

**RESÚMENES TRABAJOS  
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## EFECTO DE LA PRESENTACIÓN DEL PIENSO SOBRE LOS ÍNDICES PRODUCTIVOS EN LECHONES DURANTE LA FASE DE TRANSICIÓN

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### RESUMEN

La optimización de los parámetros productivos, consumo medio diario (CMD), ganancia media diaria (GMD) e índice de transformación (IT), durante el ciclo productivo del cerdo constituye tiene una repercusión significativa en la rentabilidad de las explotaciones ganaderas. De esta forma, una mayor ganancia de peso, ligada a un menor consumo de pienso, se convierte en una disminución del IT y, por tanto, de los costes en alimentación. Según estudios recientes, los costes de alimentación suponen el 70-80% de los costes totales de producción, y son muchos los factores que pueden modificarlos. Por ello, el objetivo de este trabajo ha sido estudiar los efectos de la forma de presentación de un mismo pienso (harina *versus* gránulo) sobre los principales parámetros productivos en lechones en fase de transición y la repercusión económica que pudiera conllevar. El experimento se llevó a cabo en 200 lechones destetados de 5-6 semanas de edad. Los animales fueron asignados a un tratamiento u otro (harina o gránulo) de forma aleatoria, y se alojaron en 10 corrales, de forma que cada tratamiento contaba con 5 corrales de 20 animales cada uno. El periodo de estudio se extendió durante 6 semanas y se dividió en dos fases: prestarter, las dos primeras semanas, y estarter, las 4 últimas. Los piensos formulados fueron diferentes para cada fase, así como el tamaño del gránulo (1.8mm y 3.5mm para prestarter y starter, respectivamente). Los resultados obtenidos mostraron que en la fase prestarter no había diferencias significativas en ningún parámetro estudiado (CMD, GMD, IT) entre el pienso en gránulo y en harina ( $P>0.05$ ). Por el contrario, en la fase starter, aunque el CMD no presentaba diferencias significativas, tanto la GMD como el IT mejoraban significativamente cuando se administraba el pienso en forma de gránulo ( $P<0.05$ ). En el periodo total de estudio, el CMD y la GMD no presentaron diferencias significativas entre tratamientos ( $P>0.05$ ), pero el IT fue 0.2 puntos inferior en animales con pienso en gránulo. Con el estudio económico realizado, se determinó que producir 1 kilo de carne era aproximadamente 11 y 12 céntimos más barato con pienso granulado que con pienso en harina, en las fases prestarter y estarter respectivamente. A partir de estos resultados se puede afirmar que, bajo estas condiciones experimentales, la presentación en gránulo mejora el índice de conversión y es más rentable económicamente que la presentación en harina, tanto en la fase prestarter como en la de starter.

**Palabras clave:** lechones destetados, harina, gránulo, productividad.

## ABSTRACT

Nowadays, the optimization of productive parameters, especially average daily feed intake, daily weight gain and the feed conversion ratio during all the pig's productive life, constitutes one of the main goals from an economic point of view. A higher weight gain, linked to a lower feed intake, lowers the feeding cost. According to recent studies, the feeding cost is around 70–80% of the total productive cost. So, the main goal of this study was to analyse the influence of the diet form of a same feed (meal or pellet) on different productive variables: feed intake, average daily weight gain, and feed conversion ratio in weaned pigs. Moreover, the feeding economic costs of both diet forms were estimated. The experiment was carried out over 200 weaned pigs (5-6 weeks old). Animals were randomly assigned to each treatment, and were placed in 5 pens for treatment, each one composed by 20 animals. The study period (six weeks) was divided in two phases: prestarter (two weeks and starter (four weeks) differenced by feed formulation and pellet size. An economic estimation of feeding diets in meal or pellet form was undertaken separately for each phase (prestarter and starter), and for the whole period. Concerning the productive results, there were no significant statistical differences in the studied parameters in the prestarter phase when comparing pellet and meal ( $P>0.05$ ). On the contrary, in the starter phase, both the average daily weight gain and the feed conversion of the animals fed meal diet were higher than those found in the animals fed pelleted diet ( $P<0.05$ ). For the total period, the study does not show significant statistical differences in average daily gain and feed intake between treatments ( $P>0.05$ ), but the feed conversion was lower (0.2 points) when pigs were fed pellet diet compared to the same diet in meal form ( $P<0.05$ ). After carrying out the economic study, it was concluded that producing 1 kilogram of meat was cheaper using a pellet diet. In the prestarter phase, the difference between both forms (pellet vs. meal) was of 11 cents, while in the starter phase it increased to 12 cents. From a global perspective, feeding weaned pigs with pellet led to a decrease of 1.65€ per animal to the total feeding cost during this period. Taking into consideration these results, it is possible to conclude that, under these experimental conditions, pelleted diet improves the feed conversion and, economically, it is more profitable than meal form, in both phases: prestarter and starter.

