Hazards of Bovine Tuberculosis as a Matter of Public Health Significance and Potential Human Lung Infections with Bovine Tubercle Bacilli

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Following discovery of the tubercle bacilli by Professor Koch, three types of the organisms were soon recognized immunologically as separate and distinct entities, i.e., the human, bovine and avian. For several years thereafter, Koch, as well as many other reputable scientists in the field of bacteriology, contended that the host-species in each category would not contract tuberculosis when exposed to other types of the bacilli and, therefore, bovine tuberculosis was not transmissible to man. However, that conclusion was later exploded and Koch, after much reluctance, finally changed his former opinion in the premise. Consequently, the transmission of tuberculosis from animal to man soon became a generally accepted fact but not without reservations as to its clinical effects. A consensus prevailed that, although transmissible to man, the condition produced by the bovine tubercle bacilli was confined mainly to certain circumscribed limitations such as glandular or lymph node infections and tuberculosis of the bone and joints, but it was not considered to be more than passively capable of producing pulmonary lesions of tuberculosis. With the development of better methods and more practical means of typing, greater stress in recent years has been attached to the importance and desirability of identifying the type of bacilli actually responsible for the disease when it occurs in man. Today bovine bacilli stand convicted not only as the causative agent of a variety of clinical forms, including progressive tuberculosis in man, but pulmonary tuberculosis of bovine origin has been established either clinically or on necropsy in an increasing number of human cases, particularly in European countries where bovine tuberculosis flourishes to a much greater extent among cattle at the present time. Also an increasing number of generalized cases of tuberculosis in humans attributed to the bovine bacilli have been reported in several of these countries.

Jordan, states "that no less than 30 per cent of the cattle in England are affected with tuberculosis. In England 5.2 per cent of all deaths in man due to tuberculosis are the result of the bovine tubercle bacilli and 25 per cent of the deaths from non-pulmonary tuberculosis are due to the bovine tubercle. Milk samples from various cities show virulent tubercle bacilli in from 2.9 to 11.1 per cent."

Lobesian, Jansen and Lossen, reported recovering bovine tubercle bacilli from 26 cases of pulmonary tuberculosis in man in Copenhagen, Denmark.

W. T. Monroe and H. Scott, writing on the subject of human and bovine type meningeal tuberculosis in Scotland, reported "50 cases, 14 at the Glenomen Sanitarium, 7 of which were human and 7 were bovine; while in 36 cases at the Royal Infirmary Dundee, 25 were human and 11 were bovine." Continuing, the authors state "it is noteworthy to mention that 55 per cent of the bovine cases were in infants and children under five years of age."

A. Stanley Griffith presents the following: "The British Royal Commission on Tuberculosis in 1907 found that cow's milk containing bovine tubercle bacilli is clearly a cause of tuberculosis and fatal tuberculosis in man. Our results clearly point to the necessity of means, more stringent than those at present enforced, being taken to prevent the sale and consumption of such milk. Twenty-five years have passed and the country still has a milk supply infected with tubercle bacilli to such an extent that often from 5 to 12 per cent and more of samples of ordinary churned milk contained tubercle bacilli and more than one-third of the cows in this country are tuberculous." He further states, and quotes figures in reporting on milk in London, south of England and northeast Scotland as follows: "It is impossible to compute how many people have died from infection with the bovine tubercle bacillus since 1911, or what it has cost or is costing in providing institutional treatment for crippled and in other ways incapacitated human beings. When to all of this are added the economic losses from bovine tuberculosis among animals, the tribute paid to the bovine bacillus must be enormous. Since 1911 a number of type demonstrations have been made and the proportional frequency of human and bovine types of bacilli in the different varieties of tuberculosis have been determined and show that all varieties of the disease may, be caused by the bovine bacillus.

"In spite of all the evidence," he continues, "which has been accumulated from 1911 onwards on the danger of tubercle bacilli infected milk, the chief administrative measures in this country for the control and prevention of bovine tuberculosis in animals and man are the slaughter of cattle only when they have done
untold mischief, and by clinical veterinary inspections, not by any means general, which may eliminate the dangerous animals a little sooner than other would be the case but will never lead to the eradication or even a noticeable diminution in the incidence of the disease."

