

## T E C H N I C A L B U L L E T I N

# Agromanol®

## *An Efficient Feed Enhancer For Laying Hens And Breeders*

### **Introduction**

Some time ago the contamination of eggs and poultry carcasses by Salmonella was the cause of great concern in the food industry. This concern was due to the toxic outbreaks linked to the consumption of products made from contaminated poultry products or eggs, even though many other foodstuffs can also be contaminated by Salmonella.

These organisms are much more widespread than imagined. They can be found in the soil where they can contaminate raw materials such as cereals and oleaginous grains used in the make up of animal feedstuff, thereby infecting animals with Salmonella. Salmonella is capable of surviving high temperatures, even though it doesn't propagate,. Studies have also shown that Salmonella can also survive in situations of dehydration. It is important to remember this capability in relation to foodstuffs and raw materials. This means that various kinds of meal, by-products of abattoirs, fishmeal, meal from cereals and oleaginous grains retain Salmonellae if they have been contaminated during any stage of the production process, or during transport or storage.

Furthermore, if Salmonella is present in the equipment or installations used for the processing of raw material; it will persist after the drying of surfaces of equipment or buildings. Salmonella can also be carried by dust particles, which are another important source of contamination alongside the manufacturing of food products and processing sites.

### **Contamination of poultry**

Poultry can become infected with Salmonella during the first weeks of their lives. In an intensive production system it is possible for the organisms to spread rapidly from bird to bird. The presence of Salmonella in the bird's stomach or on the feathers can subsequently lead to contamination of the carcass during the processing stage.

The majority of Salmonella found in the intestinal tract do not cause infection, being non-pathogenic, and are generally removed with the feces.

For Salmonella enteritidis the manner of infection is completely different. As well as being a common pathogen for humans this organism is also deadly for poultry and can lead to a high mortality rate in young chicks and broilers. Salmonella enteritidis is by nature pathogenic in poultry, which can result in excessive blood disorders or bacteremias thereby causing muscular contamination. Studies carried out on poultry carcasses reveal that 57% are contaminated by Salmonella.

The principle source of contamination of poultry by Salmonella enteritidis is most probably infected breeders and in this case it is necessary that they be treated and kept free of contamination.

### **Contamination of eggs**

Salmonella can be isolated from egg shells and this is frequently related to fecal contamination. Salmonella enteritidis can also be isolated from the content of clean dry eggs.

This appears to be as a result of an infection of the reproductive tissues, as there is no evidence that Salmonella linked to fecal contamination can pass from the surface through the shell and membrane of the egg.

During storage, the vitelline membrane of the yolk breaks creating sufficiently permeable points for the passage of Salmonella which consequently leads to the contamination of the yolk. Once this happens, it is possible to find a considerable quantity of Salmonella in both the yolk and white of the egg.

**Control of Salmonelose**

A practical and viable strategy of control is to prevent the infection of poultry by Salmonella. Prevention can be carried out in various manners, however, the aim of this technical bulletin is to focus on the acidifying of the bird's diet as an easy, practical and economic method in the prevention of Salmonella contamination of poultry.

Studies have shown that the raw materials used in the preparation of feed for broilers are often contaminated. 78 samples of meal originating from 34 different sources showed that 40 % of meal of meat origin and 20 % of fish meal was contaminated by Salmonella (Kaneto et al, 1996) which stresses the importance of employing methods to avoid this kind of contamination.

Researchers have observed that the treatment of the principal feed source with organic acids diminishes the percentage of positive cases of Salmonella, reduces the total number of coliformes and of E. coli in the gastrointestinal tract and when used throughout the bird's lifespan or for the last seven days before slaughtering reduces the amount of carcass contamination by Salmonella after immersion in cooling water.

The organic acids act directly as a bactericide in the bird's craw (Adams, 1991). Salmonella enteritidis PT4 when added to fresh material isolated from the stomach of chickens was completely sensitive to the organic acid based Salmonella inhibitor as shown in Table 1.

As well as having a controlling effect over Salmonella, the organic acids possess other beneficial properties which justify their use as acidifiers of the birds' diets. One of these properties is the increase of the limit of acid production in the stomach, which occurs in very young animals, and is responsible for the better uptake of nutrients once these acids stimulate the synthesis or liberation of a greater quantity of digestive enzymes.