**Key words:** weaned piglets, flour, pellet, productivity.

## **ESTUDIO COMPARATIVO ENTRE LA ADMINISTRACIÓN DE DEXMETOMIDINA Y LA ADMINISTRACIÓN DE ACEPROMACINA, AMBAS COMBINADAS CON METADONA, EN UN PROTOCOLO DE SEDACIÓN PREANESTÉSICO**

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### **RESUMEN**

Las combinaciones de neuroleptoanalgesia se emplean frecuentemente en medicina veterinaria para facilitar el manejo de pequeños animales dentro de protocolos de premedicación anestésica, y para realizar procedimientos quirúrgicos menores al inducir sedación y analgesia. Los agentes fenotiazínicos o los agonistas  $\alpha$ -2adrenérgicos son combinados a analgésicos opioides los fármacos más utilizados para producir neuroleptoanalgesia. Cuando estos fármacos son administrados juntos la sedación y analgesia obtenida es mayor, por fenómenos de sinergismo, a la conseguida cuando estos fármacos se administran solos. La dexmedetomidina es un agonista  $\alpha$ -2 que aporta sedación y analgesia y confiere buena relajación muscular, pero su uso está caracterizado por marcados efectos cardiovasculares, como un incremento de la presión venosa central, bradicardia y vasoconstricción periférica. Los derivados fenotiazínicos, como la acepromacina, son usados frecuentemente para producir una sedación/tranquilización suave a moderada en perros. Los opioides, como la metadona, son los agentes más eficaces para el tratamiento y prevención del dolor en medicina veterinaria. Se han publicado pocos artículos que comparen los efectos de la dexmedetomidina frente a la acepromacina, en combinación con metadona. Objetivos: Comparar el grado de sedación y los efectos cardiorrespiratorios entre la administración de acepromacina o de dexmedetomidina, combinadas con metadona, y evaluar sus posibles efectos adversos. Hipótesis: Mayor profundidad en el grado de sedación y mayor depresión cardiorrespiratoria tras la administración de la dexmedetomidina-metadona en comparación con la administración de acepromacina-metadona. Material y métodos: Estudio prospectivo, aleatorio, ciego y experimental sobre diez perros sanos, de varias razas (Chihuahua, un Yorkshire Terrier, un Pastor Alemán, un Bichón Maltés y seis mestizos). Se establecen dos grupos experimentales, grupo D (n=5) premedicados con dexmedetomidina ( $5\mu\text{g.kg}^{-1}$ ) y metadona ( $0,25\text{mg.kg}^{-1}$ ) y grupo A (n=5) premedicados con acepromacina ( $0,025\text{mg.kg}^{-1}$ ) y metadona ( $0,25\text{mg.kg}^{-1}$ ). Se miden los valores fisiológicos basales de frecuencia cardiaca (FC), frecuencia respiratoria (FR), temperatura corporal ( $T^a$ ), coloración de mucosas (CM) y tiempo de relleno capilar (TRC) antes de la premedicación y a los 5, 10, 15, 20, 25, 35 y 45 minutos tras la premedicación, así como también se mide en estos tiempos el efecto sedante

mediante una escala de sedación descriptiva numérica (SDS), cuyo rango va de 0 a 3, significando 0: ningún tipo de sedación; 1: sedación suave (respuesta al entorno y a sonidos disminuidos mero se mantiene activo); 2: sedación moderada (sornoliento, decúbito, respuesta a estímulos moderada) y 3: sedación intensa (muy somnoliento, decúbito, sin respuesta a estímulos), y también se mide el grado de sedación mediante una escala de sedación analógica visual (VAS, rango 1-100, siendo 1 un animal totalmente despierto y 100 el mayor grado de sedación posible). Se fijó un nivel de significación del 95% ( $p < 0,05$ ). Resultados: Los grupos experimentales eran ASA I-III. Como efectos adversos se encontraron temblores musculares en dos perros del grupo A y en un perro del grupo D. Se observaron diferencias significativas en todos los tiempos tras la premedicación en cuanto a los valores de FC, siendo valores más bajos en el grupo D, aunque la FC disminuyó en ambos grupos. No se observaron diferencias estadísticamente significativas respecto a CM, TRC, T<sup>a</sup> y ni en la FR, observando respecto a esta una ligera disminución en el grupo D y un ligero aumento de las FR en el grupo A. La temperatura disminuyó en todos los animales. Los perros premedicados con dexmedetomidina obtuvieron una mayor profundidad de sedación que aquellos premedicados con acepromacina ( $p < 0,05$ ). Conclusión: A las dosis estudiadas, la dexmedetomidina produce una sedación más profunda que la acepromacina, en asociación a metadona, en perros. Ambas combinaciones producen efectos parecidos en lo que respecta a la FR y la T<sup>a</sup>, pero la combinación de dexmedetomidina-metadona produce una mayor depresión de la FC.