In their report Griffith and Munny summarize the results of the investigation of 6,963 cases of pulmonary tuberculosis in Great Britain. Out of 2,769 cases in Scotland, 160 yielded strains of bovine type. Out of 3,671 cases in England, 79 were found to be of bovine type. The proportional frequencies of the bovine infection were higher in all regions in Scotland than in England, the percentage being highest in Orkney Islands, 25.8 per cent; rural districts in the mainland of northeastern Scotland, 9.1 per cent; rural districts of the rest of Scotland, 5.2 per cent; north and middle England, 2 per cent; and northern England, only 0.6 per cent. "The anatomical evidence, previous cervical and abdominal glandular and bone and joint tuberculosis, in about one-third of the cases in Scotland and one-fourth of those in England, strongly suggest the digestive tract as the channel of entry for the bacilli."

Pulmonary tuberculosis of bovine origin is summarized by Cut-

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bill and Allen as follows: "The number of cases of pulmonary tuberculosis due to the bovine type bacilli among 2,101 cases in a sanatorium was 48, or 2.28 per cent, the highest so far recorded in England. In 16 of these cases, infection most probably occurred from milk and in 19 cases no direct evidence of any source of infection was found, although milk-borne infection could not be excluded. Evidence of infection by direct contact with cattle was strongly suggested in 10 cases. Details are given of three families in each of which two members were found to have pulmonary tuberculosis of bovine origin. The original source of infection in each family was probably contact with tuberculous cattle and the subsequent infection of the other member probably due to human transmission of bacilli of the bovine type."

Considering for a moment other aspects in regard to the matter of transmission, swine are ordinarily highly susceptible to the bovine tubercle bacilli and are infected quite readily when exposed under natural conditions that exist on the average farm in the corn belt of the Middle West. Swine are susceptible also to the avian tubercle bacillus, but here again, a generally accepted opinion prevailed that, although swine were subject to infections by the avian bacilli, the disease was confined almost entirely to lymph nodes of the alimentary system; the disease rarely, if ever, became progressive in swine and, therefore, was of little consequence. As a result of this accepted opinion, it was generally assumed that the elimination of tuberculosis in cattle would automatically eliminate the disease in swine insofar as tuberculosis was concerned as an economical factor in the marketing of these animals. By the late 1920's, retentions and condemnation of swine carcasses in packing establishments maintaining Federal inspection in the Middle Western states reached a point where the situation was viewed by packers and the livestock industry with considerable apprehension. Finally, the large slaughtering establishments that formulate the meat packers' institute agreed to pay farmers and shippers of swine a premium of ten cents per cwt. for swine shipped direct to them from modified, accredited counties. The reasoning back of this movement was not founded entirely upon eleemosynary tendencies but was offered mainly as a means of stimulating interest among swine breeders and feeders in support of the county area tuberculosis eradication program in their respective counties. Thus it was believed that, by increasing these activities, it would serve a two-fold purpose: first, it would hasten the accreditation of counties and, since the incidence of bovine tuberculosis must be reduced to less than 0.5 per cent among cattle in such counties to become accredited, the losses in connection with the slaughter of cattle from such counties would be
materially reduced; second, progressive tuberculosis resulting in
the high condemnation of swine at slaughter was due to bovine
tuberculosis contracted by exposure to tuberculous cattle and there-
fore, this would, in turn, solve the problem of losses confronted
on account of tuberculosis in swine. While it was hoped that this
inducement would serve a dual purpose, the paramount reason
for this gesture on the part of the packers’ institute was ostensibly
to reduce the economic losses in the slaughter of swine infected
with tuberculosis. During the 3 years of this procedure, approx-
imately $3,000,000.00 was paid in premiums to the shippers of
slaughtered swine from modified, accredited areas. After what was
considered a reasonable trial period, it was discovered that reten-
tions and the condemnations of swine at slaughter were con-
tinuing at a rate that was out of proportion to the incidence of
tuberculosis in cattle in accredited counties. It could hardly be
reasoned that porcine breeding stock infected from previous ex-
posure to tuberculous cattle in those areas were still responsible
for perpetuating the disease among slaughter swine to such an
extent. Although Van Es and others, including veterinarians in
the Bureau had devoted considerable time, over a period of years,
to the study of various phases of the avian tuberculosis situation,
this state of affairs attracted the attention of Feldman at the Mayo
Foundation in Rochester, Minnesota. In 1936, he reported the re-
sults of a study of 30 specimens of lesions which were obtained
from swine condemned on account of tuberculosis at an abattoir
in southeastern Minnesota, in which 24 of 30 cases were found to
be due to the avian tubercle bacilli. As a result of this rather
startling disclosure, the Bureau of Animal Industry conducted a
similar study at its animal disease station in Beltsville, Maryland,
and was able to confirm the findings reported by Feldman. It is
now generally conceded that a high percentage of condemnations
on account of tuberculosis in swine slaughtered at packing centers
in the Middle Western area is a result of the avian tubercle bacilli.
While avian tuberculosis is not considered to be more than re-
motely infectious for man, it is quite apparent now that conclusions
regarding the ability of the avian type of bacilli to produce pro-
gressive tuberculosis in swine were evidently based upon infor-
mation involving too few cases and resulted from a lack of ade-
quate investigation. By the same token, human tuberculosis was
not considered pathogenic for cattle until recently. It was generally
recognized that cattle exposed to the human bacilli would develop
a sensitization to tuberculin which would cause positive reactions,
but this was viewed largely as a transitory condition and little
significance was attached to the human bacilli as a matter of
concern in cattle other than the confusion which it caused in
the interpretation of the tuberculin test, a condition which must of necessity be tolerated for the lack of a practical test possessed with greater specificity than tuberculin. It was a generally recognized fact that human beings who were discharging bovine tubercle bacilli from open lesions would readily infect cattle that were exposed to such contaminent, but for all general purposes it was thought that the human bacilli had little or no ill effect on cattle other than this particular undesirable influence which it exerted on the tuberculin test. Although long suspected by those directly engaged in the field of bovine tuberculosis eradication, the transmission of the disease and the fact that human tubercle bacilli will cause pathological lesions of tuberculosis in cattle are matters of relatively recent acceptance. At times different research workers have paused to consider the matter of mutation as a potential possibility under certain favorable conditions but this is still regarded, more or less, as a problematical phenomenon. However, there are those engaged in field activities who have witnessed conditions that strongly suggest such possibility and, in view of some of the beliefs concerning transmission which have been found to be erroneous during the present generation, further prosecution of this phase might lead to some similar situation.

