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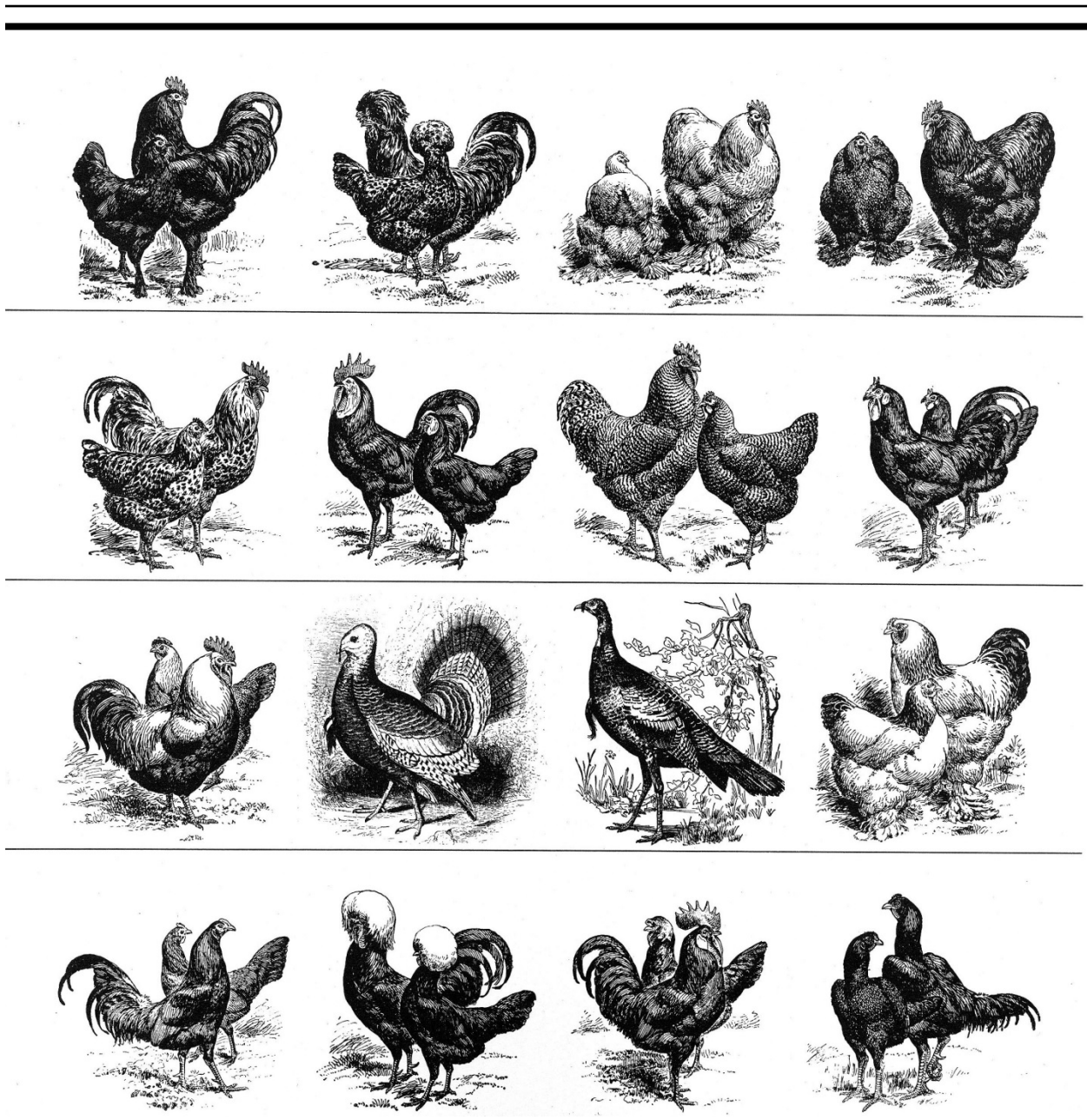
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RATIONAL REDUCTION IN ANTIBIOTIC DEPENDENCE BY TOTAL *MYCOPLASMA* CONTROL