**Palabras clave:** Acepromacina, dexmedetomidina, metadona, sedación, perro.

## ABSTRACT

Neuroleptoanalgesic combinations are commonly used in veterinary medicine to facilitate handling of small animals, a premedication and to provide analgesia for minor surgical procedures. Phenothiazine agents,  $\alpha$ -2-adrenocetor agonist and opioid analgesics are the most commonly used drugs to produce neuroleptoanalgesia. When these drugs are administered together, synergism seems to occur: sedation and analgesia being greater than that achieved with either drug given alone. Dexmedetomidine is an alpha-2 adrenergic agonist with synergistic sedation and analgesia with opioids, and confers good muscle relaxation but its use is characterized by marked cardiovascular effects, classically described as an increased central venous pressure, bradycardia and peripheral vasoconstriction. Phenothiazine derivatives, such as acepromazine, are often used to produce mild to moderate tranquilization/sedation in dogs. Phenothiazines were shown to have anti-arrhythmogenic and anti-emetic effects, but they have not been shown to provide analgesia in dogs. Acepromazine causes a decrease in arterial pressure. Opioids, as methadone, are the most effective drugs in the treatment and prevention of the pain in veterinary medicine. Few studies exist comparing dexmedetomidine and acepromazine, in combination with methadone. Objectives: To compare the effects of acepromazine and dexmedetomidine, in combination with methadone, on sedation, cardiorespiratory variables and adverse effects. Hypothesis: Dexmedetomidine provides more profound sedation and cardiorespiratory depression compared to acepromazine. Material and methods: Prospective, randomized, blinded, experimental study. Ten healthy dogs, mixed-breed (Chihuahua, Yorkshire Terrier, German Shepherd, Bichon Maltese and six mongrel dogs). Two experimental groups were defined, group D (n=5) premedicated with dexmedetomidine ( $5\mu\text{g}\cdot\text{kg}^{-1}$ )-methadone ( $0,25\text{ mg}\cdot\text{kg}^{-1}$ ) and group A (n=5) premedicated with acepromazine ( $0,025\text{mg}\cdot\text{kg}^{-1}$ )-methadone ( $0,25\text{ mg}\cdot\text{kg}^{-1}$ ). Physiological measures, heart rate, respiratory rate, temperature, mucous membrane color, capillary and refill time were recorded before premedication and 5, 10, 15, 20, 25, 35 and 45 minutes after premedication, and also the effects on sedation using a simple descriptive scale (SDS), consisted of a scale ranging from 0 to 3, with 0: no sedation; 1: mild sedation (less alert but still active); 2: moderate sedation (drowsy, recumbent but can walk) and 3: intense sedation (very drowsy, unable to walk). The degree of sedation was also assessed using a visual analogue scale (VAS), consisted of a scale from 1 to 100, with 1: totally awake animal and 100: the deepest degree of sedation. Results were deemed significant if  $p \leq 0,05$ . Results: There were no significant differences in age or weight between groups. However, the groups were significantly different in terms of sex. All animals were of ASA score I-III. Mild muscle tremors were observed in two animals of group A and in one dog in group D. Significant differences were found between groups for heart rate after premedication. Heart rate was

significantly lower in the group D, but heart rate decreased in both groups. There were no significant differences between the mucous membrane color, capillary and refill time, temperature or respiratory rate. Respiratory rate decreased in group D and increased in group A. Rectal temperature decreased in all animals. Dogs premedicated with dexmedetomidine were more sedated than dogs premedicated with acepromazine ( $p < 0,05$ ). Conclusion: Greater sedation is achieved using combination of dexmedetomidine ( $5\mu\text{g kg}^{-1}$ )-methadone ( $0,25\text{ mg kg}^{-1}$ ) compared with acepromazine ( $0,025\text{ mg kg}^{-1}$ )-methadone ( $0,25\text{ mg kg}^{-1}$ ). Both combinations produce similar effects regarding temperature or respiratory rate, but the dexmedetomidine-methadone combination resulted in a deeper bradycardia.

