Optimum Housing Design And Management

Tropical and sub-tropical areas and geographic regions experiencing low temperatures need open or closed housing as well as nutrition and sanitation strategies for extremes of climate.

The design of hot-weather ventilation systems was discussed by Pratuang Sudsakorn from Bangkok, Thailand at the recent WPSA Congress in Seoul, Korea. Clearly a speaker with considerable practical experience, Sudsakorn dealt with both open and closed housing in tropical situations. With regard to housing dimensions, he advised against open-sided buildings >12m wide because of the difficulty in ventilating them in hot weather when there is little wind. Buildings may be of any length consistent with the type of feeding systems used. He advocated the use of concrete floors as an aid to sanitation.

Practical methods to alleviate heat stress, in temperatures >95 degrees F, included the following:

- Sprinkler systems on the chicken house roof;
- Fogging systems inside the building
- Fans inside or outside the house to stimulate air movement;

The closed buildings described by this speaker were curtain-sided and they involve a pad-and-fan system to provide ventilation and evaporative cooling. He emphasised the maintenance requirements of such a system, summarised as follows:

- Clean ventilation fan blades monthly;
- Clean thermostat daily to avoid dust build-up;
- Wash outside of cooling pad weekly to limit build-up of calcium carbonate deposits;
- Clean and chemically treat water reservoir to prevent growth of fungi or algae;
- Check regularly for air leaks which by-pass pad-and-fan system;
- Check regularly all electrical controls and switches for proper function.

A comparison of the open and closed systems revealed a trade-off between capital cost and bird performance. Closed houses usually cost more but gave better growth and egg production and lower mortality than open houses.

John Brake, North Carolina State University gave a detailed description of cold weather ventilation systems, using the negative pressure, high speed air inlet concept. The high velocity of incoming air is important to be able to maintain good mixing, moisture pick-up and uniform temperature.

Brake also reviewed management of environmental stress. He described the principle of stress and the birds' reaction to various stressors. His statement, "With a seemingly endless number of stressors, the challenge for poultry managers is to modify or manage (not eliminate) physiological stress,' will strike a familiar not with many producers.

The practise of 'priming' birds in anticipation of stress, for example with high temperature, was discussed. Experiments have shown this to be a positive benefit. The use of ascorbic acid (Vitamin C) supplements has also been reported to be beneficial in minimising the effects of extremely high temperatures.

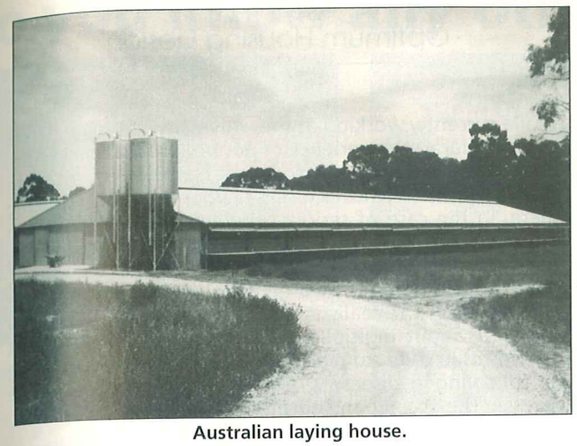
Multiple vitamin supplementation has also been shown to be of value in experimental situations where high temperature stress was imposed.

Another point made by Dr Brake was the natural rhythm of the bird's body temperature and how this should be taken into account in management programmes. Maximum body temperature occurs in late afternoon, while minimum temperature is reached just prior to dawn. This coincides exactly with normal environmental temperature cycles. The practise of feeding birds in the early morning during hot weather, in an attempt to increase feed intake, may be detrimental. This is because it interferes with the bird's attempts to lose heat and reduce its temperature at this time. Brake suggested it would be safer to feed in mid-afternoon, since heat resulting from such a feeding would not be produced until a cooler time of day.

Energy and protein management were discussed by Derrick Balnave, from the University of Sydney. Although nutritionally quite distinct, it has been shown recently that energy and amino-acid requirements should not be regarded as independent. Further, they may be influenced by environmental temperature. Results were described in which broilers were kept in two temperature regimes (25-35 degrees C versus 18-26 degrees C) and the ratio of lysine to energy was varied. At the lower temperature, varying the lysine level had no effect, but at the high temperature, growth and feed efficiency were improved at higher energy and lower lysine:ME ratios. Subsequent work confirmed these findings but also showed that although bodyweight gain and feed efficiency were improved at higher energy levels, abdominal fat levels increased. In experiments where birds were allowed to select their own diet, when offered the protein and cereal portions separately, they tended to take in less lysine, grow slightly faster and were more efficient, than birds fed complete diets.

