

Lighting up Chicken Reproduction

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Abstract:

This creative non-fiction essay explores the science of chicken reproduction on a family farm in the Fraser Valley. Science and story are entwined as the author relates her personal experience helping her dad manipulate the light conditions necessary for the flock to reproduce. The events described reveal the complexity of farming and the meticulous practices necessary to rear chickens successfully—birds native to the tropics—in coastal British Columbia. Complete with humour and vivid imagery, this narrative aims to build a better understanding of the process of light stimulation in the biology of chickens and the daily operations of a farm. This essay takes a remarkable journey into a broiler-breeder chicken barn, illuminating a little-known component of the poultry industry.

Week 19. As I open the barn door from the service area, a dim glow comes from the ceiling. I can make out three separate lines of incandescent light bulbs that extend down the length of our five-hundred foot barn. Nineteen weeks ago, these birds pecked their way out of an egg and into the world. Now I analyze

their wellness as I slowly stroll down the sawdust aisle scanning equipment for any problems. Chickens are our livelihood. These chickens depend on us and we depend on them.

My dad carefully catches up to me, making sure he won't scare the chickens with any sudden movements. He struggles with his overalls, his slippery disinfected hands, and the small group of birds jumping up at him for attention: *We have to light these buggers up soon. They're bored and horny.* I laugh as we continue our inspection. Together we examine all 150 light bulbs that run down the length of the barn, making sure than none are burnt out because any changes in light consistency would directly affect the flock's reproductive growth, and stimulation.

The lights are kept low during the flock's growth and development period to maximize maturity and immunity and to manage stress. When the flock reaches sexual maturity, light is increased to the appropriate intensity for production. Our entire industry relies on light management; it is a vital aspect of broiler-breeder chicken farming.

We, as creatures, are shaped by the environment in which we live. For the chickens on my family's broiler-breeder chicken farm, light matters most. Chickens are seasonal breeders. Light is necessary for the activation of gonads, which are the organs that produce sperm and eggs—and the initiation of annual breeding activity. The gonads of the flock become active with increased illumination during summer and regress during shorter periods of illumination in the winter. This sensitivity is known as *photoperiodism*: the ability of animals to measure day length to determine the time of year. In our chicken barn, nature is mimicked in order to achieve maximum production. Instead of waiting for the seasons, we *create* the seasons and in response poultry set their internal clock to prompt ovulating cycles in the females and sperm production in males.

Week 23. On day three we *light the flock*. As compared to the dim light of seventeen lux or luminous emittance and eight hours of daylight of the previous days, the chickens wake up to an imitated sunrise of fifty lux and for a fourteen-hour day. I hop into my overalls, disinfect my boots and hands, and slowly open the door. The flock is flighty and hyperactive. They run around like they're on speed. The increased light intensity increases their activity, and I know they can really see each other, and me. Light stimulation has taken an effect and the hormonal juices have begun jetting through their bodies.

Light signals and stimulates the chicken brain by penetrating the retinal receptors in the eyes and the top of the skull. When light stimulates the brain for reproduction, a signalling cascade begins. Light is linked to the reproductive organs, the gonads. There is an interconnection of signals starting at the brain, and flowing through glands, hormones and tissues, all the way down to the gonads. The gonads being targeted must have the necessary receptor for the hormone to initiate reproduction, much like flipping on a switch. The signalling cascade starting in the brain initiates a series of chemical reactions. The hypothalamus in the brain is the reproductive manager of the chicken that links the nervous system to the endocrine system via the pituitary gland and secretes the gonadotrophin-releasing hormone. While this is happening the anterior pituitary gland in the brain produces more hormones and stimulates other glands to produce even more hormones. Together, these portions of the brain release these hormones into the blood stream on to their destination, the reproductive tissues. As a result, reproductive function is activated, providing the development of mature gonads. Both males and females start exhibiting changes in hormonal levels and strike out on a mission for a mate, to begin producing offspring.