**Key words:** Acepromazine, dexmedetomidine, methadone, sedation, dog.





## EL ENFUNDADO DE LOS CUERNOS: UNA MEJORA EN LA SANIDAD DEL TORO DE LIDIA

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### RESUMEN

El enfundado de los cuernos de los toros de lidia es una práctica de actualidad en el mundo taurino, controvertida y que no se encuentra regulada. Debido a que se trata de una práctica ligada al manejo y a la producción del toro bravo estimamos que los ganaderos por su conocimiento en la crianza del animal son probablemente a quienes se ha de considerar la opinión en mayor medida. Por ello en este trabajo nos hemos propuesto determinar a través de una serie de encuestas, de 24 preguntas, a ganaderos aspectos relacionados con el enfundado. Se enviaron 410 encuestas entre abril y junio de 2012 a ganaderos inscritos en las diferentes asociaciones del sector y se han recibido 75 encuestas que suponen un 18.29 % de las enviadas y un 6.13 % del total de ganaderías. Según los resultados obtenidos la colocación de fundas en el toro de lidia se inició en el año 2005, alcanzando su máximo en cuanto a número de ganaderos que se sumaban a la práctica en el año 2009. Actualmente, la mitad de los ganaderos ha colocado fundas en sus toros alguna vez y un porcentaje alto 38.67 % lo hace asiduamente. Los ganaderos que han optado por no colocar fundas, no lo harían en el futuro mayoritariamente aunque se demostrase científicamente que el enfundado no tuviese consecuencias negativas. Dentro de los ganaderos que no colocan fundas, para una mayoría estadísticamente significativa, no se enfunda porque se trata de una manipulación innecesaria, que va en contra de la pureza de la fiesta y que se pierde el sentido de las “distancias”. Por parte de los ganaderos que colocan fundas, para una mayoría estadísticamente significativa, se enfunda para mantener la integridad de los cuernos, evitar lesiones por cornadas y disminuir las bajas por traumatismos. El tipo comercial mayoritariamente enfundado es el toro. El procedimiento más utilizado para la colocación de las fundas es mediante el muelco tradicional y sólo inmovilización, siendo la persona encargada de la colocación de las fundas suele ser el mayoral, a veces ayudado por el ganadero y/o el veterinario. El tipo de funda más usada es la venda de fibra de vidrio con resina que fragua con agua, colocando con anterioridad puntas que son abiertas y metálicas; una vez limpio y desinfectado el pitón. Las fundas se retiran entre 11 y 20 días antes del embarque de los toros, utilizando para ello las llaves de grifa, también se usan en menor medida limas, cuchillos o navajas y sierras o serruchos. Los ganaderos que enfundan no aprecian cambios en la valoración positiva o negativa de sus toros respecto a cuándo no enfundaban por parte de toreros, empresas o espectadores, aunque son menores los valores referidos a la opinión de las empresas. El perjuicio más importante que origina la colocación de fundas, según los ganaderos, es que a los toros se les somete a más manipulaciones durante el manejo.

Los beneficios más importantes que origina la colocación de fundas, según los ganaderos, son evitar lesiones en las peleas entre toros, disminuir las bajas o pérdida de reses por camada y evitar los cuernos estropeados por el manejo. Por tanto, el enfundado supone una mejora en la sanidad del toro de lidia.

**Palabras clave:** Toro de lidia, enfundado, cuerno, sanidad animal.

## ABSTRACT

The sheathing of the horns of the fighting bull is a current practice in the world of bullfighting, although it is controversial and unregulated. Given that it is a custom linked to the handling and production of fighting bulls, we consider that the ranchers, because of their knowledge of the rearing of this animal, are probably the ones whose opinion should be taken into account the most. Therefore, in this research we resolved to determine by means of a series of inquiries of 24 questions, sent to the ranchers, aspects related with horn-sheathing. Between April and June 2012, 410 inquiries were sent to ranchers registered in the different associations of the sector and 75 inquiries were received (Figure 3), which represent an 18.29 % of the inquiries sent and a 6.13 % of the totality of stockbreeders. According to the results obtained, the application of horn-sheaths in fighting bulls started in 2005 and the number of ranchers that used this practice reached its peak in 2009. Nowadays, half of the ranchers have sometimes placed horn-sheaths on their fighting bulls and a high percentage of them (38.62%) do it regularly. Ranchers that don't employ horn-sheaths, wouldn't do it in the future, even if it were scientifically demonstrated that the horn-sheaths don't have negative consequences. Within the group of the ranchers that don't use horn-sheaths, a statistically significant majority doesn't apply the sheaths because they feel it is an unnecessary manipulation, that it is contrary to the pureness of the tradition and that the sense of "distances" is lost. And within the ranchers that do apply horn-sheaths, a statistically significant majority sheathes in order to maintain the integrity of the horns, to prevent injuries through goring and to decrease the losses through traumatism. The bull is the commercial type to which horn-sheaths are most applied. The most used method for the application of horn-sheaths is by a traditional squeeze immobilization chute, being the person responsible for the application of the horn-sheaths the foreman, sometimes helped by the rancher and/or the veterinarian. The most used horn-sheath type is a resin covered fiberglass bandage that binds with water, combined with an open tip apical metal prosthesis. These are applied after the tip of the horn is cleaned and disinfected. The horn-sheaths are removed between 11 and 20 days before the loading of the bulls; for this pipe wrenches are used and also, to less extent, files, knives or pen-knives and saws. Ranchers that sheathe the horns don't note changes in the positive or negative evaluation of their fighting bulls compared to when they weren't using horn-sheaths, according to the feedback of bullfighters, bullring's managers or spectators, although the values that refer to the opinion of the companies are less. According to the ranchers, the most important benefits of applying horn-sheaths are to prevent injuries in fights between bulls, to decrease injuries and losses within litters and to avoid the horns being damaged during handling. The most detrimental effect caused by the use of horn-sheaths, according to the ranchers, is that the bulls are being subjected to more manipulation during handling. At present, the application of horn-sheaths in fighting bulls is a practice that is been made in large stockbreeders. There are different reasons that are used on the part of the sectors implied to justify his use, as protecting the horns of the bulls, to avoid his wear and to improve the "trapío" of the bulls, to prevent them from getting damaged during handling and to avoid the decrease of the commercial value of the bulls; as well as to prevent the injuries in the fight among animals and to diminish the number of falls for litters. The technique of sheathed has changed notably since it began to be realized in the year 2005. At present it seems that it is standardized enough and is realized one year before the celebration of the bullfight. For it, the bull goes into the "mueco", and in some cases sedation is applied to the bull. In the tip of the horn, a metallic or plastic structure is placed with orifice or without front orifice, which adapts to the morphology of the horn. Later, the horn is cleaned and afterwards the structure is applied about the piton and the middle part of the horn (caps of fiberglass impregnated with resin that acts as stiffener, are applied and plot in touch with the water, up to form a protective case of the horn similar to stucco). The retreat of the sheaths takes place a few days before the loading of the bulls, they again enter the "mueco", and are immobilized: pipe wrenches, files, knives or pen-knives and saws, cut and detach the sheaths of the horn. There aren't many bibliographic sources

