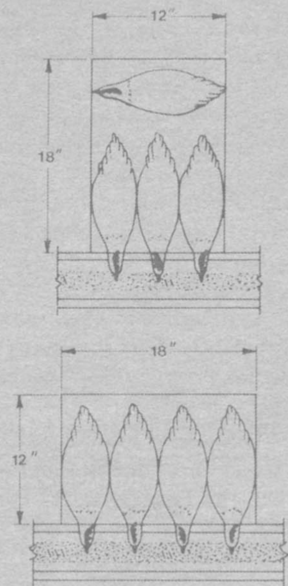
A new cage shape improves egg production

A new cage designed by UC poultry specialists, which reverses the usual configuration by placing the longer dimension of the cage along the feed trough, has resulted in significant improvements in production. Ten comparison tests show egg production per hen up by 17 eggs per year on only 0.3 percent more feed, for a 3.5 percent improvement in feed conversion. The mortality rate was 6.4 percent lower, and cracked eggs were reduced by almost 2 percent. At current prices, the additional income of 60 cents per hen is partially offset by higher cage costs.



-Don Bell, Farm Advisor
Riverside County

Avian respiration

Our interest in avian respiration and cardiovascular systems began with a search for information that would have practical application for the poultry industry and has expanded into areas with potential biomedical applications.

We found that, in hot weather, thin egg shells are probably caused by low carbon dioxide level in the blood of panting birds. If carbon dioxide is increased artificially, egg shells become thicker after allowing the kidney to compensate for the extra acid and, surprisingly, feed conversion often becomes more efficient.

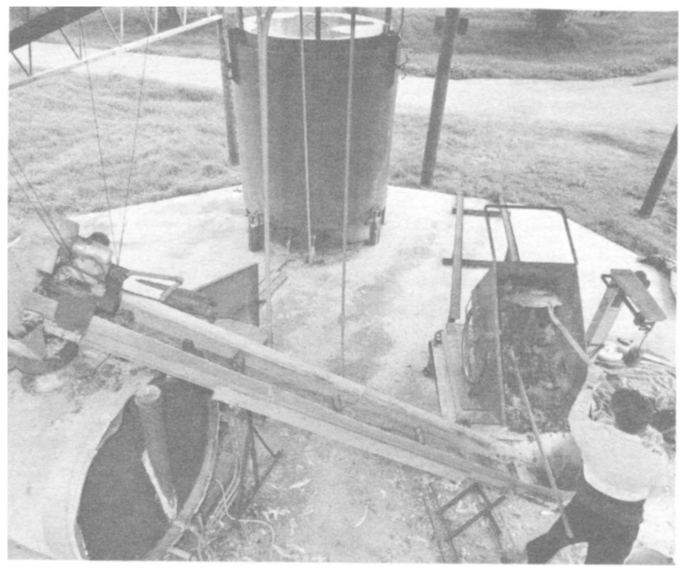
Our work on the sensory nerves of "receptors" of the lung shows that these nerves are primarily sensitive to the level of carbon dioxide and somewhat sensitive to the level of acidity in the lung, but not to respiratory movements or to the level of oxygen. In the lung, carbon dioxide varies continuously, from low in the inspired air to high in expired air and venous blood. Recently, we measured the average carbon dioxide level affecting each receptor so we could understand how all lung receptors contribute to the control of respiration.

We also have studied receptors in the wall of the heart that are stimulated by the force of heart contraction. These are more sensitive to contraction at low CO_2 than at normal CO_2. These heart receptors exert a powerful inhibition on both the cardiovascular system as well as on breathing: if CO_2 in the blood decreases or blood pressure increases, breathing slows, increasing CO_2 in the blood and bringing the tissue CO_2 back to normal.

Our group also is interested in receptors in muscle that may affect ventilation when animals exercise. None of the other receptors affect the birds' harder breathing when they exercise—arterial blood and the lung either stay the same or decrease in CO_2 and acidity. We suspect that there are probably receptors wrapped around small arteries in muscle. These arteries dilate during exercise, stimulating the receptors, and, thus, stimulating respiration.

We are attempting to combine this information mathematically with other work we do on blood-gas exchange to describe the total control of ventilation and possibly explain why birds can fly as high as 25,000 feet, when mammals at that altitude are near death from lack of oxygen. Our initial approximations were within a few percent of the observed level of blood gases and ventilation in resting ducks at sea level and at 12,000 feet altitude. We are now trying to break up our equations to describe each receptor system separately, along with the way each receptor system influences the response of the brain to other systems.

-R. E. Burger



Loading poultry wastes into a methane generator.

Biogas production from poultry manure

Intensive poultry production requires intensive energy input. Recovery of part of this energy lost in poultry excreta could be accomplished by refeeding to animals and partly in the form of biogas (methane).

Working with UC agricultural engineers, we have developed an experimental digester for production of biogas and are studying the various conditions for its optimal operation.

The digester has a 100 cubic foot capacity and consumes 70 to 210 pounds of organic matter weekly. Six to seven cubic feet of gas are produced per pound of organic matter. The product is about 65 percent methane.

Although the mechanics of methane generation have been mastered, our work indicates that methane from poultry manure is not an economical energy source at this time. Also, there are large volumes of liquid residue created by the process that would cause disposal problems on any large-sacle production system. A joint project with UC agronomists to determine the fertilizer value of this liquid waste is in the planning stages.

-Pran Vohra