Invited Review

ANIMAL WELFARE AND POULTRY PRODUCTIVITY: A SHORT REVIEW[1]

[EL BIENESTAR ANIMAL Y LA PRODUCTIVIDAD AVÍCOLA: UNA REVISIÓN CORTA]

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SUMMARY

The aim of this review is to present production alternatives based on animal welfare standards and good management practices on broiler and posture breeding. The excessive intensive production of eggs and chicken meat comes from the demand for food from a growing world population. And it has forgotten good animal husbandry and management practices. Which causes an imbalance of the sympathetic nervous system and adrenal medullary tissue that control the response of the poultry to stress, raising catecholamine levels inducing the release of glucose causing liver, heart and neuronal failure. these effects become visible due to the increase of diseases since the immune system is depressed, food intake decreases, oxytocin inhibition, which results in reduced reproduction and even death of the poultry. The incorporation of animal welfare standards imposed in intensive breeding, as well as, the production of eggs and meat under production systems (grazing) and backyard production become a sustainable alternative that maximizes the welfare of the poultry

Keywords: *Gallus domesticus*; Backyard; Animal welfare; Production.

RESUMEN

La presente revisión tiene como objetivo presentar alternativas de producción basadas en normas de bienestar animal y buenas prácticas de manejo sobre la cría de aves de engorde y postura. La desmedida producción intensiva de huevos y carne de pollo proviene de la demanda de alimentos de una población mundial en crecimiento. Y con ello, se ha olvidado las buenas prácticas de manejo y bienestar animal. Lo cual provoca un desequilibrio del sistema nervioso simpático y el tejido medular suprarrenal que controlan la respuesta del ave ante el estrés, elevando los niveles de catecolamina induciendo la liberación de glucosa provocando falla hepática, cardiaca y neuronal. estos efectos se hacen visibles debido al aumento de enfermedades ya que se deprime el sistema inmune, disminuye la ingesta de alimentos, inhibición de oxitocina, lo que trae como consecuencia reducción de la reproducción e incluso la muerte del ave. La incorporación de normas de bienestar animal impuestas a la cria intensiva, así como, la producción de huevos y carne bajo sistemas de producción campera (pastoreo) y traspatio se convierten en una alternativa sustentable y que maximiza el bienestar de las aves.

Palabras clave: *Gallus domesticus;* Traspatio; Bienestar animal; Producción

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INTRODUCTION

The world poultry production has grown at an accelerated pace since 1961 (Nicol and Davies, 2013) driven by the high demand for white meat and eggs for the consumption of the world population, which has also grown by leaps and bounds since 1961 where there were approximately 3,036 thousand million human beings, which has allowed and influenced during the last 15 years its expansion, consolidation, development and globalization in most of the countries of the world (Glatz et al., 2013).

The Food and Agriculture Organization of the United Nations determined that the world production of poultry meat was 108.7 million tons (Giacomozzi, 2015), as well as the world production of eggs within the last two decades. from 64.2 million tons to 86.2 million tons during the period from 2010 to 2015, thus supplying the global demands (Giacomozzi, 2014), which are generated since the 1980s as a result of the development and population growth, the increase in per capita income and the demand for livestock products leading to the so-called "livestock revolution" (Steinfeld and Chilonda, 2006). Thanks to this livestock revolution, the council on animal welfare of farm animals that the English government created in 1979, prior to research carried out in intensive livestock farming by Professor Roger Branbell in 1960, was left aside. which has caused, that for several decades the animal welfare of the domestic species that the human being breeds has been neglected, among them the poultry, suffering thus, high levels of stress due to the over exploitation to which they are submitted in intensive systems managed worldwide.

