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Prevalence of bovine tuberculosis in dairy cattle in Korea from 1961 to 2004

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Abstract : The trend in the prevalence of bovine tuberculosis (BTB) in Korean dairy cattle was investigated in relation to test programs used between 1961 and 2004, during which a total of 8,961,061 dairy cows were tested and 10,248 confirmed to have BTB. The annual prevalence increased in the late 1960s, then decreased during the 1970s and 1980s, and started to increase again from the late 1990s. It seemed that the prevalence varies according to the different test program used. The prevalence of BTB was higher when the tests were performed with heat-concentrated synthetic medium (HCSM) or purified protein derivative (PPD) tuberculin alone compared to that when using combined HCSM and PPD tuberculin testing.

Key words : dairy cattle, HCSM, PPD tuberculin, prevalence rate, tuberculosis

Bovine tuberculosis (BTB), caused by *Mycobacterium bovis*, is a worldwide infectious and zoonotic disease. In the Republic of Korea, the first official report of BTB was in 1913, and connected to two dairy cows [5]. Thus, following the promotion of dairy farming in Korea through a national project in the early 1960s, an eradication program for BTB was instigated in 1964 based on a test-and-slaughter policy with compensation [2, 6]. However, the standard diagnostic methods approved by the veterinary authorities have changed over time. The first cases of BTB in 1913 were confirmed using the caudal-fold-tuberculin test with old tuberculin (OT), which was employed until 1960. The sensitivity of OT was then remedied by the introduction of heat-concentrated synthetic medium (HCSM) tuberculin in 1961, while the nonspecific reactivity of HCSM tuberculin resulted in the introduction of retesting with purified protein derivative (PPD) tuberculin in 1974, and from 1995 until now, only PPD tuberculin has been used for BTB diagnosis in Korea [1]. Nonetheless, despite the implementation of a strong eradication program for more than 40 years, BTB has persisted in cattle in Korea. Accordingly, this study examined the trend of BTB cases in Korea, where the prevalence of BTB was estimated for each year from 1961 to 2004, and the estimates compared in relation to the various diagnostic policies in effect. The BTB prevalence was estimated as the proportion of reactors among the number of tested animals. The upper and lower limits of 95% confidence intervals were also calculated. The prevalence and 95% confidence interval are presented per 100,000 dairy cows. Two prevalence-estimators were considered significantly different if their 95% confidence intervals were not superimposed. The numbers of BTB-tested animals and reactors were extracted from publications by the Korean Ministry of Agriculture and Forestry [7, 8].

From 1961 to 2004, a total of 8,961,061 dairy cows were tested and 10,248 confirmed to have BTB, giving a weighted prevalence of 113.92 (95% CI = 111.71 – 116.12) per 100,000 dairy cows. The annual prevalence increased in the late 1960s, then decreased during the 1970s and 1980s, and started to increase again from the late 1990s. The prevalence of BTB was higher when the tests were performed with HCSM or PPD tuberculin alone compared to that when using combined

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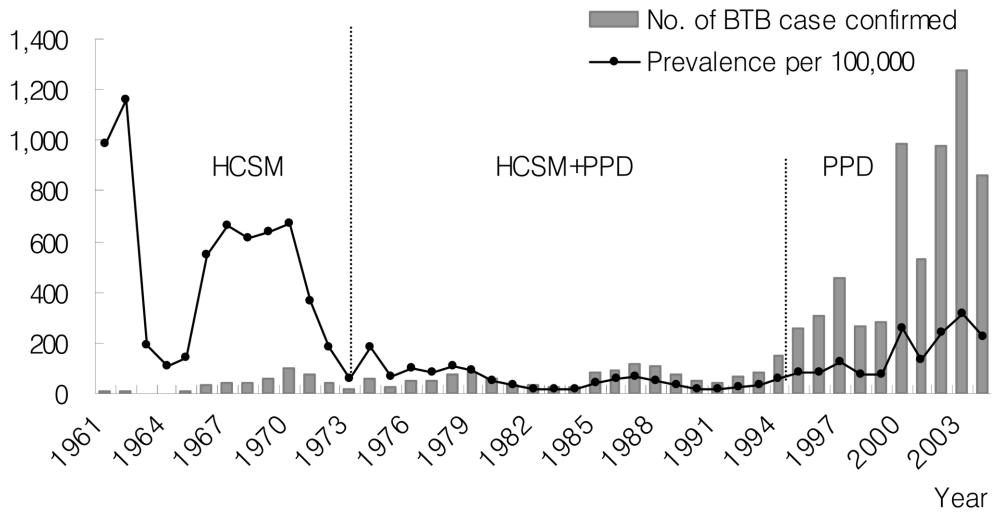

Fig. 1. Chronological observation on the number of reactors and prevalence of BTB in dairy cows in the republic of Korea from 1961 to 2004. HCSM: Heat-Concentrated Synthetic Medium Tuberculin. PPD: Purified Protein Derivative Tuberculin.

Table 1. Comparison of prevalence of bovine tuberculosis in Korean dairy cattle according to different tuberculin test programs used between 1961 and 2004

Period (year)	Tuberculin	No. of tested animals	No. of reactors	Prevalence per 100,000 cows 95% Confidence interval
1961-1973	HCSM*	159,627	457	286.29 (260.08-312.50)
1974-1993	HCSM + PPD	3,079,345	1,318	42.80 (40.49-45.11)
1994-2004	PPD†	5,722,089	8,433	147.38 (144.23-150.52)

*HCSM: Heat-Concentrated Synthetic Medium Tuberculin.
†PPD: Purified Protein Derivative Tuberculin.

HCSM and PPD tuberculin testing (Fig. 1). The prevalence of BTB in Korean dairy cattle also seemed to differ according to the different tuberculin test programs used from 1961 to 2004. Based on the estimated 95% confidence interval, prevalence differences were clearly exhibited (Table 1), where the first phase (1961-1973) was identified as the "epidemic period", the second phase (1974-1993) as the "decreased period", and the third phase (1994-present) as the "re-emerging period of BTB".

BTB eradication campaigns in many industrialized countries have already led to a huge reduction in the incidence of cattle and human tuberculosis [3], and the major weapons for controlling BTB include periodic tuberculin testing of dairy cattle, the slaughter of reactors, and pasteurization of milk. BTB has been almost completely eradicated in the United States and Canada as a result of a sustainable BTB eradication program [4, 10, 14], while Australia successfully eradicated BTB based on a sound technical program with strong industrial and governmental support during a brucellosis and tuberculosis eradication campaign lasting more than 25 years [12]. In the case of Japan, a country-wide survey showed that the bovine tuberculin reactor rate was 4,463 per 100,000 dairy cows in 1903, which then declined to a prevalence of 30 per 100,000 dairy cows in 1967 when the testing included the use of both HCSM and PPD tuberculin. More recently, the prevalence further declined to about zero, including false reactors with non-visible lesions, thereby indicating almost perfect eradication of bovine tuberculosis in Japan [9, 11, 13]. In Korea too, the prevalence of BTB has been significantly reduced through a BTB eradication program based on the test-and slaughter policy [1]. However, a new program aiming at the complete eradication of BTB from Korea

is now required. Therefore, the development of rapid and accurate diagnostic methods is urgently needed, along with identification of the transmission factors through well-designed epidemiological studies.

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