Maintaining a lower gastrointestinal pH as a result of the addition of organic acids allows a greater control over the micro organisms which develop in the animal's stomach, not only with Salmonella but also with E. coli e and other pathogenic agents.

Also the addition of acidifying agents results in the quelation of minerals which improves their absorption, and consequently is more profitable for the animals.

**Table 1 - Percentage of initial inoculation of S. enteritidis PT4 which survives in stomach contents after treatment with an organic acid based Salmonella inhibitor.**

Time after treatment	Treatment (% of salmonella inhibitor)			
	0	0,25	0,30	0,50
0	100	100	100	100
15	92	80	74	60
30	71	43	36	35
60	57	8	5	1
90	50	0,7	0,6	0,2

Fonte: Adams, 1991.

**Agromanol®**

Agromanol® is a product developed and manufactured by Quinabra®. It is derived from organic acids and its use is specifically as an acidifier of feedstuff for laying hens and breeders in order to preserve the feedstuff and control pathogenic bacterial agents such as Salmonella.

Agromanol® is made up of fumaric, lactic, citric and ascorbic acids of high bio-availability which act synergetically on the bacteria and fungi present in the feedstuff.

The inhibiting effects of Agromanol® on the contaminating feedstuff agents occur through contact with the agent in which the cellular membrane is altered and the cell's oxidative respiration is prevented. This action together with the acidification facilitates the control over the pathogenic bacterial population and thereby permits a selection of the gastrointestinal flora.

As well as the inhibiting effects on pathogenic agents, the high bio-availability of the organic acids of Agromanol® provide other advantages by optimizing the bird's productivity which has been demonstrated by various field tests such as reduction of mortality rate, increase in feed consumption rate, better feed conversion rate, better yolk pigmentation and harder egg shells.

The benefits obtained by the use of Agromanol® were proven during tests carried out at the Instituto Biológico do Estado

de São Paulo, Bastos, SP; where not only the control over Salmonella by Agromanol® was demonstrated, but also the beneficial effects on egg quality and the levels of production as a result of its use as a feed additive.

**The evaluation of Agromanol® in the presence of salmonella enteritidis "in vivo"**

100 chickens previously treated and certified free of Salmonella were divided into four groups (I, II, III and IV) three of which were later infected and one which remained as a control (no treatment). Groups I and II received a ration based diet treated with Agromanol® for four weeks before being infected with Salmonella enteritidis. Group II continued to receive the same treatment after being infected but group 1 did not. Groups III and IV received no treatment at any stage, but only group III was infected with Salmonella enteritidis while group IV remained as a control, (table 2).

**Table 2 - Experimental scheme of the Agromanol® test**

Group	Infected prior to treatment	Infected after treatment	Control
I	Sim	Não	Sim
II	Sim	Sim	Sim
III	Não	Não	Sim
IV	Não	Não	Não

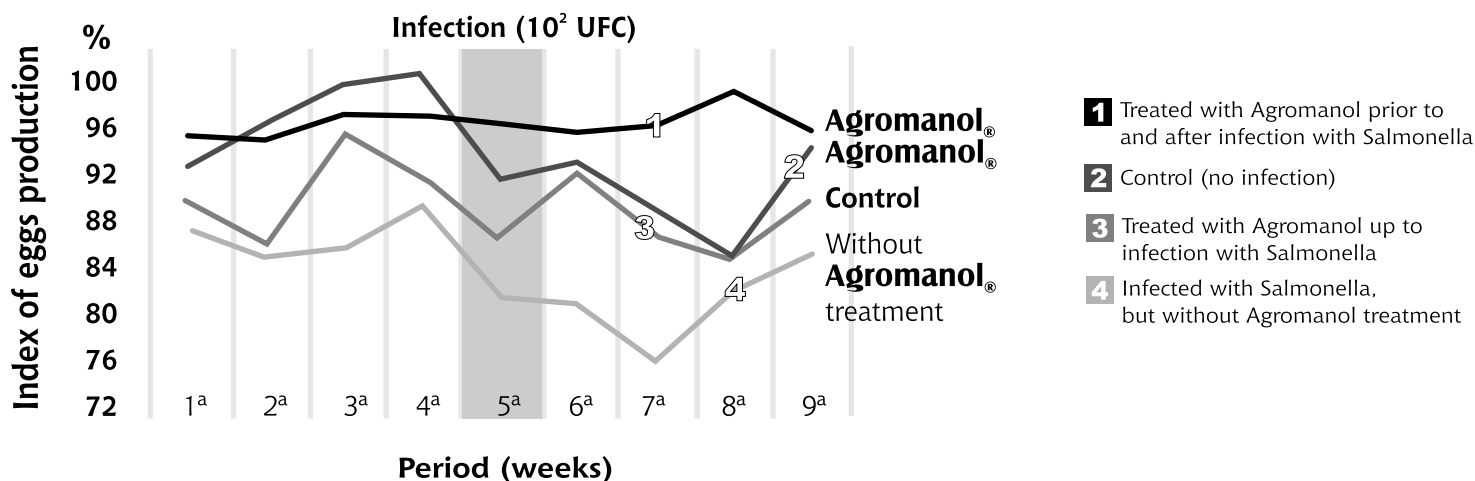
On the 3rd, 4th and 5th day after being infected, three birds from each group were collected and slaughtered in order to obtain Salmonella enteritidis from their organs, fecal material was collected from 5 birds of each group by means of an anal swab and also 7 eggs from each group were tested.

