglets fed diets supplementing with 1000 and 1500 mg/kg ABP increased ($P < 0.05$) on days 14 and 28 compared with the non-additive piglets, as well as serum contents of IgG, IgA, IgM, C(3), C(4), IL (interleukin)-2 and IFN (interferon)-gamma. The ABP had dose-dependent immunomodulatory activity and the dose of 1500 mg/kg presented the strongest stimulating activity in vivo. In addition, the ABP increased ($P < 0.05$) the proliferation activity and production of IL-2 and IFN-gamma of cultured lymphocytes in dose- or time-dependent manner. The proliferation activity of peripheral T cells and splenic lymphocytes in 400 microg/ml of ABP group arrived at their peak values, as well as the production of IL-2 and IFN-gamma at 72 and 12 h after the treatment, respectively. Collectively, these findings suggested that dietary supplementation with ABP to weaned piglets enhances cellular and humoral immune responses, and ABP addition to culture medium also increases the proliferation activity and cytokine production of lymphocytes cultured in vitro, which indicate that dietary supplementation with the herbal polysaccharide may offer an effective alternative to antibiotics for weaned piglets.

Kong XF1, Yin YL, He QH etal [Dietary supplementation with Chinese herbal powder enhances ileal digestibilities and serum concentrations of amino acids in young pigs.](#) Amino Acids. 2009 Oct;37(4):573-82.

This study was designed to determine the effect of ultra-fine Chinese herbal powder as a dietary additive on serum concentrations and apparent ileal digestibilities (AID) of amino acids (AA) in young pigs. In Experiment 1, 60 Duroc x Landrace x Yorkshire piglets weaned at 21 days of age were randomly assigned to one of three treatments, representing supplementation with 0 or 2 g/kg of the powder, or 0.2 g/kg of colistin (an antibiotic) to corn- and soybean meal-based diets (n = 20 per group). Blood samples from five piglets per group were collected on days 7, 14, and 28 to determine serum AA concentrations. In Experiment 2, 12 barrows with an average initial body weight of 7.64 kg were randomly assigned to one of the three dietary treatments, followed by surgical placement of a simple T-cannula at the terminal ileum. All of the diets contained 0.1% titanium oxide as a digestibility marker. The samples of terminal ileal digesta were collected on day 7 for determining AID of AA. Results show that dietary supplementation with the herbal powder increased ($P < 0.05$) serum concentrations and AID of most AA by 10-50% and 10-16%, respectively. As an indicator of improved intestinal function, AID values of calcium were also enhanced in piglets supplemented with the herbal powder. Dietary supplementation of colistin increased serum concentrations and AID values of some AA by 8-44% and 10-15%, respectively, in comparison with the non-supplemented group. These novel findings demonstrate that the herbal powder can enhance the digestibility of dietary protein and the intestinal absorption of AA into the systemic circulation in post-weaning pigs,

therefore providing a new mechanism for its growth- and immunity-promoting efficacy.

Xiao C1, Rajput ZI, Liu D, Hu S. [Have Enhancement of serological immune responses to foot-and-mouth disease vaccine by a supplement made of extract of cochinchina momordica seeds.](#) Clin Vaccine Immunol. 2007 Dec;14(12):1634-9.

Foot-and-mouth disease (FMD) is a highly contagious disease affecting cloven-hoofed animals. Vaccination against FMD is a routine practice in many countries where the disease is endemic. This study was designed first to investigate the extract of the seeds of *Momordica cochinchinensis* (Lour.) Spreng. (ECMS) for its adjuvant effect on vaccination of inactivated FMDV antigens in a guinea pig model and then to evaluate the supplement of ECMS in oil-emulsified FMD vaccines for its immunopotential in pigs. The results indicated that ECMS and oil emulsion act synergistically as adjuvants to promote the production of FMDV- and VP1-specific immunoglobulin G (IgG) and subclasses in guinea pigs. A supplement of ECMS in a commercial FMD vaccine significantly enhanced FMDV-specific indirect hemagglutination assay titers as well as VP1-specific IgG and subclasses in pigs. Therefore, ECMS could be an alternative approach to improving swine FMD vaccination when the vaccine is poor to induce an effective immune response.

Other papers

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