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Commentary

Making things clear: Science-based reasons that chickens are not fed growth hormones

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ABSTRACT

Background: Global public concerns about "industrial agriculture" have widely disseminated amongst consumers the myth that chickens are fed growth hormones to produce meat more efficiently. This misleading information regarding the use of hormones in chickens is now a growing health concern among consumer groups.
Scope and Approach: Worldwide, the poultry industry relies on science and technology to define new strategies to improve the health, welfare and performance of animals in production. In this report, we performed a detailed analysis of the poultry science literature and provide the scientific bases explaining why chickens are not feed hormones.
Key Findings and Conclusions: The use of growth hormones in poultry meat production does not occur because: i) they are too expensive to be used in chickens, ii) they do not promote growth in poultry and iii) their use is illegal in many countries. Therefore, health providers, policy makers, food professionals, consumer advocates, food producers and veterinarians can use this information to educate consumers and eliminate negative concerns related to hormone use in the poultry industry.

1. Introduction

In the last few years, spread largely by social media and internet "food experts", the myth that chickens are fed growth hormones to produce more meat rapidly has spread globally. This inaccurate information not only has negatively affected the poultry industry, but also has created spurious health concerns among consumers. In response to these concerns, numerous universities and institutes around the world have described that feeding hormones to chickens is fictional (web references: 1-4). However to date, a detailed scientific description explaining why hormones are not used in poultry production has not been published. We believe that health providers, policy makers, food science professionals, consumer groups, food producers and veterinarians should understand the underlying reasons why poultry producers do not use growth hormones during meat production.

Growth hormones, natural or synthetic versions of somatotropin, estrogen, progesterone, testosterone and other steroids, are used in beef cattle and sheep to increase growth rate and meat production efficiency (Johnson & Chung, 2007; Rumsey, Hammond, & McMurtry, 1992; Stephany, 2010). These hormones are implanted as pellets under the skin behind the ear of the animal (web reference: 5). Beef cattle carcass weights are increased by growth hormone usage by 9–14%, longissimus muscle area (ribeye area) by 13%, and beef prices are reduced by the resultant increase in efficiency [e.g (Duckett & Pratt, 2014; Platter, Tatum, Belk, Scanga, & Smith, 2003).].

World-wide Health organizations have established a list of approved products, withdrawal periods, and safe limits for use of these hormones in livestock to ensure that there are no health impacts associated with meat consumption [(web reference: 5) and (Stephany, 2010)]. However, because poultry are not considered livestock these growth hormone-implants are not approved for use in poultry meat production. In the present manuscript, the physiological, economic and legal reasons of why growth hormones are

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not used specifically in poultry production are analyzed. We also provide the physiological factors behind the rapid growth rate in commercial chickens.

1.1. Physiological reasons

In beef cattle, it is common to implant hormone pellets in growing steers (~1 year-old, 320–360 kg body weight). Once implanted, the hormone delivery time is approximately 120 days (Preston, 1999), but the hormone takes between 35 and 98 days after implantation to have an effect on muscle production (Heitzman, Gibbons, Little, & Harrison, 1981). In contrast to beef cattle, chickens reach market at a very young age (~6–9 weeks) when growth hormones have no physiological effects on the birds since they are marketed prior to reaching sexual maturity. For instance, somatotropin (at 5, 10, and 50 μg/day for 14 days via i.v. injection) failed to promote growth in young (4 week old) chickens (Leung, Taylor, Wien, & Van Iderstine, 1986). This lack of exogenous hormone effect was also observed by many other researchers (Burke, Moore, Ogez, & Builder, 1987; Cogburn, Liou, Rand, & McMurtry, 1989; Cravener, Vasilatos-Younken, & Wellenreiter, 1989; Moellers & Cogburn, 1995; Scanes, 2010). The lack of response to somatotropin was hypothesized to be due to a low number of somatotropin-receptors at this early stage of life (Scanes, 2010). Somatotropin mediates growth by increasing IGF-I (Insulin-like Growth Factor I) systemic levels; yet in young chickens, chronic somatotropin administration does not induce IGF-I levels (Moellers & Cogburn, 1995; Scanes, 2010). The lack of growth stimulation mediated by exogenous somatotropin in chickens was well documented by Harvey in 2013. His review provides a comprehensive body of literature showing minor, transitory or absent growth responses to exogenous somatotropin supplementation in avian species. The review also documents that the lack of growth promotion effect from exogenous somatotropin is associated with a down-regulation of tissue somatotropin-receptors (Harvey, 2013). Altogether, these studies agree that exogenous somatotropin does not stimulate growth in chickens.