Data regarding egg production and quality, bird behavior, food consumption, bacterial re-isolation, serological tests and the presence or absence of injuries were observed.

All data obtained were statistically analysed using uncertainty analysis with 95% reliability.

**RESULTS:** An analysis of the results obtained using Agromanol® as an acidifying feed additive demonstrates its important role in the control of Salmonella as well as its use as a productivity promoter for birds. Results show that the productivity levels of birds treated with Agromanol® and then infected with Salmonella enteritidis were better than those of the control group (which were not infected). This can be easily verified by Graph 1 which shows the percentage of egg production per bird before and after being infected with Salmonella enteritidis.

**Gráfico 1 - The percentage of egg production per bird**



As well as the above mentioned test carried out at the Instituto Biológico do Estado de São Paulo, various other field tests were carried out in different Latin American countries and the United States which demonstrate that the use of Agromanol® increases the quantity of eggs laid, improves the egg laying curve, increases the number of hatchable eggs and the number of births, reduces the number of dirty eggs, as well as decreasing the number cracked shells.

This proves that Agromanol® is a product which can always be used in the control or prevention of Salmonella as well as a productivity promoter of laying hens and breeders.

**The evaluation of Agromanol® against salmonella gallinarum "in vivo"**

This test was carried out in the Department of Animal Production of F.M.V.Z. of UNAM (Mexico), Abril 1994.

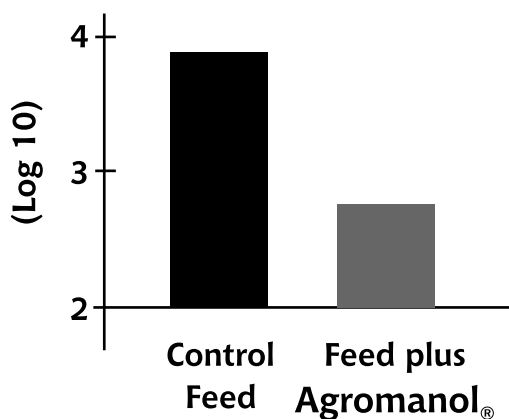
**Objective:** To evaluate the use of Agromanol® in the birds' diets, against the infection of organs by Salmonella gallinarum.

**Materials and methods:** The method used was that described in the National Plan of Agricultural Improvement of the United States (USP-NPIP), using an inoculation of 10<sup>8</sup> UFC/ml of a pathogenic strain of Salmonella gallinarum known as U-2 (resistant to nalidixic acid and novobicina).

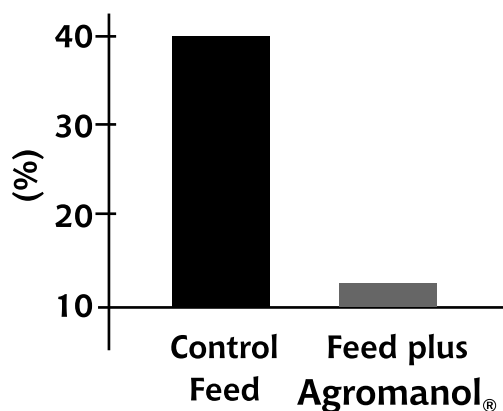
The test was carried out in duplicate using a total of 200 one day old fattening chicks. 500 g /ton Agromanol® was added to the experimental group's feed ration over a period of 13 days. All birds were inoculated orally and the slaughtered.