In order to epitomize the subject, bovine tuberculosis should probably be referred to as a disease that commonly affects cattle and swine, is transmissible to certain other domestic animals, only to a slightly lesser degree, is infectious for some species of mammalian wild life, and one to which man himself is also susceptible. Therefore, in effect, the disease is not alone a matter of economic importance in the production of dairy and breeding cattle and to the swine industry, but is also a question of public health significance.

By virtue of this fact, a program was inaugurated in the United States in 1917 which had for its objective the ultimate eradication of bovine tuberculosis. This enterprise was inspired and fostered by various individuals and groups and the movement was launched in face of what appeared to many to be a humanly impossible task that would only result in a waste of time, effort and money. A larger portion of the support behind this task came from those who were directly connected or closely affiliated with the livestock industry and others with allied interests, although there were still others less directly concerned who were intensely interested and displayed much enthusiasm in the enterprise. The optimism that prevailed among the various individuals that composed this group of pioneers is responsible in a large measure for the success thus far attained. The disease incidence among dairy and breeding cattle in this country at that time was estimated
at approximately 4.2 per cent with the greater portion of these diseased animals being located in the milk sheds that supply the large metropolitan areas with milk and its by-products for human consumption. The mean average for the dairy and breeding cattle population in this country during the past twenty-five years approximates about 63,000,000 animals. Thus far, in the conquest of bovine tuberculosis, approximately 279,500,000 tuberculin tests have been applied in more than 22,000,000 lots of animals scattered throughout the nation and have resulted in the condemnation of about 3,892,000 animals that revealed positive reactions to these tests. The peak of activities in this campaign was reached in the fiscal year of 1935, and during that year, 25,237,532 animals were subjected to tuberculin tests, resulting in the condemnation of 376,623 animals that gave positive reactions to these tests. Since that year, there has been a gradual decline in the number of cattle tested annually, due in part to the man power shortage caused by the war, but mainly as a result of the continued lowering of the disease incidence, thereby reducing the frequencies of tests necessarily required to preserve the situation during the control era. Only 19,534 positive reactor animals were slaughtered in the entire United States during the fiscal year of 1945, which is quite a contrast to the number disclosed ten years previous and is equivalent to only about 0.03 per cent of the entire dairy and breeding cattle population of the country.

