Studies On Plasma Fractions From Domestic Livestock May Lead To Animal Disease Control

H. S. Cameron

Investigations of the effectiveness of plasma fractions obtained from the blood of domestic animals, in combatting certain infectious diseases of livestock are the logical extension of similar studies on human plasma during the war period.

The vast supply of blood from domestic food-producing animals available for fractionation or separation into its components, probably contains neutralizing substances formed by exposure to various antigens, the substances which when entering the blood or other cells stimulate the production of an antibody which in turn opposes the action of the toxin or other disease producing agent responsible for its formation.

The blood from which the fractions, used in these studies, were obtained, represented a pooled sample from about 400 hogs or cattle at a Chicago packing house. The blood was collected without regard to post-mortem or ante-mortem examination.

Hog Cholera

Because in this group of hogs many would have been exposed to virus through vaccination, passive immunization against hog cholera was suggested.

Ten cholera-susceptible crossbred pigs, averaging 35 pounds apiece, were used as subjects in the tests.

Injections were made subcutaneously. Temperatures were taken daily, and autopsies were conducted on the pigs that died.

Results of the experiment showed that 35 pound pigs were protected from two cubic centimeters of virus by four cubic centimeters of plasma fraction 11 (gamma globulin).

Brucellosis

Specific antibodies for **Brucella**, the cause of contagious abortion in cattle and swine, were concentrated in fraction 11 of both swine and cattle plasma.

Passive immunization—swine alone—has not been successfully used in brucellosis of cattle or swine. Whether or not the concentrated antibody can be effective will be determined by animal experimentation.

Staphylococcus

Several strains of **Staphylococcus aureus**—a form of mastitis-producing organism—were tested for toxin production.

Three of the strains showed marked toxicity, two a slight amount and four none at 1.10 dilution.

In testing for antitoxin the same procedure was followed, but with the addition of the plasma fraction.

Antitoxin was clearly demonstrated in the bovine gamma globulin fraction and to a lesser degree in the corresponding porcine fraction. It was absent in other fractions.

Conclusion

The use of plasma fractions in therapy, and passive immunization leading to modification, at least, of an outbreak of disease, would appear as a distinct possibility.

Probably the greatest application of the fractions will be found in those classes of livestock, such as chickens, turkeys, and rabbits, where extensive domestication is relatively recent, large numbers are concentrated in small areas, and mortality from infectious disease constitutes the greatest single hindrance to economical production.

An application may also lie in the field of pork production, wherein it has been stated that 40 per cent of pigs farrowed fail to reach market.

Intensive investigations exploring the field are warranted.

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White Or Yellow—Butterfat Has Approximately Equal Value In Vitamin A Potency

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our principal dairy breeds. In order to meet this requirement, the mixed herd and the crossing of breeds have reached alarming proportions in the market milk areas.

In one important dairy county in California, it has been estimated that 90 per cent of the dairy herds are a mixture of the high and low fat breeds.

When two Guernseys are mated, it is reasonably certain that the female offsprings will produce milk yellow in color and testing about 5 per cent fat and 9.5 per cent solids-not-fat.

The mating of Holsteins would probably result in an individual capable of producing twice as much milk, but with less color at a lower test in both fat and solids-not-fat, than that of the Guernsey.

Indiscriminate Cross-Breeding

When breeds are crossed indiscriminately and the offspring retained for breeding purposes, much that has been gained through generations of selective breeding is lost. There is an entirely new combination of characters in the offspring, so that there is no way of predicting what the results will be. Usually, in the first generation, there is a rather high proportion of exceptionally good animals, but the second and third generations yield many mediocre and worthless individuals.

When the crossing of breed results in lowering production, either the margin of profit to the dairy farmer is reduced, or the consumer must pay more for milk.

Butterfat and Economy Related

That there is a direct relation between the amount of butterfat produced and economy of production is shown by the figures recently released by the Bureau of Dairying of the United States Department of Agriculture.

In a survey in the 1944 cow testing association records, it was found that as butterfat production was multiplied by 5, the cost of feed was doubled, and the profit above feed cost was multiplied by 22. That is, for a group of cows producing 100 pounds of fat yearly, the average feed cost was $47 with a return of $8 above the cost of feed.

At the same time, for the group whose average yearly production was 500 pounds, the feed cost was $90 and the income over feed cost was $178 per cow.

The Channel Island breeds produce a pound of butterfat with greater economy than does the average Holstein; yet the Holstein, because of the greater volume of milk produced, is more economical in the production of solids-not-fat than is the average Jersey or Guernsey.

