pH Matters
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WINTER 2016

It's All about Relative Humidity: The Interaction between Brooding, Ventilation, Litter Quality and Gut Health

Quite often, producers can get too focused looking for a specific causative agent that might be responsible for what we are seeing in a flock in terms of respiratory or gut health, or a loss of performance. While pathogens–viral, protozoal and otherwise—can be responsible for a specific disease condition we encounter, quite often it is the husbandry within the house that is the root of the problem. One of those husbandry parameters that can be overlooked, but whose impact is far reaching, is the relative humidity (RH%) within the house—particularly at the air/litter interface in the first week to ten days after bird placement.

At times, weather can have a negative impact on the relative humidity within a poultry house. Heavy rainfall coupled with mild temperatures can make it more difficult to control relative humidity. Since warming the air is key to dropping relative humidity, a lack of temperature differential between the inside and outside of a house during very wet weather can make moisture removal difficult. When faced with this weather pattern, it's important to increase run times as it will take longer to remove moisture from the air/litter interface. Moisture can be cumulative, which means it's vital to ensure the house is tight and inlets are working effectively for every flock. The moisture you fail to remove from this flock can cause problems months down the road.

Periods of extended rainfall that cause standing water around a house can also contribute to litter moisture issues as water seeps under the footers and into the house through the pad. Because litter functions like a French drain, this excess moisture overloads the moisture holding capacity of the litter and it cannot evaporate fast enough from the floor to keep the litter dry.

The preparation of a house for brooding, the amount of space each chick actually utilizes once placed, and the style and accuracy of ventilation within a house all determine if the relative humidity will be within the desired range of 50-65% at the air/litter interface.

Chicks warmed to the appropriate temperature spread out and maintain optimal eating and drinking levels.

RELATIVE HUMIDITY THAT IS TOO LOW RESULTS IN:

- Dehydrated chicks
- Too little cocci cycling when using coccidiosis vaccines.

RH% THAT IS TOO HIGH WILL RESULT IN:

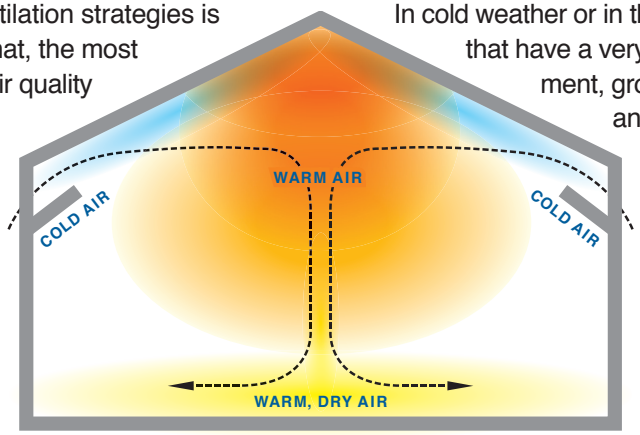
- Caked litter
- Too heavy of a cocci challenge
- Increased clostridial counts as spores hatch due to the higher humidity

The Relative Humidity / Antibiotic Connection

As the poultry industry throughout the world moves away from the use of preventive antibiotics including ionophores, understanding and controlling relative humidity in the production environment becomes critical. Controlling relative humidity throughout the brooding period and grow-out is essential to prevent a bloom of Clostridium, coccidia and other unwanted organisms during the brooding period when ventilation needs are low. Houses should be ventilated for relative humidity and directional air flow should be maintained to keep the litter dry. Allowing the floor to get damp and tacky will causes changes in the litter microflora and thereby intestinal microflora in a way that is often difficult to recover from.

Ventilation for Moisture and Ammonia Control

The main role of minimum ventilation strategies is moisture control. Because of that, the most important factor in monitoring air quality and ventilation success during the cooler parts of the day is relative humidity. Poultry houses are designed to be ventilated for relative humidity and moisture control. Doing so requires not only sufficient fan run time but also proper directional airflow within the house so that all the air entering a house goes across the ceiling both warming and drying.



In cold weather or in thinning production systems that have a very high density at bird placement, growers tend to under ventilate and slick over the litter. In free range houses, air enters through the bird doors when fans turn on resulting in air that neither gets warmer or drier before contacting the litter. Ammonia must also be controlled for a house to be ventilated properly for relative humidity otherwise excess ventilation would be needed to exhaust the ammonia.

Relative Humidity Measurement Best Practices

Cold chicks huddle together for warmth leaving no room to access food and water.

The best time to measure relative humidity is in the mornings during brooding. After 14-21 days the need to vent heat from the house becomes the dominant factor in ventilation regardless of the time of year. It is important to **keep relative humidity between 50-70%.**
Above 70% for more than 24 hours and the house will begin to become damp and the litter will slick over. Once this happens, the damage is done and difficult to correct. The litter will begin to generate greater amounts of ammonia and this, combined with the high humidity, will burn up a litter treatment within a matter of hours and cause a grower to burn more fuel later on to rid the house of excess ammonia. The increase in litter moisture will also allow for a bloom of bacteria, fungi, viruses, and coccidia, which can

overwhelm even the best health programs. Drying the litter out then disseminates a large number of fungal and Clostridial spores throughout the house.

If the relative humidity is below 50%, the dry air will begin to dehydrate the young chicks and will dry out their mucous membranes. This makes them more susceptible to respiratory disease and is similar to what happens to humans on a long airplane trip.
The core temperature of the litter (or the surface concrete temperature) at placement should ideally be 32°C and the surface temperature at 34°C at the time the chicks are placed. It's important that actual litter temperature be observed and not air temperature. In houses that are not properly preheated, litter core temperature can be as much as ten degrees lower than the air temperature, which provides a perfect way for chicks to be chilled. Chicks that are placed on a cold floor spend more time trying to keep warm than eating or drinking. Numerous studies have shown that birds placed on floors even as little as 3 degrees cooler than optimal temperature, gain significantly less weight than chicks placed on warm floors. Litter temperature also plays a large part in bird distribution during brooding. Uneven bird distribution will cause uneven cycling and coverage of coccidial vaccines, transient areas of wet litter due to increased relative humidity at the air/litter interface and areas of increased bird density all of which can cause problems an antibiotic free program. Sometimes it only takes and additional degree of floor heat to be enough to drop the relative humidity below the breakpoint for litter caking.

Tools for Measuring RH

The easiest way to measure relative humidity is with a simple digital humidity meter or hygrometer. These are available from a large variety of sources and range from $15-100. Simply place the hygrometer on the feed line when you enter the house in the morning and let it sit for 10-15 minutes and take a reading. The hygrometers should not be left in the house because they easily become clogged with dust. If the relative humidity is above 70%, increase fan time by 15-30 seconds and make sure that there is sufficient house tightness and air speed to get the incoming air to move across the ceiling of the house before falling to the floor. If the relative humidity is below 50%, decrease fan time by 15-30 seconds. It is that simple. Stationary humidity sensors connected to the house's controller do not work well for a number of reasons and are not recommended. Keeping relative humidity in the correct range through proper house preparation prior to brooding and appropriate ventilation strategies during brooding pays dividends in maintaining bird performance, litter quality and gut health in all types of poultry production environments.