The uniform methods and rules adopted shortly after the cooperative bovine tuberculosis eradication project was inaugurated provided that, when the incidence of bovine tuberculosis had been reduced to 0.5 per cent as a result of the actual tuberculin testing of all dairy and breeding cattle within its borders followed by the immediate slaughter of all positive reactors, the county as a unit would then be designated by the U. S. Bureau of Animal Industry and the cooperating State Department in the state where such county was located as a modified, accredited area for a period of three years. A somewhat similar procedure was also provided for the re-accreditation of such counties upon termination of the three-year period. There are 3,069 counties in the United States, and the last one of these was accredited in November, 1940, approximately twenty-three years after the project was undertaken and, incidentally, that county is located in the state of California. Consequently, all states, including the municipalities of Puerto Rico and the Virgin Islands, now enjoy the distinction of this classification by virtue of the fact that all areas within their borders are modified, accredited areas.

Professor H. R. Smith, general manager, National Livestock Loss Prevention Board, presents the following under the caption "Bo-
vine Tuberculosis Declines 98 per cent.” “The Federal meat inspection records, which give us a true picture of conditions, show that in 1916, the year before the national tuberculosis eradication campaign was started, 2.35 per cent of all cattle slaughtered had tuberculous lesions, as compared to 0.96 per cent in 1908, increasing two and one-half times in the eight-year period. If nothing had been done and if it had continued at the same rate to the present time, today, 50 per cent of our cattle would be infected with the disease. But the situation was brought to the attention of legislative bodies and something was done. With adequate appropriations from Congress, State legislators and county boards, and with an efficient army of veterinarians ably directed by Federal and State sanitary officials, tuberculin testing was done so thoroughly that, by 1943, only .048 per cent of all cattle slaughtered under Federal inspection showed lesions and were retained for the disease—a reduction of 98 per cent from the 1916 figure. The number of beef carcasses condemned has been reduced from 40,746 in 1917 or 0.43 per cent of the total killed to 1,248 or 0.01 per cent in 1943, also a reduction of 98 per cent. In Chicago the reductions have been 99 per cent in each case.” A further reduction in both retentions and condemnations is reflected in the percentage figures for the fiscal year 1945, which reveal but .04 per cent of the animals slaughtered under Federal inspection during the year were retained for tuberculosis and only .009 per cent of these were condemned.

Again Professor H. R. Smith, states: “Since 1917, with the gradual removal of nearly all tuberculous cattle, there has been a constant decrease in the tuberculosis death rate among humans in the United States from 22.5 to 3.5 in 1942 (84 per cent). During the same period, there was a decrease of 68 per cent in the human death rate from respiratory tuberculosis.”

Unfortunately, statistical data on typing during the greater part of this period are not of sufficient volume to determine the extent that bovine tuberculosis eradication actually played in this very gratifying reduction in the human death rate. Therefore, conclusions in this respect are for the most part based upon circumstantial evidence which, of course, presents a matter of conjecture, but it is believed with all candor that achievements attained in this project have been a contributing factor of more than meager proportion.

The U. S. Bureau of Animal Industry, in a release issued by the Department of Agriculture through the USDA Publication, January 7, 1946, estimates “that nearly 40,000 animals or sixteen million pounds of beef a year, which would otherwise have been condemned as unfit for human consumption, are saved as a result
of the bovine tuberculosis eradication campaign. During the last fiscal year (1945) about fourteen and one-half million cattle, exclusive of known reactors, were slaughtered under Federal inspection. Only 0.04 per cent were found to be tuberculous and only one in 10,000 was sufficiently infected to warrant condemnation. But when the campaign began, condemnations were thirty times as frequent. Meat inspection and livestock shipping records are of value in tracing tuberculous cattle to their home premises, in order that any remaining infected cattle may be eliminated. Although our cattle as a whole are now remarkably free from the disease which troubles the livestock industry of many other countries, unsuspected centers of infection are frequently found. But the vast saving in beef has paid for the eradication campaign many times over, not to mention the far safer milk supply we secure as a dividend."