concerning to the sheathed. After checking the books of presentations, and scientific communications of the eight world congresses of bullfighting veterinary celebrated up to now, the nine symposiums on fighting bull of Zafra, the communications presented in the technical seminars of the association of bullfighting veterinary specialists (AVET), and the publications on the fighting bull of the General Council of Veterinary Colleges of Spain. Only I have located nine references about the sheathed. The conclusions of this work are numerous. The most important prejudice that originates the placement of sheaths, according to the ranchers, is probably an increase of bull's manipulations. The placement of sheaths in the fighting bull began in the year 2005, reaching his maximum in 2009. Nowadays, the half of the ranchers (48 %) has sometimes placed sheaths on his bulls and a high percentage of them (38.67 %) do it assiduously. The ranchers who have chosen not to place sheaths, wouldn't do it in the future even though it was scientifically demonstrated the absence of negative consequences. Among the ranchers who do not place sheaths, a statistically significant majority thinks, it is an unnecessary manipulation, that goes against the feast purity and also the sense of the "distances" gets lost. The ranchers who place sheaths believe that, it is useful in order to maintain the integrity of the horns and avoid injuries for gores. The fighting bull is the commercial type to which horn-sheaths are mostly applied but it is also used in steers and in all kind of bullrings. The procedure mostly used for the placement of sheaths is by means of the traditional "mueco" without sedation, being the foreman the responsible of placing the sheaths, frequently aid by the rancher and/or the veterinarian. The sheath mostly used is the fiberglass with resin, placing previously open and metallic tips; after the cleaning and disinfection of the piton. The horn-sheaths are removed between 11 and 20 days before the loading of the bulls; for this, pipe wrenches are used and also, files, knives or pen-knives and saws. Most of the ranchers who sheathed do not estimate changes about the positive or negative valuation of bulls by the bullfighters and companies or spectators, in comparison with the time when they were not sheathing, though there are less reference about the opinion of the bullring's manager. The most important benefits that the placement of sheaths originates, according to the ranchers, are to avoid injuries in the fight among bulls, to diminish the falls or loss of beasts for litter and to avoid the horns damaged by the handling. This supposes a great improvement in health of the fightingbull.

**Key words:** fightingbull, sheathing, horns, animal health.



## COMPARACIÓN DE LA EFECTIVIDAD DE LA TILVALOSINA Y UNA VACUNA COMERCIAL FRENTE A LA NEUMONÍA ENZOÓTICA PORCINA EN CONDICIONES DE CAMPO