Possible Solution

The solution of the problem does not lie in the crossing of breeds with the probable lowering of production and loss of economy. Nor does it lie in the inefficient procedure involved in maintaining two separate breeds on the average dairy ranch. The wisdom of attempting to develop a new breed to meet our present market demand is to be seriously questioned.

The problem can be solved only through the efforts of a unified dairy industry directed towards the utilization of our present breeds of dairy cattle in the efficient production of the kind of milk the public wants.

Consumer education concerning the special nutritive qualities of milk should be encouraged. It might even become necessary to establish, in areas where the high fat breeds predominate, enough herds of lower testing breeds to make possible the blending of milk for market demand.

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Study Of Evolution Aided By Research On Genus Crepis

E. B. Babcock

New knowledge about evolution which came to light during the investigations of a 25-year research program in the general field of plant genetics has a definite value in practical agricultural plant breeding.

The chief aim of this research was to discover new facts about the evolution of plants—how new species originate in nature—and how the younger members of a group of closely related species come to differ from the older species of the genus.

Outline of Study Plan

The aim of the research program was accomplished by the following lines of work:

(1) Analyzing the comparative features of the 196 different species which comprise the classification—genus **Crepis**—herbs of the Chicory Tribe of the Sunflower Family.

Only one of the 196 species of **Crepis** has become a common garden flower, the Red Hawksbeard. All the others are wild species, some of them being weeds, but a few kinds are used locally as fodder.

As a group, **Crepis** is closely related to the genus **Lactuca** which contains the lettuce plant, and to the genus **Taraxacum** which includes the common dandelion and its wild relatives.

Crepis species exhibit great diversity in their life processes, since the various kinds are peculiarly adapted to extremely different environments, such as swamps, deserts, meadows, seashores, and alpine peaks.

(2) Bringing together at Berkeley, living plants of 113 of these species, from North America, Asia, Europe, and Africa, and subjecting them to microscopic study and experimental breeding.

(3) Synthesizing or fitting together, all the available evidence in working out the evolutionary history of this group of related species.

Important Factors in Evolution

Three general conditions and three vital processes have been important in the evolution of the 196 species from a few original ones.

The first condition is secular—the time element. The genus **Crepis** originated 20 to 30 million years ago. Although many **Crepis** species are perennial, all of them produce new seed progeny each year. Hence there have been 20 to 30 million generations of **Crepis** since the group originated.

The second condition is environmental change, of which there are three important groups: (1) the cooling and drying of the climate in the late Miocene and Pliocene epochs; (2) the processes of mountain building which opened new migration routes for some species and erected barriers for others; and (3) the effects of glaciers, including the extreme vacilliation in climatic temperatures and moistures.

The third condition is isolation, which may be accomplished in two ways: (1) the natural migration of species—mostly through seed distribution by the wind—which may result eventually in the isolation of populations, the migration being either from one altitude to another or from one place to another in the same altitude; (2) the isolation between groups of individuals within any one species by means of genetic changes taking place within the plants themselves. This second method of isolation depends upon the first vital process.

The first vital process involves the sexual isolation of different parts of the same population by the creation of an internal mechanism which is capable of becoming more and more complicated and effective as time goes on.

The second vital process is the gradual building up of differences between isolated populations. In **Crepis** this has been accomplished largely by means of minor gene mutations. The recurrence of gene mutations is potentially able to create endless changes in the form and function of the plant and its parts.

The third vital process is adaptation to environmental changes which is accomplished through gene mutation and natural selection. One adaptation of the most profound significance in the evolution of **Crepis**, is the change in type of root from the shallow root system to the deep taproot. This made it possible for perennial plants to maintain themselves under drier conditions than the oldest species in the genus could endure.

Another adaptation of general importance is the development of tolerance to dry climates—the oldest **Crepis** species were moisture-loving perennials whereas some of the youngest species are short-lived desert annuals.

Foundation for Future Research

There are many unsolved problems in plant breeding to be studied, but the results of research on **Crepis** have laid a good foundation on which future research can be based.

No longer can the systematic study of plants and animals be restricted to the herbarium or museum and yield satisfying results. The organisms must be studied, if possible, in their native environments.

They must be brought into the experimental garden or laboratory for intensive study in order to throw all the light possible on their natural relationships.

In this way accurate classification becomes the indispensable foundation of both biology and agriculture.