Although bovine tuberculosis is now at low ebb among cattle in the United States, this should not be construed to mean that all danger therefrom to man, cattle, or any other mammalian species is non-existent. An occasional focus of infection is disclosed and frequently a number of animals in a single unit or individual herd are found diseased. Even though dwarfed by percentage terms when applied to the cattle population of the county, state or nation as a whole, yet such animals serve as a potential dangerous element to those in direct contact, in addition to those less directly connected, who may consume milk or its by-products that have not been rendered safe.

In conclusion, it appears obvious that we have arrived at a point in this country when the dissemination of bovine tuberculosis is no longer a matter of serious concern. Sporadic cases of the disease will inevitably occur in mammalians from time to time, be they man or animal, until the disease is finally extirpated. It may also be postulated that a definite challenge may now be encountered toward any further appreciable reduction in the incidence of tuberculosis in cattle, so long as tuberculosis exists in any form to plague human or animal life.

Dr. A. E. Wight, who at that time directed tuberculosis eradication in livestock for the Federal Bureau of Animal Industry, says: "Now that tuberculosis in cattle has been reduced to a small fraction of 1 per cent as a result of the systematic Federal-State campaign of eradication, veterinary officials are concerned about the danger of tuberculosis-free herds becoming re-infected. One way that this can happen is from persons who have pulmonary tuberculosis, present evidence indicates." A case is cited in which four herds of cattle were infected by one person. Because of this danger,
he urges close cooperation between public health officials and veterinarians engaged in bovine tuberculosis eradication.

It is also probable that, when more data are available in countries where bovine tuberculosis is much more prevalent today, in view of a greater tendency for typing, plus the effects of a prolonged war, human tuberculosis in all clinical varieties, including pulmonary tuberculosis caused by the bovine tubercle bacilli, will reveal a very conspicuous increase. This potential reflects not alone the extremely favorable situation for those fortunate enough to live in the United States but also the eminence attained by this country in the field of tuberculosis eradication in cattle, an achievement not emulated by any other country and one to which we point with scintillating pride as reminiscent of the fact that bovine tuberculosis is a constant menace to human health, life and general welfare; it is economically destructive and insidious, yet a disease possible of eradication.

*Appreciation is expressed to Dr. A. B. Crawford, superintendent, Animal Disease Station, U. S. Bureau of Animal Industry, Beltsville, Maryland, for assistance rendered in supplying some of the references used.

SUMMARY

Following discovery of the tubercle bacilli by Professor Koch, three types of the organism were soon recognized immunologically as separate and distinct entities, i.e., the human, bovine and avian. For several years thereafter, Koch, as well as many other reputable scientists in the field of bacteriology, contended that host-species in each category would not contract tuberculosis when exposed to other types of the bacilli and, therefore, bovine tuberculosis was not transmissible to man. However, that conclusion was later exploded and Koch, after much reluctance, finally changed his former opinion in the premise. Consequently, the transmission of tuberculosis from animal to man soon became a generally accepted fact but not without reservations as to its clinical effects. A consensus of opinion prevailed that, although transmissible to man, the condition produced by the bovine tubercle bacilli was confined mainly to certain circumscribed limitations such as glandular or lymph node infections and tuberculosis of the bone and joints, but it was not considered to be more than passively capable of producing pulmonary lesions of tuberculosis. With the development of better methods and more practical means of typing, greater stress in recent years has been attached to the importance and desirability of identifying the type of bacilli actually responsible for the disease when it occurs in man. Today the bovine bacilli stand convicted not only as the causative agent of a variety of clinical forms, including progressive tuberculosis in...
man, but pulmonary tuberculosis of bovine origin has been established either clinically or on autopsy in an increasing number of human cases, particularly in European countries where tuberculosis flourishes to a much greater extent among cattle at the present time. Also an increasing number of generalized cases of tuberculosis in humans attributed to the bovine bacilli have been reported in several of these countries.

