

Brucellosis Control

successful state law regulating calfhood vaccination program followed 18 years of experimental tests

Kenneth G. McKay

Each month of the current year an average of 25,110 calves were vaccinated against brucellosis in California.

An estimated total of 889,625 six to twelve months old female calves have been vaccinated—643,327 dairy calves and 246,298 beef calves—since January 2, 1948—when California's first law pertaining to the control of bovine brucellosis went into effect.

In dairy cattle brucellosis lowers potential milk production about 22.5%; may reduce calf crops by 40% and it can cause sterility in 20% of the aborting females.

Of infected mature cows that do abort approximately 75% abort one calf before they develop immunity; 18% abort two calves, and 7% abort three times.

There is no known cure for brucellosis in domestic animals. Many drugs and empirical remedies have been used and to the present time, none has been found to be of value based on critical experimental study.

Brucellosis is found all over the world and in cattle it is known also as Bang's disease and contagious abortion. The three species of *Brucella* are cattle (*Brucella abortus*), swine (*Brucella suis*), and goats (*Brucella melitensis*). However, goats, swine, horses, dogs, cats, and fowl are resistant to the cattle type of infection, but where these species have been exposed to a high volume of infective material, it is a matter of record that individual animals of each species have become infected. The disease also has been reported in buffalo and deer. Experimentally, an additional variety of zoologically unrelated hosts are known to have become infected.

Brucellosis is readily transmitted and may spread quickly through a herd of cattle. During the course of the disease the foetal membranes—water bag—of the infected animals break, discharging bacteria-laden material. The organisms may also be eliminated by the infected animal in milk, urine, and feces. Other animals may become infected by ingesting contaminated food or drinking contaminated water. The bacteria may enter through a break in the continuity of the skin or when the eye membranes become soiled by infectious material.

Economic livestock production, and protection of public health—man is sus-



Calfhood vaccination against brucellosis with Strain 19

ceptible to brucellosis—made necessary the control of brucellosis infection in domestic animals.

The enactment of California's brucellosis vaccination law was preceded by 18 years of field study and demonstration by the Agricultural Extension Service. At first the brucellosis control program involved blood testing and segregation of infected animals along with accepted sanitary practices, and later the program was supplemented by calfhood vaccination with Strain 19, a vaccine developed by the United States Bureau of Animal Industry.

In the early stages of the program—in 1929—control procedures were initiated with serological—blood—tests of the animals. Positive animals—reactors—were segregated from the negative—clean—animals, and later salvaged by butchering. At that time it was estimated that 15% of California's dairy cows were infected with brucellosis. The national average was believed to be near 5%.

Following a survey of the brucellosis situation in the state by the University of California and co-operating agencies, two projects of brucellosis control were initiated.

In the first, Del Norte County was se-

lected as a location to study brucellosis control because the disease was rampant there and conditions were favorable for a long-term study. In the first survey of the 3,760 cows submitted from a total of 5,000 cows in the county, it was found that 16.2% were positive with an additional 13.9% suspicious. A comparatively small number of herd owners—145—represented the 5,000-cow population. Because the county was isolated from other dairy sections of the state and divided by natural barriers of rivers and hills, it lent itself to an excellent field study of the disease on a voluntary county level basis.

In the second brucellosis control project, demonstration herds were selected, without regard to percentage of infection or to available equipment. The demonstration herds were located in the strategic dairy sections of the state and varied from small dairies of a few cows to elaborate enterprises, thus providing a variety of observations on all phases of the disease.

In 1935, after five years of brucellosis control experiments by blood test—under the first project—81 dairymen in Del Norte County qualified their herds for a State *Brucella* disease-free certificate. Additional dairymen might have qualified if they had consistently submitted their herds for test purpose. However, some dairymen in the county were unable to control brucellosis.

In the course of the second project, 67 owners of the demonstration herds received the State *Brucella* disease-free certificate by 1935. Herds qualifying for the certificate had to be free from the evidence of brucellosis for one calendar year.