REDUCCIÓN RACIONAL EN LA DEPENDENCIA DE LOS ANTIBIÓTICOS POR CONTROL TOTAL DE *MICOPLASMA*

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RESUMEN

Se pueden producir pollos de engorda sin infección vertical de MG y MS sin la necesidad de regímenes de antibióticos de rutina, en especial de medicamentos en el período de 18 a 22 d. Esto también permite la utilización de vacunas respiratorias más fuertes (La Sota por ejemplo). La transmisión horizontal en los pollos de engorda no parece ser lo suficientemente potente como para requerir antibióticos de rutina. Las gallinas de postura, especialmente las que se crían en jaulas, también pueden tener reducciones masivas en la dependencia de los antibióticos por el control de MG y MS. Esto ayudará a maximizar el rendimiento biológico y satisfacer las demandas emergentes de los clientes. Donde la libertad no es práctica para MG y MS, la vacunación contra micoplasma de reproductoras y gallinas de postura se ha utilizado con ts-11 y vacunas MSH. Otros beneficios incluyen expresiones menos complicadas de diversos virus (virus de influenza aviar, enfermedad de Newcastle, APMV y IBV) y las infecciones bacterianas (coriza y cólera aviar), pero es posible la aparición de la enfermedad clínica de *Brachyspira*.

SUMMARY

Broilers without vertical contamination with MG and MS can be produced without the need for routine antibiotic regimes, especially medication in the 18 to 22 d period. This also allows stronger respiratory vaccines (La Sota for example) to be used. Horizontal transmission to broilers does not seem to be potent enough to require routine antibiotics. Layers, especially cage layers can also have massive reductions in antibiotic dependence by control of MG and MS. This will help maximize biological performance and meet emerging customer demands. Other benefits include less complicated expressions of various viral (AIV, NDV, APMV and IBV) and bacterial co-infections (coryza and fowl cholera) but without antibiotics there maybe the emergence of clinical *Brachyspira* disease. Where freedom by exclusion only is not practical mycoplasma vaccination of breeders and layers with ts-11 and MSH vaccines can be used.

INTRODUCTION

The simplest approach to decrease dependence on routine antibiotic regimes in animal production is to implement alternative methods to control the bacterial challenges that the antibiotics are modulating (and not look at antibiotics as non-specific production enhancers). The chronic nature of mycoplasma infections and vertical transmission in poultry are the reasons for the strategy of mycoplasma freedom but this is often very difficult to implement at the final production level due to scale, the need to source mycoplasma free stock, economic barriers, lack of insurance, existing infrastructure and practises, and/or current antibiotic usage. Mycoplasma freedom has a fundamental problem that the birds are totally susceptible to infection (and breaks may require culling).

Synergistic effects of mycoplasma infections with other “simple/uncomplicated” infections have been long recognised but perhaps forgotten (4). The chronic nature of mycoplasma infections in chickens and their propensity to make infections with NDV, IBV, AIV (especially H9), and APMV virus to trigger diseases has been demonstrated in laboratories. Indeed it is very hard in the laboratory to produce respiratory disease with *Mycoplasma synoviae* without adding respiratory viruses or vaccines. The effects of bacterial infections in chickens have also been potentiated by mycoplasma infections. In the field often many potential pathogens are present and can be identified but their role in disease is difficult to ascertain. For example, in broilers in Germany “cheesy broilers” (airsacculitis in the slaughter house) have been considered to be ORT for a long time but the potentiating

effect of MS has recently been considered. Thus improvement of mycoplasma status can be seen as a massive improvement in the overall health status of breeders, layers or broilers (by eliminating vertical transmission as no useful immunity is passed to the broilers).