Laying hens offered self-selection of energy-rich and protein-rich feeds, in a 25-35 degrees C fluctuating temperature, increased their protein intake when compared to hens fed complete diets. They showed improved egg mass output (6%-10%), which appeared to be due to their ability to increase bodyweight, thereby providing the ability to draw down bodyweight and maintain production. The selection of additional protein began three weeks before and plateaued six weeks after first egg. From this and other work, Balnave concluded that, "it should be possible to formulate complete diets to overcome the adverse effects of high temperature on egg production." He also stated that, "a limitation in protein, rather than energy, intake is the main problem for laying hens at high temperatures." Balnave did not state whether the birds used in these trials were Leghorn type or a heavier breed. Protein and total feed intake levels suggest Leghorns.

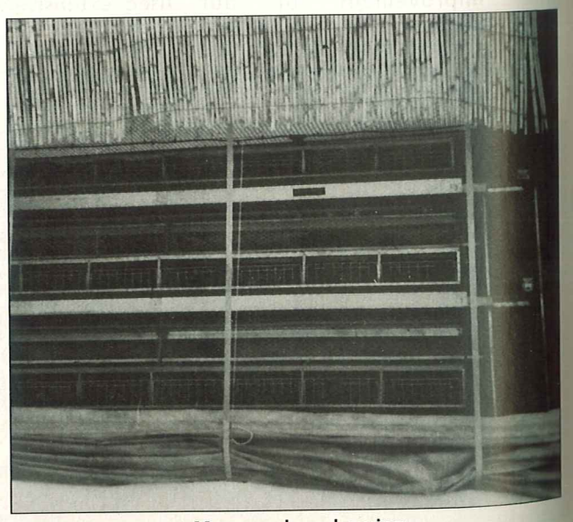
H. Michael Opitz dealt with sanitation of poultry houses for improved disease control and product quality.



Australian laying house.

Open housing for layers in the tropics.

Broiler housing, Republic of Yemen.



Moroccan layer housing.

Optimum Housing Design

While currently working at the University of Maine, Opitz has considerable experience of poultry production in Asia. He emphasised the difference between sanitation attempting to eradicate disease organisms and reducing them. In the case of serious, virulent diseases like avian influenza and Newcastle disease, eradication is essential, but both difficult and costly. For most other pathogens, reducing the number of organisms rather than outright elimination is the realistic goal. Producers need to know the facts about multiplication and survival of different organisms in order to plan for disinfection, either routine or following a disease outbreak. Some guidelines are given in the accompanying charts.

Multiplication of Pathogens Outside Host

Yes	No
Many bacteria Fungi	Viruses Mycoplasma Chlamydia

Effect of Environment On Pathogen Survival

Prolonged Survival	Limited Survival
Neutral ph Presence of protein Low temperature	Low Humidity ph extremes Clean surfaces Very high or low temperature thawing following freezing Sunlight

"The effectiveness of a good sanitation programme is only as good as the biosecurity programme used as a follow-up," stated Optiz. The freshly sanitised poultry house should be 'off-limits' to visitors, staff and particularly to rodents and non-resident birds. Try to ensure that the new flock of broilers, layers and particularly breeders, encounters the lowest pathogen level possible when placed in the poultry house.

Some of the sanitation procedures used in the past may no longer be available. An example is formaldehyde gas, an excellent bactericide, but no longer permitted in some jurisdictions. Phenolic disinfectants may be restricted, as dangerous to people working with them.

In terms of evaluating the effectiveness of sanitation procedures, Dr Opitz suggested a range of possibilities. One is visual inspection, using the 'white glove' test. If there is still dirt on surfaces, they are likely not disinfected. Even apparently clean surfaces may still be contaminated and swabbing followed by bacterial culturing may be needed, for example, after a premise has been found positive for a salmonella infection. Rodent control programmes should be checked using traps or glue-boards to determine whether mice have been reduced or eradicated.

These papers provided an excellent basis for scientists and advisors working with poultry producers in the Far East and South Pacific region. — *Dr Peter Hunton.*