Thus far in the conquest of bovine tuberculosis, approximately 279,500,000 tuberculin tests have been applied in more than 22,000,000 lots of cattle scattered through the United States, resulting in the condemnation and slaughter of approximately 3,892,000 animals that revealed positive reactions to these tests. Following this systematic process of tuberculin testing of cattle at regular intervals since the inauguration of the eradication project in 1917, the incidence of the disease has been reduced to 0.5 per cent in all of the 3,069 counties in the United States and all municipalities in Puerto Rico and the Virgin Islands, and these states and municipalities have enjoyed the distinctive classification of officially modified accredited areas since November 1, 1940. During the fiscal year 1945 about fourteen and one-half million cattle, exclusive of known reactors, were slaughtered under Federal meat inspection. Only 0.04 per cent were found to be tuberculous and only one in 10,000 was sufficiently infected to warrant condemnation.

Therefore, it appears obvious that we have arrived at a point in this country when the dissemination of bovine tuberculosis is no longer a matter of serious concern. Sporadic cases of the disease will occur in mammals from time to time, be they animal or man, until the disease is finally extirpated. It may also be postulated that a definite challenge may now be encountered toward any further appreciable reduction in the incidence of tuberculosis in cattle so long as tuberculosis exists in any form to plague human or animal life.

It is probable, when more data is available in countries where bovine tuberculosis is prevalent to a considerably greater extent among cattle today, in view of a greater tendency toward typing, plus the effects of a prolonged war, that human tuberculosis in all clinical varieties, including pulmonary tuberculosis caused by the bovine tubercle bacilli, will reveal a very conspicuous increase. This potential reflects not alone the extremely favorable situation for those fortunate enough to live in the United States but also the eminence attained by this country in the field of tuberculosis eradication among cattle, an achievement not emulated by any other country, and one to which we point with scintillating pride as reminiscent of the fact that bovine tuberculosis is a constant menace to human health, life and general welfare and, although...
economically destructive and insidious, yet, a disease possible of eradication.

RESUMEN

Pronto después del descubrimiento del bacilo tuberculoso por el Profesor Koch, se reconocieron tres tipos del organismo como entidades separadas y distintas, desde el punto de visto inmunológico, a saber: el humano, el bovino y el de las aves. Durante varios años, Koch, lo mismo que muchos otros hombres de ciencia prominentes en el campo de la bacteriología, afirmaron que la especie-huesped en cada categoría no contrairía tuberculosis como resultado de su exposición a otros tipos del bacilo y, por consiguiente, que la tuberculosis bovina no podía ser transmitida al hombre. Sin embargo, esa conclusión fue refutada más tarde y Koch, aunque con mucha reserva, cambió por fin su opinión anterior sobre este punto. Consiguientemente, la transmisión de la tuberculosis del animal al hombre pronto llegó a ser un hecho generalmente aceptado, aunque con ciertas restricciones en cuanto a sus efectos clínicos. Prevalió la opinión colectiva de que, aunque transmisible al hombre, la condición causada por el bacilo de la tuberculosis bovina estaba confinada principalmente dentro de ciertos límites circunscritos, tales como las infecciones glandulares y de los ganglios linfáticos y la tuberculosis de los huesos y las articulaciones; pero se consideraba que no era capaz de producir, sino pasivamente, lesiones pulmonares de tuberculosis. Con el desarrollo de mejores técnicas y de medidas más prácticas para determinar el tipo, en los últimos años se ha insistido más sobre la importancia y conveniencia de identificar el tipo de los bacilos que son realmente responsables por la enfermedad cuando ocurre en el hombre. Al presente se condena a los bacilos bovinos no solamente como agentes causales de una variedad de formas clínicas, inclusive de la tuberculosis progresiva en el hombre, sino que se ha establecido el diagnóstico de tuberculosis pulmonar de origen bovino, ya clínicamente o por autopsias, en un número creciente de casos humanos, particularmente en países europeos, donde la tuberculosis es actualmente mucho más común en el ganado. En algunos de estos países se han presentado también informes relativos a un número creciente de casos de tuberculosis generalizada en seres humanos imputable a los bacilos bovinos.