Stress arises when there is an imbalance of the nervous system, in poultry there are three phases: alarm reaction, resistance or adaptation and exhaustion (Mohan, 2005; Medina, 2016) in general the mechanism influences the sympathetic nervous system and adrenal medullary tissue that control the response of the bird to stress, raising catecholamine levels (dopamine and nor-adrenaline) inducing the release of glucose causing liver, heart and neuronal failure (Selye, 1950; Siegel, 1980), these effects are visible in the increase of diseases since the immune system is depressed, food intake decreases, oxytoxine inhibition, reduction of reproduction and even death (Brake, 1985; Freeman, 1987; Maxwell, 1993).

Animal welfare

Although all species of domestic and wild animals are different to humans, they have the ability to experience and express different emotional states, which is why it is extremely important to implement ethical considerations within their production or exploitation guaranteed, thus a satisfactory level of animal welfare, the dictionary of the Royal Academy of the Spanish Language determines that welfare is the set of things and activities necessary for the development of situations that generate a satisfactory living condition (Nicol and Davies, 2013; Van Horne and Achterbosch, 2008), the World Organization for Animal Health (OIE) defines animal welfare as the way in which an animal confronts all the conditions of its environment (Meluzzi and Giordani, 1989; Rojas et al., 2005).

Animal welfare has been formally established as a discipline since 1965, and in 1979 the Farm Animal Welfare Council of the United Kingdom sets five freedoms and principles for the origin of animal welfare, taking into account the physical and behavioral needs of animals. they are: freedom from not suffering hunger or thirst, freedom from not suffering discomfort, freedom from not presenting pain, wounds or illnesses, freedom to express a natural and innate behavior and freedom from developing fear or anguish (Rojas et al., 2005; Dottavio and Di Masso, 2010; Nicol and Davies, 2013;).

In recent years the issue of animal welfare within poultry production has gained strength and significant importance in the European Union, the United States (Van Horne and Achterbosch, 2008), Canada and in some developing countries such as: Argentina, Bolivia, Brazil , Cuba, El Salvador, Mexico, Paraguay, Peru and Uruguay (Rojas et al., 2005) the same ones that propose viable production alternatives, improving especially the management practices, care and production of poultry (Nicol and Davies, 2013) increasing notoriously the productivity and the quality of the products as well as, that standards of animal welfare are fulfilled which allows the widening of the range in sales and exports (Rojas et al., 2005).

In 2012, the European Union prohibits the use of conventional cages for laying hen within commercial egg production, where it is approved that equipment and cages must present conditions that favor the manifestation of natural and innate behaviors of poultry (Nicol Davies, 2013), thus replacing traditional cages or lodgings with composite cages, which have an area of 750cm^2 (Van Horne and Achterbosch, 2008) and are made up of a perch, a bed, a nest box, their respective feeders and drinking troughs, constituting an alternative system to the intensive productions in which the poultry had access to a minimum area of 550 cm^2 and lacked all comfort and well-being (Aseprhu and Prhucam, 2013) as can be seen in Figure 1. For commercial poultry production (meat) a maximum level of density was also determined in relation to the number of poultry per square meter, setting a density of 33kg to 39kg/m^2

if animal welfare conditions are present at a considerable level and range within the production system (Van Horne and Achterbosch, 2008; Vizcaíno and Betancourt, 2013), given that in intensive production systems there are large levels of poultry integration per m^2 which generate biological disturbances and behaviors related to inappropriate management in different stages during the development of the poultry, sometimes causing death (Dottavio and Di Masso, 2010).

Intensive poultry production

The obtaining of products of massive consumption (meat and eggs) is characterized by contributing with the minimum of investments to obtain the maximum of the possible yields (Dottavio and Di Masso, 2010), in countries of the Andean region it has been adopted with little creativity the intensive breeding of birds with the objective of increasing the economy, where maximizing the density of poultry per m^2 is a priority without taking animal welfare into account. What generates unnatural and precarious living conditions for birds (Meluzzi and Giordani, 1989; Dottavio and Di Masso, 2010) depriving them of all kinds of innate behavioral expression such as the agitation of their wings, snacking and bathing with sand (Van Horne and Achterbosch, 2008; Nicol and Davies, 2013); Other factors that affect the welfare of the birds are: the limited supply of the amount of food, inadequate handling during transportation and slaughter. In general, all these bad conditions lead to metabolic disorders that mainly damage the bone system, cardiovascular functions and low immune system in poultry (Dottavio and Di Masso, 2010). As a result, high levels of stress are triggered, which are directly proportional to the high mortality of birds (Nicol and Davies, 2013).