A good example is the effect of LaSota NDV in broilers in the field. The use of LaSota at 10 d will need antibiotic administration at 18 d in mycoplasma positive chicks to dampen down post vaccinal reactions. Obviously here the antibiotics are not directly affecting the viral infection component. Similarly in long lived birds coryza and fowl cholera are more chronic in mycoplasma infected birds. These synergistic effects are seen with either MG and/or MS.

MG and MS field strain freedom has been successfully achieved by biosecurity in many areas including UK, USA, and NZ. Usually this has been in broiler segments although MG freedom in egg production units is seriously attempted in some areas. Some places have only effectively controlled MG including Israel, Iran, Brazil, Germany, France, the Netherlands and in the field by individual producers elsewhere. In some areas they have controlled MG by ts-11 vaccination of breeders (best if they are MG free as DOC). MG only control can lead to MS potentially causing problems. The MS status in many operations is hard to tell because of antibiotic usage especially in lay.

Mycoplasma vaccines that interfere with wild strain spread and maintenance will be more useful than ones that just ameliorate clinical signs (probably vaccines that induce mucosal immunity are more efficient than those predominately inducing humoral antibody). A useful way to look at the effects of these vaccines is that they increase the resistance of the birds to infection with field strains. If some producers are unwilling to participate in pathogen control programmes they can become significant pathogen reservoirs (example MS in layers). Because of the large scale of poultry units sterilizing effects (for example total prevention of vertical transmission) are more useful than reduction of vertical transmission (1). These live mycoplasma vaccines differed from previous generations of vaccines in that they can displace wild strains from farms; not always predicted in the laboratory where they can be overwhelmed in some challenge systems. Although vertical transmission of ts-11 has been suspected once it is not the usual experience with ts-11(2,1).

MATERIALS AND METHODS

MG and MS control by combined vaccination with ts-11 and MSH has been used in Australia, South Africa, Japan, Philippines, Argentina (layers only), and Indonesia. This strategy is particularly attractive as both mycoplasma infections have the same control strategy (antibiotic strategy for MS control may be incompatible with live vaccination for MG).

RESULTS AND DISCUSSION

In Australia the strategy to develop mycoplasmal vaccines was not an active decision to decrease antibiotic usage but a response to the emergence of tylosin resistance in MG in some large broiler integrations in the mid 1980s (7). The vaccines ts-11 (MG) and MSH (MS) have been used extensively in layers and breeders in Australia for the last twenty years and now most chickens (layers, breeders or broilers never have antibiotic at therapeutic levels even when *in ovo* vaccinated). Concurrently coryza was controlled by a vaccine; this vaccine is no longer available but coryza has not re-emerged as a big problem. Fowl cholera is still a problem on some sites especially those with earthen floors (layers and breeders) and emerging in free range layers. Control of fowl cholera in organic broilers has been done by vaccination with killed vaccine at day old and no antibiotics (6). Some other problems are re-emerging in free range layers including erysipelas and spotty liver disease.

A Japanese trial successfully controlled egg apical abnormality (EAA) and improved production parameters in layers by adding MSH to a vaccination programme already containing ts-11 (5). No antibiotic was used. This was more effective than predicted in a laboratory challenge trial presumably as the field challenge was lower (3).

In some areas where MG is effectively controlled by a freedom strategy the addition of MSH vaccination has a similar impact (Arkansas trial, EU, Mexico and Iran) allowing massive antibiotic reduction. F strain vaccination of breeders is not done in the USA and the addition of MSH to F strain could still see the vertical transmission of F strain and the continued need for antibiotics around the third week in the broiler progeny.

Mycoplasma vaccination with these live vaccines will only control mycoplasma infection and disease but clinicians in Australia, South Africa report that other infections behave more like uncomplicated diseases in mycoplasma vaccinated stock. During a field trial in Indonesia I saw a ts-11 and MSH vaccinated flock with an egg production drop associated with avian metapneumovirus (AMPV) seroconversion that had minimal other clinical effects and did not require antibiotic treatment.