En la conquista de la tuberculosis bovina se han llevado a cabo, hasta ahora, aproximadamente 279,500,000 pruebas a tuberculina en más de 22,000,000 de lotes de ganado esparcidos a través de los Estados Unidos, lo que ha resultado en la condenación y matanza de aproximadamente 3,892,000 animales que revelaron reacciones positivas a estas pruebas. Subsiguente a este proceso sistemático de comprobar con tuberculina al ganado con intervalos regulares
desde la inauguración del proyecto de erradicación en 1917, se ha reducido la frecuencia de la enfermedad al 0.5 por ciento en todos los 3,069 Condados de los Estados Unidos y todas las municipalidades de Puerto Rico y las Islas Virgenes, y estos Estados y municipalidades han merecido, desde el 1º de Noviembre de 1940, la distinguida clasificación oficial de zonas autorizadas modificadas. Durante el año fiscal de 1945 se mató, bajo inspección Federal de carne, catorce y medio millones de reses, exclusivo de reactores conocidos. Se descubrió que sólo el 0.04 por ciento eran tuberculosas, y solamente una en 10,000 estaba lo suficiente infectada para justificar su condenación.

Por consiguiente, parece evidente que en este país hemos llegado al punto en que la diseminación de la tuberculosis bovina no es ya una cuestión de gran importancia. De cuando en cuando ocurrirán casos esporádicos de la enfermedad en mamíferos, sean ya animales o seres humanos, hasta que sea extirpada finalmente la enfermedad. Se puede postular también que, de aquí en adelante, podrá encontrarse gran dificultad en reducir apreciablemente la frecuencia de la tuberculosis en el ganado mientras exista tuberculosis en cualquiera forma para infectar al hombre o a los animales.

En vista de la mayor tendencia a determinar el tipo ahora, y de los efectos de una guerra prolongada, es probable que cuando se obtenga más datos de países donde la tuberculosis bovina prevalece hoy en sumo grado entre el ganado, se revelará un aumento muy conspicuo de la tuberculosis humana en todas sus variedades clínicas, inclusive de la tuberculosis pulmonar causada por los bacilos de la tuberculosis bovina. Esta posibilidad refleja no solamente la situación, en extremo favorable, de las personas que tienen la buena suerte de vivir en los Estados Unidos, sino también la eminencia alcanzada por este país en el campo de la erradicación de la tuberculosis entre el ganado, hazaña ésta que no ha sido emulada por ningún otro país, y que la presentamos con orgullo centelleante como recordativa del hecho de que la tuberculosis bovina es una amenaza constante a la salud, vida y bienestar general humanos y de que, aunque económicamente destructiva e insidiosa, es, sin embargo, una enfermedad posible de erradicar.

REFERENCES
Discussion

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Mr. Chairman and members of the College: I would like to compliment Dr. O’Rear on his most interesting information and timely paper. Most physicians are aware in only a vague sort of way of the astounding accomplishment of the veterinarians of the United States in reducing so drastically the incidence of tuberculosis of cattle in this country since 1917. As the statistics clearly show the results obtained during this relatively short period, have been truly remarkable. It has been achieved by the ruthless application of the one sure method of eradicating tuberculosis among domestic animals, i.e. the tuberculin test and the slaughter of the reactors. Considering the results obtained, the cost has not been excessive, approximately 250 million dollars. That the task could be accomplished, provides an amazing example of man’s ability to utilize his scientific knowledge to free his environment of formidable and insidious factors that threaten his life and economic well being.

As Dr. O’Rear’s paper shows, it is extremely significant that in those countries which have no bovine tuberculosis control program, the incidence of infection among cattle remains very high, and there is a relatively high incidence of infection among humans with the bovine type. The gains made in this country in controlling bovine tuberculosis can be maintained and advanced only by exercising constant vigilance. As long as a single tuberculous animal remains, the possibility of the transmission of the infection to healthy animals and to humans exists, the goal must be complete elimination of the disease.

The splendid accomplishment of the veterinarians thus far, in the program to eradicate bovine tuberculosis, constitutes a magnificent challenge to all physicians and laymen alike, who are...