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### RESUMEN

El presente estudio pretende investigar la eficacia de distintos tratamientos frente a *Mycoplasma hyopneumoniae* en la especie porcina. Para ello se utilizaron distintos grupos de animales en función del tratamiento recibido. Así, un primer grupo fue medicado con un antibiótico, más concretamente con una tilvalosina cuya marca comercial es Aivlosin®, un segundo grupo vacunado con una bacterina cuya marca comercial es Stellamune One®, un tercer grupo control no medicado ni vacunado, y finalmente un último grupo doblemente tratado: medicado con Aivlosin® y vacunado con Stellamune One®. En el diseño original se estableció que los animales fueran ubicados en cuatro naves de cebo similares en una misma granja, pero no se cumplió esta premisa y fueron alojados en cuatro granjas diferentes en condiciones muy dispares. Se realizó un seguimiento de cada uno de los grupos con el fin de observar su evolución y determinar que tratamiento era más eficaz frente al patógeno. A la entrada a la transición al cebo se determinaron los pesos de los animales de cada grupo, con un mayor peso de entrada por parte del grupo doble tratado (5.52 kg), seguido del grupo medicado (5.15 kg), vacunado (5.06 kg) y control (4.9 kg), mientras que al finalizar el cebo, se determinaron los parámetros productivos durante esta fase, obteniendo los mejores resultados en índice de conversión, consumo medio de pienso, peso medio de entrada, ganancia media diaria, coste por kilo repuesto en cebo y coste de medicación por cerdo en el grupo medicado. La seropositividad de cada uno de los grupos fue evaluada al principio y al final de cebo, observando un menor porcentaje de seropositivos en el grupo medicado frente al grupo control, vacunado y doble tratado respectivamente. Excepto en los animales del grupo medicado, donde no se detectó ningún positivo a *M. hyopneumoniae*, el resto de grupos mostraron la presencia de la bacteria tanto a mitad de transición como al final de cebo con una frecuencia de positivos del 66.7% en los grupos control y doble tratado, y del 100% en el grupo vacunado. La carga bacteriana al sacrificio también fue más intensa en el grupo vacunado, y similar entre el grupo control y el grupo doble tratado. Finalmente, la media de las lesiones compatibles con neumonía enzoótica porcina (NEP) evaluadas en el matadero fue menor en el grupo medicado (0.51), con respecto al grupo control (1.49), grupo doble tratado (2.19) y grupo vacunado (2.23). Los pesos medios de las canales fueron de 87.65 kg en el caso del grupo control, 86.81 kg en el grupo medicado, 85.04 kg en el grupo doble tratado y 83.2 kg en el grupo vacunado. Los resultados obtenidos no fueron los esperados según el tratamiento utilizado en cada grupo, debido fundamentalmente a la ubicación que se le dio a cada uno de ellos. Todos los grupos, a

excepción del medicado, se ubicaron en explotaciones con más cerdos que no pertenecían a este estudio, siendo por tanto sometidos a la acción de diversos factores como la presión de infección o la excesiva densidad de animales, obteniéndose así unos resultados totalmente desvirtuados de la realidad, no pudiendo precisar cuál fue el tratamiento más efectivo frente a NEP.

**Palabras clave:** *Mycoplasma hyopneumoniae*; tratamiento; tilvalosina; vacunación.

## ABSTRACT

The present study investigates the effectiveness of different preventive treatments against *M. hyopneumoniae* in order to reduce the clinical incidence, prevalence and economic impact of the swine enzootic pneumonia. Four groups were established in this study, three of them received a different treatment against *M. hyopneumoniae* and the other one was the control group not subjected to any treatment. Thus, the first group was medicated with Aivlosin®, an antibiotic whose active ingredient is tylvalosin, the second group was vaccinated with Stellamune One®, the third group was double treated, medicated with Aivlosin® and vaccinated Stellamune One®, and finally the untreated control group. In the original design the four groups should be accommodated in four similar facilities in the same farm, however, this assumption was not fulfilled and the animals were housed in different farms in different conditions. This fact, completely changed the results of the study. All groups were monitored in order to determine the most effective treatment against *M. hyopneumoniae*. The weights of the animals at the beginning of the nursery were measured, the highest weight was obtained in the double treated group (5.52 kg), followed by the medicated group (5.15 kg), the vaccinated group (5.06 kg), and the control group (4.9 kg). The main productive parameters during the fattening were calculated, obtaining the best values in the medicated group followed by the control group, where the results were better than in medicated and double treated groups. At the beginning and at the end of finishing, the percentage of seropositive animals was assessed using an ELISA technique, resulting in a lower percentage of seropositive pigs in the medicated group than in control, double treated and vaccinated groups, respectively. The bacteria was not detected by q-PCR in the red group at the middle and the end of the fattening, whereas in a 66.7% of positive animals were detected in both moments in both control and double treated groups, and a 100% of positive animals were detected in both moments in the vaccinated group. The bacterial load at the final of the fattening estimated by q-PCR was  $5256833 \pm 1000383$  copies / 20 mg tissue for the vaccinated group,  $2242444 \pm 445\ 347$  for the double treated group and  $2024833 \pm 770163$  for the control group. The average score of gross pulmonary lesions was lower in the medicated group (0.51) compared with the control group (1.49), the double treated group (2.19) and the vaccinated group (2.23). The mean of carcass weight were higher in the control group (87.65 kg), followed by the medicated group (86.81 kg), double treated group (85.04 kg) and vaccinated group (83.2 kg). The results obtained in serology, presence of *M. hyopneumoniae*, bacterial load, scoring of gross lung lesions and carcass weights were better in the medicated group than in the vaccinated and double treated groups. In this study, tylvalosin demonstrated to be effective in the control of the SEP but the results should have been very similar for the vaccinated and double treated groups. Even the values of some parameters as carcass weights were better in the control group than in treated groups. In conclusion, the data obtained were not as expected according to the treatment used in each group, mainly due to the location that was given to each of them at the fattening. All groups, except for the medicated, were located on farms with more pigs that did not belong to this study, therefore being subjected to the action of various factors such as pressure of infection or excessive density of animals, obtaining unexpected results and being not possible to establish what was the most effective treatment against *M. hyopneumoniae* in this study.