**Results:** Significant statistical differences between both groups were observed (P<0,05).

Grafic 1  
Salmonella gallinarum /g (log<sup>10</sup>)



Grafic 2  
Positive organs to Salmonella gallinarum



**OBSERVATIONS:** There were no significant differences in the weight of the organs, intestinal pH and luminal morphology.

**CONCLUSION:** Agromanol® significantly reduces the infection of organs by Salmonella gallinarum.

**To evaluate the effect of Agromanol® on the productivity and quality of eggs , feed conversion of laying hens and the reaction of birds to the newcastle vaccination.**

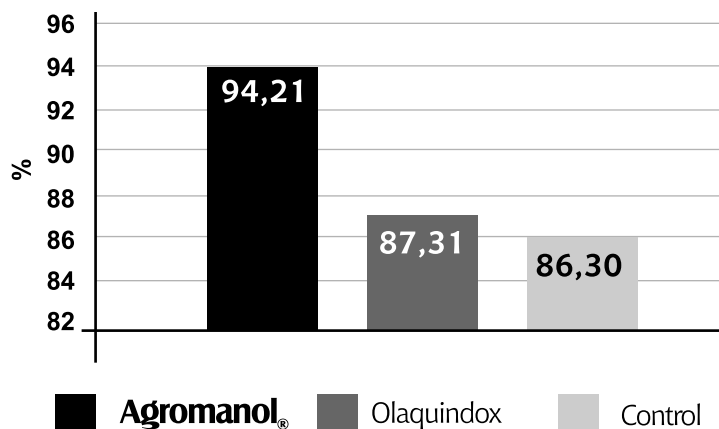
This test was carried out in the avery of the laboratório de patologia avícola e bromatologia bastos são paulo in september 2001.

**Objective:** To evaluate the effect of agromanol on the productivity and quality of eggs , feed conversion of laying hens and the reaction of birds to the newcastle vaccination.

**Material and methods:** The experiment was conducted by the biological institute of são paulo in bastos over a period of 70 days ( 5 periods of 14 days). 80 26-week-old lohmann hens were used, which were housed in commercial poultry sheds. 500gr of agromanol per ton of feed were added to the birds' diet over a period of 70 days. All figures related to productivity were taken daily and the average calculated every 14 days.

- The effect of Agromanol® on the productivity of laying hens can be seen as a direct influence on the efficiency of the farm. As well as increased productivity, the hens which received Agromanol® in their diet demonstrated a greater increase in production during the height of the laying cycle as well as extending the period of egg production.

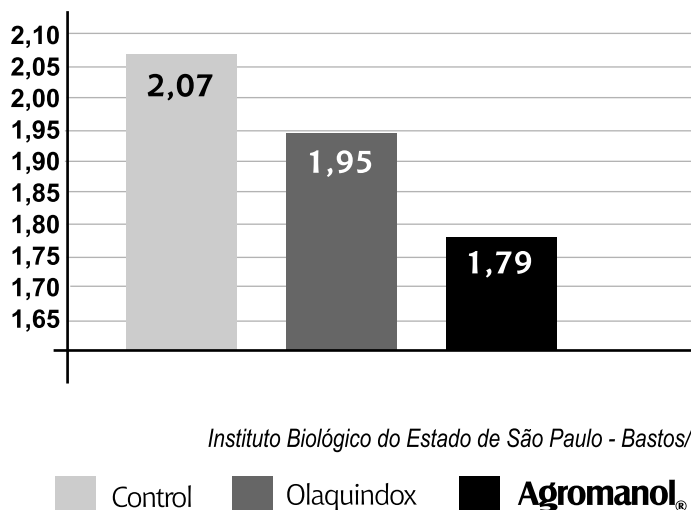
**This graph demonstrates the values obtained related to the productivity observed during testing.**