Week 25. The entire flock has reached sex mode. Everywhere I look there is a rooster inviting a hen for a roll in the sawdust, or more like a mount in the sawdust. While doing my routine walk-through I have to make sure I walk slowly,

because the chickens are flighty to any of my sudden movements. My dad always tells me to sit down and examine the flock when I am part way through the barn. So, when I reach the middle of the barn I sit down on the slats with my feet buried in the sawdust. Sitting among them I watch: are they playing, scratching around in the sawdust, or breeding? If I am sitting down and they start crawling all over me, sticking their heads through my arm, or on my lap trying to peck out my eyes, they are happy chickens. Happy chickens are stress-free chickens, and stress-free chickens lay eggs.

The whole point of the broiler-breeder farm is to produce fertilized eggs which are sold to broiler hatcheries for incubation. It's one thing to maintain a healthy chicken, but another to provide conditions that maximize their willingness to mate and produce eggs with high fertility. Manipulating photoperiodism and initiating successful *photostimulation* in poultry is difficult to achieve, that's why broiler-breeder farming is so challenging. Controlling the length of daylight will either cause a flock to come into production or hold them back. Photostimulation is important for sexual maturation; however, controlling light in a flock requires careful management, as birds are sensitive to any amount of light intensity.

Incorrect light management will cause stress, leading to low fertility, and poor hatching egg production. Mismanaging light in a poultry barn can have harmful effects on a flock. Too much light can cause stress and even cannibalism. If a flock is maintained under light intensity significantly over fifty lux, egg production will decrease, and the chickens will "burn out." Not enough light or fluctuating light will minimize egg production. If at any time the light intensity is decreased during the peak reproductive cycle, egg production will decrease and never regain original percent production again, even if the light intensity is turned up again. Without fertile eggs my family's farm goes under. Precise lighting matters.

To obtain highly productive flocks, barns have strict light programs that initiate optimal reproductive ability and fertility. Pullets, or hens less than a year old, begin oviduct development between nineteen to twenty weeks of age. However, waiting another four weeks will increase regularity in the start of egg production. Keeping light intensity low for an extra two to five weeks allows for a more mature and developed pullet. A physically stronger bird is advantageous in broiler-breeder production; farmers are looking for optimal strength and health before fertility. It is crucial to enable pullets to develop slowly into sexual maturity; stronger chickens can produce hatching eggs consistently at their peak period without stressing out their bodies. Following photostimulation, the onset lay or the start of egg production takes three weeks to occur, with twelve to fourteen hours of light a day at the optimal light intensity of fifty lux.

Week 25. Dad and I wake up at 4 A.M. We head out of the house, and walk across the field towards the chicken barn, coffee in my hand, cigarette in his. During the first two weeks, of *lighting the birds*, we wake up every morning to watch the *sunrise* in the chicken barn. Upon reaching the barn, I listen for the auger in the large feed bin next to the barn, pushing the feed inside the barn to get ready for the morning feeding. We open the door into the service area, change our boots, spray off the cigarette, and wash our hands. Dad heads to the large computers and control boxes mounted on the wall next to the barn door; he checks to make sure the settings for the “sunrise” are correct. I walk to the viewing window, and slowly open it up. The computer on the wall makes a loud click, signalling the light clock. A tiny glow emerges from the light bulbs.

Slowly, the glow gets brighter. As it gets brighter the chickens roosting up on the slats ruffle their feathers, yawn, and jump down into the sawdust. First, three jump down, then ten, fifty, two-hundred, and then two-thousand. Pretty soon

half the flock is scratching around in the sawdust. The lights are still slowly increasing in intensity, and another click comes from the computer. The feeder turns on, squeaking as it distributes feed into the feed pans running the length of the barn. The sound of feed landing into the pans sends the chickens into a scurry. Little white butts start shaking from side-to-side heading to the nearest feed pan. By this time the lights are at full *daylight*. Everything is working properly. Good.

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