Production alternatives

Within the production of eggs, various systems have been implemented as alternatives to improve the welfare of laying birds (Muñoz and Vellojin, 2002), these systems eradicate all or part of the use of cages (Fanatico, 2007), within which They have established 3 types called: Production in soil, the same one that foresees a density of 9 birds per m^2 (Vizcaíno and Betancourt, 2013), bed, feeder, drinker, perches and nesting, all these are on aviaries or a unique plant within of a warehouse or shed (Aseprhu and Prhucam, 2013), which has characteristics similar to that of intensive production (De Luca and Kuricic, 2015), within this production system can be obtained low rates of ectoparasites "lice" since the hens present higher levels of grooming and care of all the external parts of their body, thanks to the space that this system provides them (Castañeda and Gómez, 2010) (Figure 2).

Figure 1. Cages with excess laying hens by m^2

Figure 2. Hens in a modified barn coop with greater comfort

Backyard production; It is a complement to the production system in soil with the variation that poultry have access to parks (Castañeda and Gómez, 2010) or large areas of open land and covered with vegetation where they will proceed to graze (Fanatico, 2007; Dottavio and Di Masso, 2010), this activity is carried out by momentarily leaving the facilities by means of trapdoors or doors arranged longitudinally in the warehouse or production shed, the parks must be planned for a density of 1 hen per m^2 or a population of 2500 poultry per hectare (Aseprhu and Prhucam, 2013) (Figure 3).

Ecological production; is the combination of production systems in soil and jacket production in which a density of 6 poultry per m^2 is handled with the difference that the farm area within this production system must be declared in ecological production or that the area to be used For the pasture of the hen has not been subjected to treatments with any type of chemical products (Fanatico, 2007; Aseprhu and Prhucam, 2013), this system improves the poultry immune response, reduces stress levels and significantly reduces the percentage of Mortality and incidence of diseases (Muñoz and Vellojin, 2002; Castañeda and Gómez, 2010).

On the other hand, meat production has also adopted some characteristics of the production system of egg producing hen, allowing poultry to have free access to the farm (Fanatico, 2007) in such a way that they can express their own behavior. the animal species and thus conferring better quality meat (Dottavio and Di Masso, 2010). This production alternative promotes the use of probiotics or foods rich in beneficial microorganisms for the gastro-intestinal flora, natural vitamins, fresh air, natural light (photoperiod), natural diet and balanced with fresh pastures (Castañeda and Gómez, 2010)

Influence of light

When poultry do not have access to natural light, it is recommended that they receive at least 8 hours of artificial light, according to the rules on animal welfare for poultry, during an experiment with chickens it was observed that, by offering them the possibility of choosing between light and dark, chickens chose to spend 80% of the time in the light (Savory and Duncan, 1982). Hughes and Black (1974) studied the negative effect of low intensities on the behavior of hens. Thus, chicks housed in ships with intensities between 17 and 22 lux were more timid and fearful of mobile forms than those housed in ships with intensities between 55 to 88 lux. In another study carried out by Martin (1989) it was evidenced that there was a higher percentage of picace at low intensities (50 lux) than high intensities (500 lux), since the hens at high intensities, had greater visual acuity, paid more attention to the soil (both in cages housed in cages as in soil) spending much more distracted pecking particles of soil and investigating their social environment, which evidently decreased social disputes and pecking between chickens.