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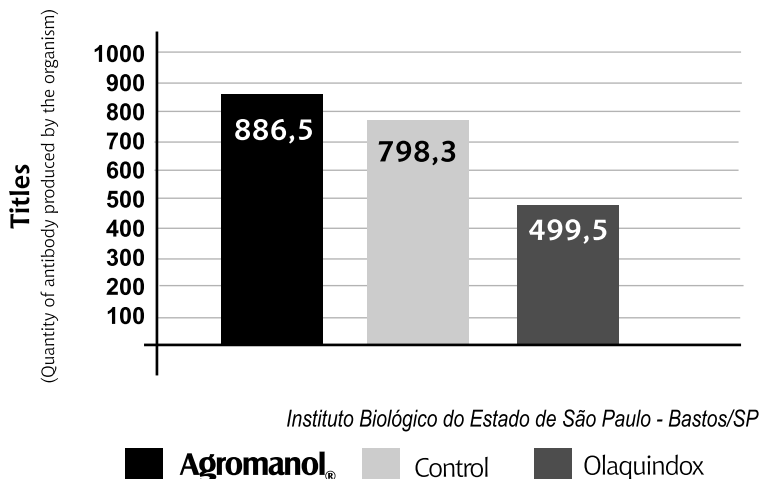
- From the studies carried out it can be seen that the hens treated with Agromanol demonstrate higher levels of feed conversion in relation to other treatments. In other words, the hens consumed less feed ration to produce 1kg of eggs, thereby improving the financial efficiency of the production system.

**This graph demonstrates the values related to feed conversion during the test.**



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- The presence of stabilized vitamin C (by means of bioflavonoids) in Agromanol is responsible for stimulating the hens' immunological system.

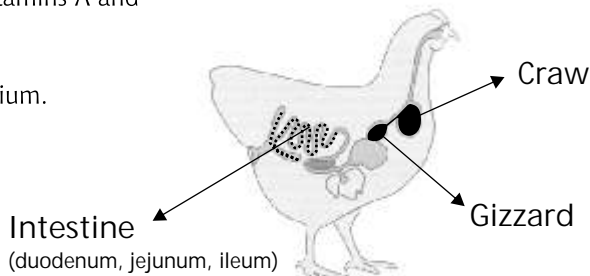


**CONCLUSION:** Agromanol® acts as a feed enhancing additive for laying hens by improving productivity, egg quality, feed conversion rate and the birds' reaction to the newcastle vaccination. Agromanol® demonstrated better results for all parameters analyzed when compared with the large scale commercialized antibiotic growth promoters

**Physiological action of Agromanol®**

..... Acidifying action of agromanol in the craw and the Gizzard favors the development of beneficial natural flora and inhibits the growth of pathogenic microorganisms.

- Antioxidant action which protects vitamins A and Greater absorption of nutrients;
- Acts as free radical scavenger;
- Preservation of the intestinal epithelium.



**Characteristics of the product**

Agromanol® is a beige colored fine powder, with a pH of between 2,5-3,5. It is stable in the presence of organic material, sunlight and high temperatures (130°C), and can therefore be used before the rations are made into pellets.

Agromanol® is a product which is totally non-toxic to man and animals. It doesn't irritate skin or mucous membranes during handling. It has a wide range of action against Gram-positive and Gram-negative bacteria and fungi without being corrosive to the equipment used in the manufacture of animal ration.

Agromanol® is non volatile, and remains active in the feed rations without emitting toxic fumes or altering the taste or smell of the ration, consequently there is no chance of the animals rejecting the treated product. Agromanol® is compatible with antibiotics, chemo-therapeutics and the rest of products usually found in the make up of rations.

**Avantages in using Agromanol®**

- Controls fungal and bacterial growth in feed rations;
- Helps in the control and prevention of salmonella in birds;
- It is a coadjuvant during periods of physiological "stress" (egg laying cycle peaks);
- Increases egg production and maintains production level even during periods of low resistance;
- Improves the shell quality and the pigmentation of the yolk;
- Reduces incidents of diarrhea and dirty eggs.

**Method of use**

Pre-mix the vegetable meal with the required quantity of Agromanol® and the mix with the other ingredient of feed ration. 500 g/ton of feed ration for laying hens from the first week on or in accordance with the recommendations of the nutritionist /

**Storage**

Maintain the bags of Agromanol® closed in a fresh dry place far from toxic or contaminating products.

**Packaging**

15 Kg multi-layered bags

**Validity**

Three years after date of manufacturing.

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