Strain 19

In the same year—1935—11 additional herds were vaccinated with the United States Bureau of Animal Industry vaccine Strain 19, containing live brucellosis organisms of low virulence. Control of the disease in the demonstration herds was successful. Within a few years brucellosis control by vaccination—still on a voluntary basis—largely replaced control by blood test.

By 1940, a total of 108,327 cattle blood samples had been taken for brucellosis

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RESEARCH

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introduction of closely related species which there is reason for believing may have resistance to the root-rot organism. While several of these species have succeeded thus far as grafts on the avocado, it remains to demonstrate their suitability as rootstocks. Plans have been made to materially expand this line of work in the immediate future.

Propagation

Incidental to or in connection with the rootstock studies, the investigations of the division have contributed materially to the knowledge concerning propagation problems and methods and to the practices employed by nurserymen.

The desirability of seed selection has been emphasized and the value of seed storage under certain conditions shown. Striking benefits in earliness and uniformity of germination, associated with removal or peeling of the seed coats or clipping or other mutilation of the cotyledons, has been demonstrated. A method for rooting cuttings from old clones has recently been developed, though it is considered still in the experimental stage.

Storage Problems

With financial co-operation from the industry, studies of the physiology of the avocado fruit were initiated with a view to developing the facts necessary to the understanding and solution of the problems of fruit handling and storage. As a result, a very considerable body of knowledge is now available which may lead to better handling and storage practices and results.

Important facts concerning the nature



Mexicola avocado seedlings of the same age: 4 and 6, seedcoats left on; 5, seedcoats peeled.

of the softening process and its relations to temperature and respiration have been developed. It has been shown that the avocado fruit gives off ethylene gas during respiration and that the softening process is closely associated with the climacteric in respiration; also that both processes are markedly affected by the temperature of storage. Decided benefits have been found to occur from reduction in the oxygen content of the storage atmosphere. Striking effects of the carbon dioxide content of the storage atmosphere have been demonstrated in slowing down respiration and delaying softening, even at storage temperatures considerably higher than those currently in use.

The possibility of prolonging the storage life of the fruit toward the end of the shipping season and thus extending the marketing period with fruit of excellent quality and appearance is clearly indicated from these studies.

Horticultural Botany

Incidental to or associated with the research summarized above, a very considerable amount of study has been given to morphological and physiological problems, among which may be listed the following: time of fruit bud differentiation; morphology of the inflorescence; ontogeny, floral anatomy and embryology; chromosome number; flower behavior; pollination; parthenocarpy; fruit anatomy; bearing behavior; fruit respiration and enzymatic systems; chemical composition of the fruit; and nitrogen economy and storage reserves in the tree.

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determination and that year 1,148 calves had been vaccinated with Strain 19. In the following year only 2,455 cattle were serologically tested while 8,539 calves in nine co-operating counties were vaccinated with Strain 19. By 1942 only 699 cattle were bled for brucellosis determination while 18,490 calves in 20 co-operating counties were vaccinated with Strain 19.

By 1945, conservatively estimated, over 65,000 calves had been vaccinated. In that year Modoc County reported 70% of all heifer calves were immunized with Strain 19, and the calf crops in certain herds increased from 65% to 90%. Tehama County reported one half to three fourths of all calves received the vaccine.

In many counties—including Siskiyou, Colusa, Kern, San Luis Obispo, Imperial, San Joaquin, Santa Barbara, Tulare and Monterey—vaccination with Strain 19 had become a regular practice.

At the same time the voluntary acceptance of calfhood vaccination in beef cattle was becoming more general. Surveys in 1932 had indicated that 8½% of beef cattle in California were affected by brucellosis, causing premature birth, sterility and loss of beef production.

The year 1947 witnessed the culmination of 18 years of field application of research findings in the control of bovine brucellosis. Thus an act to provide for the control of brucellosis in dairy cattle became a law of California on January 2, 1948.

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TURKEYS

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a small dark spot on the surface of the yolk. This test, as described, is intended only to estimate trends in fertility, not to segregate infertile eggs; a few fertile eggs will be missed. It should be performed only on the last days' eggs laid before the setting.

Whenever this test indicates a drop in fertility the males should be isolated at once for a day or two before being used to inseminate the entire flock artificially.

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