The backyard: a viable alternative, ecological and of comfort

The poultry production, traditional, rustic or also called backyard is a livestock activity practiced since pre-Hispanic times that aims to use family labor to

obtain products (meat and eggs) with high nutritional content in an ecological way and with high levels of well-being. animal (Soler, 2010; Molina, 2013; Hernandez et al., 2014), these products can be both for the consumption of the family nucleus and for commercialization, generating income capable of satisfying needs and improving the quality of life of producers (Hernández et al., 2014; Romero, 2013). In this sense, it constitutes an activity that is important within the rural regions of developing countries (Molina, 2013) such as: Cuba, Chile, Costa Rica, Honduras, Mexico, Africa and developed countries such as: Asia and members of the European Union (Soler, 2010), because the birds are monogastric and small animals constitute an easy handling and great adaptation to the majority of existing climatic floors (Molina, 2013). Furthermore, this production system requires low investments in facilities, supplies and equipment for its implementation and operation (FAO and SAGARPA, 2007).

Figure 3. Breeding poultry with access to grazing.

The backyard consists of a small group of 4 to 15 poultry which live together and remain free in grazing during the day and at night crowded in a chicken coop during their rest, their food is varied naturally consisting of herbs, insects, pastures, forages , worms, worms, organic household waste (fruits, vegetables), grains, seeds and food supplements provided by the producer (FAO and SAGARPA, 2007; Soler, 2010; Molina, 2013; Hernández et al., 2014), poultry houses or facilities are built based on existing materials to the area or recycled materials (plastic bottles) and according to the budget of the farmers (Figure 4).

The size of the poultry house and the grazing area will depend directly on the number of poultry to produce these should have a density of 2-3 poultry/m^2 (FAO and SAGARPA, 2007), have feeders and drinkers that can be made by hand or acquire them of some commercial house. The nests can be built empirically as long as they offer comfort and the established dimensions (30cm wide x 40cm long and 35cm deep) perches for the rest of the poultry and finally a fence that surrounds these facilities to protect the integrity of the poultry in production, which avoids its dispersion and facilitate its management (Hernández *et al.*, 2014; Soler, 2010; FAO and SAGARPA, 2007).

The backyard viability is presented as a feasible production system since it can reach 2.26 kg of weight at sexual maturity (22 weeks) and an egg production of 2.3 eggs /hen/ week obtaining a peak of posture of 59.1% in red Rhode Island hens, considering that the feeding was not based on concentrate (Jerez-Salas and Carrillo Rodríguez, 2009). This alternative small-scale system proposed for the production of eggs fulfills a very important function, whose main purpose is self-consumption, the generation of complementary income and an element of savings in the units of peasant production. With respect, to the quality of the egg in the backyard Creole hens the results are similar to the eggs of hens of commercial stock (Segura-Correa et al., 2010). In this sense, Jerez-Salas et al. (2014) report higher ($P < 0.05$) pigmentation of the yolk and omegas content in the eggs of hens with access to purslane (*Portulaca oleracea L.*) typical characteristics of the so-called "ranch eggs" themselves that are very desired by consumers.

Appropriate transportation

The transport of domestic animals to the farms or slaughterhouse influences the loss of weight due to mismanagement, triggering high levels of stress to which they are subjected during this activity (Kannan et al., 2000, Ali et al., 2006; Schwartzkopf- Genswein et al., 2012). The mobility of poultry through land transport and in conjunction with loading and unloading operations are frequent activities that constitute a new and unknown situation for them (Glatz et al., 2013), the simple fact of removing poultry from its controlled atmosphere of production, whether from one farm to another, from the farms to the place of slaughter or from the farms to the markets of markets and fairs, suppose conditions that generate stress, anxiety, fear, vertigo and alterations in activities or frequencies food (Ros, 2008; Arrebola et al., 2013).