As producers decrease antibiotic usage sometimes some previously unidentified problems can emerge. Most commonly egg production drops that responded to tylosin coming into lay may not be mycoplasma (in Argentina these egg drops responded to amoycillin in mycoplasma vaccinated birds). Avian intestinal spirochaetosis (*Brachyspira* spp.) infections will do this with little increase in mortality and mild diarrhoea (increased second quality eggs with caramel shell stains). Indeed I believe that until *Brachyspira* in poultry recognized in a country then little effective limitation of antibiotic use has been done in layers. Routine antibiotics may be controlling/suppressing mycoplasma, salmonella, *E. coli*, *Pasteurella*, *Avibacterium*, “spotty liver disease,” and other infections (see Table 1).

CONCLUSION

The potentiating effects of MG and MS infections on the impact of respiratory viruses (NDV, APMV and AIV) and bacterial respiratory diseases (coryza, EPEC, ORT and fowl cholera) are well recognized. Effective control of wild type mycoplasma infections offers chicken and egg producers great advantages in decreasing the need for antibiotics and the impact of these infections. Although antibiotics are initially effective at controlling mycoplasma and bacterial respiratory diseases in poultry, the development of resistance means that this is not sustainable even in the medium term. The best long term strategies for mycoplasma control in sites with potential challenge are live vaccines that are safe and prevent vertical transmission. It is important to have criteria for judging success of mycoplasma control programme and realize that vaccination must take into account antibiotic interventions and other interactions. These criteria will include biological and economic parameters. The most important criteria for successful mycoplasma control in breeder operations is the ability of the next generation to be reared without routine antimycoplasmal antibiotics at d 18 to 23.

See <http://www.bioproperties.com.au/vaccines/documents/DOC-Bulletin-2012-01.pdf>

Increasingly, customers have an expectation that routine medication with antibiotics will not be used in the production of their food. In the Australian egg and poultry industries, MG and MS vaccination facilitated this aim on a country wide scale. Control of all the bacteria that had previously necessitated routine antibiotic administration was the final piece in the puzzle (often MS being the last) for these industries to really come of age and wean themselves from routine administration of antibiotics.

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Table 1. Common reasons for antibiotic therapy in chickens.

Disease/pathogen	Antibiotic use	Alternatives	Comments
<i>Mycoplasma gallisepticum</i> (MG) (CRD & suboptimal production)	Routine administration in lay and day 20-22 in broilers (not penicillins or phosphomycin)	MG free replacement stock and vaccination where necessary	ts-11 in Breeders and layers Antibiotic resistance
<i>M. synoviae</i> (MS) (CRD, EAA, Peritonitis & suboptimal production)	Routine administration in lay and day 20-22 in broilers (not penicillins or phosphomycin)	MS free replacement stock and vaccination where necessary	MSH in breeders and layers Antibiotic resistance
Coryza (<i>A. paragallinarum</i>)	Antibiotics when clinical signs appear.	Vaccination	Synergistic effect with mycoplasma
Fowl cholera (<i>P. multocoda</i>)	Antibiotics supplementing vaccination.	Vaccination, concrete floors and rodent control. Stress minimization	Not all sites have this problem. Better understanding and vaccines needed.
<i>Salmonella</i>	Suppression	Freedom (Biosecurity) and vaccination	Antibiotic resistance is problem
<i>E. coli</i> and others	Suppression	Hygiene and perhaps vaccination	Antibiotic resistance is problem
<i>Respiratory viruses and vaccines</i> NDV (esp LaSota), APMV, IBV, H9,	Control of secondary bacterial infections including vaccine reactions.	Better or more appropriate vaccines	Synergistic effect with mycoplasma infections Routine antibiotics 8-10 days post vaccination
<i>Brachyspira</i> spp. (egg drop and diarrhoea)	Cryptic; often controlled by antibiotics targeting other infections.	Water acidification?	Emergence with decreased antibiotic usage
<i>Immunosuppressive viruses</i>	Control of secondary bacterial infections	Biosecurity and vaccination	MDV, IBD, CAV, REV and others.