In beef cattle and sheep, steroid hormones (estrogen and androgens) have shown important growth promotion effects; however, these effects are not observed in young chickens. Research has actually indicated that androgenic steroids inhibit growth in chickens (Fennell, Johnson, & Scanes, 1990; Fennell, Radecki, Proudman, & Scanes, 1996; Fennell & Scanes, 1992) and this was mediated via an interaction with androgen receptor (Fennell et al., 1996; Scanes, 2010) and a reduction in systemic secretion of somatotropin and IGF-I (Scanes, 2010). In addition, the growth promotion effects of estrogens (estradiol-17β, Zeranol, or zearalenone) observed in beef cattle does not occur in chickens (Allen et al., 1981; Chi, Mirocha, Weaver, & Kurtz, 1980; Marusich, Ogrinz, Camerlengo, & Mitrovic, 1978; Scanes, 2010; Yu & Marquardt, 1973). Research indicated that dietary supplementation of zearalenone at levels of 10, 50, 100, 200, 400, and 800 mg/kg diet for a 3 week period in chickens of 6–9 weeks of age, did not improve body weight gain or feed consumption (Allen et al., 1981). Collectively, these studies indicated that growth hormones have no growth promotion effect in young chickens.

1.2. Economic rationale

Poultry meat production is one the largest agricultural revenue generator in many countries around the world (Chemnitz, 2014). Practically, all poultry meat currently sold comes from commercial farms. These farms represent a considerable investment in financial, technology and human resources. To be profitable, producers must adjust to well-established programs and policies to ensure proper growth rates and health of the birds to maximize efficiency, product yield, and profitability.

The total cost of poultry production can be divided into three main categories: chick cost (15–25%), feed cost (60–70%), and overhead cost (10–15%) (Donohue & Cunningham, 2009; Korver, Zuidhof, & Lawes, 2004; Williams, 1999). Using actual real-world production costs and commercial data analysis, the supplementation of growth hormones in chickens is unprofitable. For example, to accomplish the growth promotion effect observed in livestock, growth hormones would have to be injected continuously or used as subcutaneous implants. The cost of a single injection per chicken represents ~10% of the overhead cost or ~1% of the total production cost [(Donohue & Cunningham, 2009) and (web reference: 6)]. More important, the cost of the growth hormone exceeds the grow-out budget intended to buy all disease prophylactic treatments. For example, the cost of commercially available growth hormone-implants varies between $1.17 to $3.70 USD per implant (based on a survey of USA veterinary suppliers). If these growth hormone-implants were used in poultry, the estimated cost would be between $1.59 and $3.25 USD per chicken. This would equate to the cost of the hormone being more than ten-fold the estimated total cost of vaccines, electricity and heating required per chicken ($0.13–0.23 USD/bird) [(Gocsik, Kortes, Lansink, & Saatkamp, 2014) and (web reference: 6)]. The estimated cost of coccidiostat medication (antiprotozoal agent required in poultry production) in Brazil, Mexico, UK and USA varies between $0.011 to $0.021 USD per chicken (Williams, 1999). Thus, the individual cost of a single hormone-implant is more than one hundred and fifty fold higher than the cost of the whole coccidiostat medication program (Table 1). Basically, the cost of a growth hormone-implant is >50% of the total cost of poultry meat production [(Donohue & Cunningham, 2009) and (web reference: 6)]. These costs would be too high to incorporate and the meat costs would be considerably higher to compensate. Therefore, chicken meat would not be considered the most economical meat available globally. Taken together, this analysis indicates that the use of growth hormones is not economically feasible in poultry production.

1.3. Legal reasons

Governmental regulations in many nations prohibit the use of growth hormones in poultry meat production, as well as in dairy cattle. In the EU and USA regulations prohibit the use of hormones in Poultry (web references: 5, 7), and the EU banned the use of hormones for growth promotion in all farm animals (web reference: 8). Meat producer federations worldwide have banned the use of hormones in poultry (web references: 9, 10). Moreover, commercial poultry production is a highly regulated activity. For instance, in the USA, poultry production is scrutinized by the Poultry Products Inspection Act; regulated by the Food Safety and Inspection Service of the US Department of Agriculture (USDA). These regulations ensure sanitary conditions for slaughter and processing, as well as inspection of live animals and their processed products. The Animal and Plant Health Inspection Service (APHIS) of the USDA shares responsibility for regulations regarding the health of live animals prior to slaughter (DeHaven & Goldberg, 2006). Comparable legislation for food safety in poultry production have been established in the European Union (Mulder & Hupkes, 2007). Furthermore, because of the globalized structure of the modern poultry industry, commercial firms have to fulfill national and international food safety standards; thus, the use of hormones becomes unacceptable and unprofitable alternative for poultry producers.