**Key words:** *Mycoplasma hyopneumoniae*; treatment; tylvalosin; vaccination.

## EVALUACIÓN DE LA EFICACIA DE UNA VACUNA COMERCIAL FRENTE AL ABORTO ENZOÓTICO OVINO EN MODELOS MURINOS

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### RESUMEN

*Chlamydia abortus* es una bacteria intracelular obligada causante del aborto enzoótico ovino (AEO), una enfermedad de importancia económica en muchos países. Dadas las características de esta enfermedad, su control se basa en de la profilaxis vacunal. Las vacunas inactivadas han sido las más utilizadas en la lucha contra esta enfermedad. Sin embargo, se han notificado numerosos brotes de AEO en rebaños vacunados con este tipo de vacunas por lo que se hace necesario el desarrollo de nuevas vacunas inactivadas que, asociadas con adyuvantes adecuados, ofrezcan niveles óptimos de protección para hacer frente al microorganismo. Así, en este estudio se evaluó en dos modelos murinos, gestante y no gestante, la protección conferida por una vacuna comercializada, comparándola con otra desarrollada y previamente contrastada en un modelo murino por el Grupo de Investigación de Patogénesis Microbiana de la Universidad de Murcia, frente a una infección por *C. abortus*. Para ello, se analizaron los signos clínicos presentados por los animales de los distintos grupos, la producción de anticuerpos específicos producida por los mismos mediante ELISA y la colonización por *C. abortus* en hígado y útero medida por el aislamiento bacteriológico y la detección del antígeno clamidial mediante técnicas inmunocitoquímicas. Los resultados obtenidos indican que la vacuna comercial analizada, a diferencia de la vacuna experimental, no protege del aborto a los animales gestantes y el nivel de protección conferido a los animales no gestantes es muy limitado. Además, esta vacuna comercial provocó importantes reacciones adversas durante el proceso de inmunización.

**Palabras clave:** *Chlamydia abortus*, AEO, vacuna inactivada, modelo murino.

### ABSTRACT

*Chlamydia abortus* is an obligate intracellular bacterium that colonizes the placenta causing abortion in multiple species of mammals. The microorganism is considered a zoonotic agent able to induce abortion in pregnant women working with infected animals. In sheep, the disease is known as ovine enzootic abortion (OEA). The OEA, is an important disease in many countries, causing important economic losses. The vaccination is the best choice for controlling the disease. The development of inactivated vaccines, form the basis of products that have been commercially available for the prevention of OEA. However the efficiency of these

vaccines varies, as outbreaks have been reported in vaccinated flocks. This fact, drive to idea of designing new inactivated vaccines that could control the disease while avoiding excessive production costs. For the production of this kind of vaccine appropriate inactivation procedures and adequate adjuvants are required to get a maximum efficacy and to minimize potential risks. By other hand, mice have been shown to provide controlled experimental animal model to investigate the efficiency of the commercial or experimental vaccines against *C. abortus*. The aim of this study was to test, in two murine models (pregnant and non-pregnant), the protection conferred by a commercial vaccine (CV) against OEA, in comparison with an experimental vaccine developed in the Department of Animal Health of the University of Murcia (UMU), whose efficacy have been previously tested by our group. For this purpose, we analyzed the morbidity and mortality observed in the groups of vaccinated and infected mice, the production of specific antibodies, by ELISA, the colonization of *C. abortus* in liver and uterus, by bacteriological isolation from cell cultures, and the detection of chlamydial antigen by immunohistopathological methods. The results obtained indicated that (CV) caused important adverse reactions in vaccinated mice. This group showed local swelling from the second or third day post-vaccination and, 7 days later, the lesions become in 0.5-1 cm nodules in 100% of animals. From day 10 post-vaccination, in 60% of these mice, the nodules produced locally alopecia and fester wounds. These wounds healed few days later and none UMU vaccinated mice showed lesions. After challenge with *C. abortus*, the CV vaccinated mice showed a lower specific-antibody production than the UMU vaccinated mice. The totality of CV vaccinated animals was depressed and prickly among the day 2 and 5 post-infection (pi.). In addition, these mice showed a progressive weight loss until the last day pi. This result was correlated with the detection of a high chlamydial load in liver and multifocal hepatitis with presence of high number of neutrophils and macrophages. The results, also showed that the CV, produce adverse reactions and do not avoid the development of the pathology associated with *C. abortus* infection. In fact, the abortion was presented by the 80% of CV vaccinated pregnant mice and 60% of these animals, presented late abortions and one mouse showed an early abortion with vaginal discharge during consecutive days. Only one animal in the CV vaccinated group, showed a birth at term and it gave birth 6 stillbirth and 3 living pups which died 48 hours postpartum. The CV pregnant mice, also presented a high mortality dying the 40% of these mice during abortion or few days later. In contrast, the UMU vaccinated pregnant mice, showed no abortions and none pregnant mice or newborn died along the experience. In addition, the UMU vaccinated mice showed high specific-antibody production and no clinical signs after challenge. The chlamydial load in liver and multifocal hepatitis was markedly minor than in CV vaccinated mice, corroborating the effectiveness of this experimental vaccine previously published in other studies. In conclusion, our results indicate that the commercial vaccine is not a good candidate against *C. abortus* infection in our experimental pregnant mouse model, showing significant adverse local effects, high morbidity and mortality and not avoiding the abortion. However, the residual protection conferred by CV, in comparison with non-vaccinated mice control group, could be enough in the case of infections with *C. abortus* where the chlamydial load in the flock is low.