During transport, the poultry are placed in loose boxes or modular trucks, which represent a large population of poultry in a small area, thus generating a very high density (Glatz et al., 2013; Arrebola et al., 2013). of this, they are exposed to noise and vibrations of which they are not accustomed, for example: the vibration of the vehicular engine and the noises of the outside of the farm, all this together causes the poultry to develop aggression behaviors among themselves giving as Result lesions, fractures or bone ruptures, muscle tears, bruises, bruises and sometimes extreme death (Aseprhu and Prhucam, 2013; Glatz et al., 2013; Arrebola et al., 2013).

Figure 4. Poultry reared in traditional or backyard system.

For all these problems of animal welfare the European Union determines that for long trips (more than eight hours) from the embarkation of the first poultry to the discharge of the last poultry, an adequate and abundant supply of water and food must be available, as well as as well as rest periods (Ros, 2008; Arrebola et al., 2013; Glatz et al., 2013) the vehicle should simulate a relatively stable environment and provide protection, comfort and safety to poultry, this regulation also integrates the maximum densities per poultry weight for transport, which are detailed in Table 1 (Aseprhu and Prhucam, 2013).

Heat stress

Several studies (Franco-Jiménez and Beck, 2007; Mertens et al., 2010; Havlicek and Salma, 2011; Gudev et al., 2011) have shown that thermal stress in hens, especially in poultry, makes their Heat dissipation system (conduction, convection and radiation) becomes less effective with the increase of room temperature, since they can not sweat due to the absence of sweat glands, therefore, the animal depends more and more on thermolysis by panting and metabolic changes to relieve heat stress, thus decreasing thermogenesis, limiting the provision of nutrients and proteins for egg formation, directly

influencing the decrease in weight and egg size, quality of the skin (appearance of furrows), loss of the coloring of the yolk, loss of consistency of the albumin, making the yolk vulnerable to microbial contamination; the optimum temperatures in laying hens are from 21 to 25 ° C (Keener et al., 2006; Mashaly et al., 2010; Felver-Gant et al., 2012).

Interaction between animal welfare and poultry productivity

Numerous studies show that improving animal welfare can increase productivity and quality of meat, milk or eggs (Beattie et al., 1995; Boivin et al., 1998; Briones et al., 2011; Schwartzkopf-Genswein et al., 2012). In this sense, when comparing intensive production systems versus production of hens reared in the open field, less parasitism (coccidia) and lower mortality from birth were observed in hens reared in the open field (evaluation for 13 weeks) (Briones et al., 2011). In another study conducted by Mohammed et al. (2013) reported higher ($P<0.05$) egg mass (50.66 vs 45.30 g egg/hen/day) higher feed intake (103.70 vs 97.67 g/day) and eggs with darker yellow buds in hens under one system of open field production vs cage production system, it should be noted that the concentrated feed supplied was the same for the two production systems.

Table 1. Density of poultry transported in cages or containers (Aseprhu and Prhucam, 2013; Ros, 2008; Arrebola et al., 2013).

Category	Space (cm^2)
One-day-old chicks	21-25 cm^2/chicken
chicken less than 1.6 kg	180-200 cm^2/kg
chicken of 1.6 kg to 3 kg	160cm^2/kg
chicken of 3 Kg to 5 kg	115cm^2/kg
chicken of more than 5 kg	105cm^2/kg

Perspectives

As a result of this review, the following questions arise:

Is consumer behaviour influenced by animal welfare awareness?

Could the animal welfare implement be promoted through NGOs in developing countries, given that their government seen to have little interest in this issue?

Could the backyard existing in rural areas of all countries, known as traditional breeding, be managed in a more technical way, conserving the empirical experiences of its owners?

CONCLUSION

The incorporation of animal welfare standards imposed on intensive farming, as well as the production of eggs and meat under production systems (grazing) and backyard production, become a sustainable alternative that maximizes the welfare of the poultry. providing better quality animal protein products and promoting the protection of animals and the ecosystem in future generations.

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