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Production Problems Of Rabbit Growers Subject Of Cooperative Research At Davis And Fontana

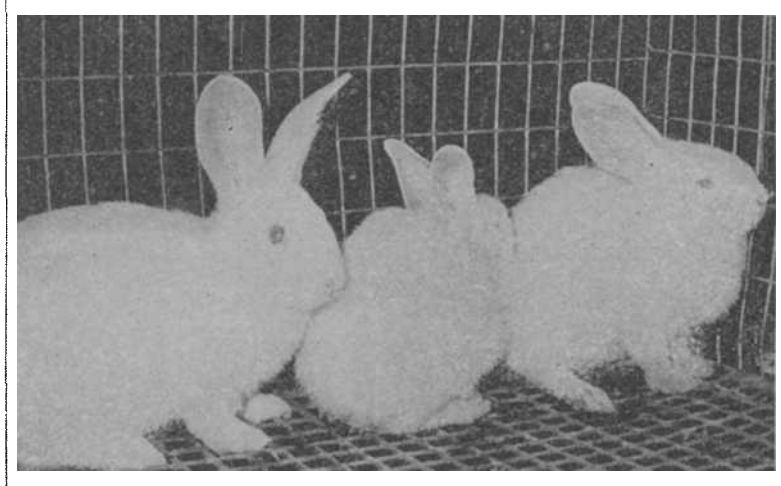
T. J. Hage

Disease-free herds and better management practices for commercial rabbitries form the goal of a research program now under way.

The United States Rabbit Experiment Station at Fontana and the University of California are cooperating in the research program.

One experimental herd of rabbits is maintained at Davis where danger of contamination of the research herd from outside herds is comparatively small.

A second experimental herd is kept at Fontana in San Bernardino County which with Los Angeles County is believed to lead the nation in the production of rabbits and rabbit products.



The rabbit on the left is normal; weight 3 pounds, usual stance, eyes bright, ear alert, and the fur smooth and clean. The center rabbit, a litter-mate of the first, has advanced enteritis; weight 2 pounds, characteristic position of arched back with feet drawn up under the body, eyes almost closed and lusterless, ears laid down and darker in color, fur rough, matted, and soiled with fecal matter. The rabbit on the right is a litter mate of the other two; enteritis is less advanced than in the center animal.

In 1946, Los Angeles County produced rabbits, meat, pelts, and fertilizer valued in excess of $9,680,000.

The nearness of the Fontana herd to heavy producing rabbit centers increases the hazard of contagion. Control measures developed at Davis may be tested thoroughly at Fontana before they are recommended.

Disease-free Herds

To get a true picture of the cause and control of the various disesases of rabbits it was necessary to have some normal, healthy animals as a foundation herd.

Three bucks and five does, free of fleas or other external parasites and without symptoms of common diseases of rabbits, were obtained as the start of the experimental herd at Davis.

The stock for the disease-free herd at Fontana was picked from the experimental herd there.

DDT for External Parasites

A series of investigations produced the conclusion that control of external parasites, such as fleas, on rabbits can be gained successfully by the use of 10 per cent DDT in talc. The rabbits do not suffer any toxic effects from the dusting at that concentration.

Two methods of application were used:

(1) A dusting powder containing 10 per cent DDT in talc was applied to the rabbits by shaking the dust from a quart size Mason jar with a perforated lid; and

(2) A generous amount of the DDT dust was placed in the bottom of a cellophane bag large enough to contain the body of a rabbit, leaving its head out of the bag. Tapping the outside of the bag under the dust, causes the powder to rise in a cloud to settle in the fur.

Investigations of Enteritis

"Mucoid enteritis"—a disease attacking the intestinal system of young rabbits—is responsible for a heavy mortality in the herds.

Charts kept during the past two years show the trend in mortality caused by enteritis in the 11-to-56 day old age groups.

The most accurate statistics are maintained on this age group because after they reach 56 days, a large proportion of commercially raised rabbits are sold for meat.

It is assumed that enteritis is infectious as it seems to be constantly present in a greater or less degree.

Sudden increases in the numbers of cases take place but no month is free from mortality in the herd. The low points on the chart for 1945, were the months of April and October. The same months were the high points on the 1946 chart.

By the time the rabbits had reached 41 days of age, one-third of the mortality had taken place. The next seven days accounted for the second one-third, with the greatest mortality at the rabbit age of 45 days.

The age distribution seems alike in both the high and the low months of mortality with a possible slight shift to younger ages in the low months as shown on the chart.

In the course of the study of enteritis, investigations have not as yet produced specific control measures which can be recommended for commercial use.

Research Program Continues

The ultimate goal of this cooperative research program is to obtain knowledge that will be helpful to the industry in reducing losses in the commercial herds.

Efforts are being made to develop definite and practicable measures that can be employed by rabbit producers in the prevention and control of diseases and for the improvement of management practices.

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