**Key words:** Chlamydia abortus, OEA, inactivated vaccine, mouse model.



## COMPARACIÓN DE LA COMPOSICIÓN QUÍMICA Y NUTRICIONAL DE DISTINTAS VARIEDADES DE TRIGOS DE PRODUCCIÓN ECOLÓGICA Y CONVENCIONAL

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### RESUMEN

A nivel mundial, el trigo es el tercer cereal más producido después del maíz y el arroz constituyendo el alimento principal de un tercio de la población. Se trata de un alimento rico en hidratos de carbono, contiene proteína con propiedades químicas y físicas únicas, aporta minerales y vitaminas del complejo B, vitamina E, fibra y fitocompuestos. Por otra parte, el trigo sarraceno es una fuente de energía importante. Posee un alto valor biológico debido a su contenido en proteína y otras fracciones como compuestos fenólicos, taninos, fitoesteroles, vitamina E, catequinas y taninos condensados y minerales. La producción de alimentos ecológicos está aumentando en importancia. El trigo ecológico, en sus diferentes variedades, es considerado una parte importante dentro la producción de granos pequeños debido a su alta utilización en la alimentación en Europa Occidental. De ellos, el trigo sarraceno constituye uno de los cultivos de grano más importantes producidos en la agricultura ecológica. Para este estudio se utilizaron cinco variedades: trigo de producción convencional harinero (*Triticum aestivum*) (HC) y, tres variedades de trigo ecológicas: espelta (*Triticum spelta*) (EE) , Khorasan Kamut® (*Triticum turgidum* ssp. *turanicum*) (KKE) y harinera (*Triticum aestivum*) (HE). Así como una especie muy próxima, el llamado trigo sarraceno ecológico (*Fagopyrum esculentum* Moench) (SE) Se analizaron los componentes químico-nutricionales habituales, así como, los contenidos en diferentes minerales (Ca, Mg, Na, K, Fe, Mn, Cu y Zn) Los resultados mostraron que el HC presentó unos valores más elevados significativamente en MS, PB, Fe y Mn que el HE. Por otra parte, el SC posee un contenido significativamente mayor en almidón ( $645,7 \text{ g.kg}^{-1}$ ) y significativamente menor en MS, FND y FAD. La producción ecológica parece influir en la composición químico-nutritiva de las diferentes variedades de trigo estudiadas con respecto a la variedad convencional. También se aprecian diferencias estadísticamente significativas en los contenidos minerales estudiados por el tipo de producción realizada cuando se analizan las especies en su conjunto.

**Palabras clave:** trigo, producción, ecológica, convencional, variedades, *Triticum*.

## ABSTRACT

At the global level, wheat is the third most produced cereal after corn and rice. It constitutes the main food of a third of the population. It is a food high content in carbohydrates, protein with unique chemical and physical properties, provides minerals and vitamins of the B complex, vitamin E, fiber and phytochemicals. On the other hand, buckwheat is an important source of energy. It has a high biological value due to its content in protein and other fractions such as phenolic compounds, tannins, phytosterols, vitamin E, condensed catechins and tannins and minerals. The production of organic food is increasing in importance. Organic wheat, in its different varieties, is considered an important part of small grain production due to its high utilization in Western European food. Of these, buckwheat constitutes one of the most important grain crops produced in organic farming. For this study, five varieties were used: flour wheat from conventional production (*Triticum aestivum*) (HC) and three organic wheat varieties: spelled (*Triticum spelta*) (EE), Khorasan Kamut® (*Triticum turgidum* ssp. *Turanicum*) (KKE) and wheat for flour (*Triticum aestivum*) (HE). As well as a very close species, the so-called ecological buckwheat (*Fagopyrum esculentum* Moench) (SE) The usual chemical-nutritional components were analyzed, as well as the contents in different minerals (Ca, Mg, Na, K, Fe, Mn, Cu and Zn). The results showed that the HC had significantly higher values in MS, PB, Fe and Mn than the HE. On the other hand, SC has a significantly higher content in starch (645.7 g.kg<sup>-1</sup>) and significantly lower in MS, FND and FAD. Ecological production seems to influence the chemical-nutritive composition of the different varieties of wheat studied with respect to the conventional variety. There are also statistically significant differences in the mineral contents studied by the type of production carried out when the species as a whole are analyzed.

**Key words:** wheat, production, ecological, conventional, varieties, *Triticum*.