

Research with inbred lines of chickens

Research in immunogenetics using highly inbred lines of chickens is underway at the Avian Sciences Department. While studies with mice have pointed out the need for so-called isogenic inbred lines, which produce genetically identical individuals, there are today less than a dozen lines which meet this need in chickens. Three of them have been developed at Davis over the last twenty years by continued matings of brothers and sisters.

The resulting lines produce individuals that can accept skin and organ transplants between members of the same line. It has also been shown, in agreement with other studies, that the rejection of transplants between lines is primarily controlled by a gene complex consisting of perhaps hundreds of genes located in a special chromosome segment. This Major Histocompatibility Complex has numerous functions and our studies have shown that the immune response of individuals to certain synthetic amino acid polymers is also under MHC control. Similarly the MHC complex is known to be important for resistance to several viruses, including those responsible for Marek's disease and lymphoid leukosis of chickens.

A systematic effort is now underway to develop a series of so-called congenic lines which differ in the major histocompatibility locus but are identical for most other genes typical of one of our highly inbred lines. Ten distinct MHC complexes collected from different breeds and lines of chickens have so far been incorporated into one of our inbred lines and will now be studied for immunological activity. Disease resistance is going to be of major interest.

Another inbred line recently developed at Davis exhibits inherited autoimmunity, a condition known to be important in an increasing number of human diseases and especially prevalent with increasing age. An individual afflicted with autoimmunity produces antibodies circulating in its blood stream which will react against its own tissues as if the latter were foreign, such as bacteria or substances to which the body normally stages an immune reaction. In our line males show autoimmune symptoms by producing semen in which the sperms are clumped together and the male rendered infertile. In other cases antibodies are formed against red blood cells and the birds die of anemia. This line of chickens now serves two functions: one is to further our understanding of autoimmunity in chickens and man; the second is to develop techniques which allow us to diagnose autoimmunity in chicken and turkey flocks which may have developed as a result of virus infections or other disease.

-Hans Abplanalp

Aflatoxins

Aflatoxins, mold-produced poisons that are sometimes present in certain poultry feeds, are extremely toxic to turkeys, ducks, certain breeds of chickens, and trout. We have been studying the effects of aflatoxins on poultry and in the processing methods to render aflatoxins harmless, in collaboration with the Western Regional Research Laboratory at Albany.

We have established that wide species and breed differences exist among poultry in their susceptibility to aflatoxins.

No adverse effects were detected when Arbor-Aires broiler chicks were fed a diet containing 400 ppb aflatoxin from day one to 8 weeks of age. Levels of 800 and 1600 ppb caused adverse biochemical and histological changes in liver. However, no aflatoxin was detected in meat liver or blood of these broilers fed 1600 ppb of the toxin for 60 days. Eggs, meat, liver, and blood from White Leghorn hens fed 2700 ppb aflatoxin contained no detectable aflatoxin.

On the basis of biochemical and histological evaluation, New Hampshire chicks and turkey poults were found to be the most sensitive to aflatoxin; Barred Rock and Australop chickens and guinea fowl the least sensitive. Among game birds, chukar partridge and Tennessee Red quail were more sensitive to aflatoxins (but less than New Hampshires) than Bobwhite or Japanese quail. The crosses of New Hampshire X White Leghorn chickens, and Tennessee Red X Bobwhite quail were far more resistant than the sensitive parent.

We also found that aflatoxins in feed ingredients like cotton seed meal can be detoxified by treatment with ammonia and autoclaving or moist heating. Studies are in progress to improve processing methods using chlorinated hydrocarbons to remove aflatoxins as well as gossypol from cottonseed products.

-Pran Vohra

Crowding sometimes pays

Field tests and laboratory experiments to determine minimum space needs of laying hens have shown that when economic conditions are marginal, poultrymen must avoid any performance-reducing practices, especially crowding. When margins are good, however, some crowding may be profitable.

The accompanying table illustrates a method of determining optimum colony size at one set of economic conditions. In this example, the house with three hens per cage would have a \$316 advantage over the same house with four hens per cage.

But when feed prices are reduced to \$6 per hundred pounds, the four-hen-per-cage house has a \$391 advantage. Because economic margins in the egg industry tend to be cyclic, we recommend a concept of variable capacity—high capacity during good years, low capacity during poor years.

Three Versus Four Hens per Cage
in Low-Margin Year (1976)*

	3 hens/cage (1,000 cages)	4 hens/cage (1,000 cages)
Costs		
Total pullet costs	\$6,000	\$8,000
Total feed costs	\$17,940 (85.4 lb/hen)	\$22,880 (81.7 lb/hen)
Income		
Eggs per hen	264	241
Average value of eggs/dozen	\$.437	\$.439
Total value of eggs	\$28,842	\$35,266
Number of fowl sold	2,800	3,371
Total value of fowl	\$980	\$1,180
Net income	\$5,882	\$5,566

*when 20-wk pullet = \$2.00
feed = \$7.00/100 lb
large eggs = \$.45/dozen
fowl = \$.35