EFFECT OF VACCINATION AGAINST PARATUBERCULOSIS IN THE DIAGNOSIS OF BOVINE TUBERCULOSIS WITH COMPARATIVE CERVICAL SKIN TEST

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INTRODUCTION
Paratuberculosis is one of the diseases that cause the heavy economic losses in cattle industry, especially in dairy herds. Control is based on two main strategies: detection and slaughter of infected animals and vaccination. Vaccination has been widely used in both bovine and ovine with good results when issues such as reduction of clinical cases, excretion rate and severity of lesions are taken into account (1,2). Also the economic balance is quite clear and the cost-benefit analysis shows better ratios for vaccination versus test and culling programs (3,4,5). However, there are two issues that have limited its use. The first is that the goal of those programs until very recently has generally been full and immediate eradication instead of just control to reduce economic losses in affected farms. The second is that vaccination against paratuberculosis can cause a cross-sensitization that would interfere with the diagnosis of tuberculosis. Since most countries have advanced eradication programs against this zoonotic disease in cattle which is also tightly regulated for international trade, Animal Health Authorities tend to be reluctant to allow paratuberculosis vaccination in bovine (6). Nearly complete eradication of bovine tuberculosis in the Basque Country, as well as the high prevalence of clinical cases of paratuberculosis, led the local Animal Health Authorities to approve a vaccination field trial. The goal of the trial reported here was to investigate the bovine version of the Spanish killed vaccines and to what degree vaccinated cows become false positives in the Comparative Cervical Skin Test (CCST) for bovine tuberculosis.

MATERIAL AND METHODS
Seven bovine herds of the Basque Country with a history of clinical paratuberculosis were selected. They had been officially tuberculosis-free for, at least, the last ten years before joining the trial. Given environmental effects of shedding changes on both vaccinated and non-vaccinated animals, as well as other management difficulties, the trial was designed to compare animals in Vaccinated Herds (VH) versus animals in farms on just Test and Culling (TC). Two herds applied a Test and Culling program, while the other five applied a vaccination one. The trial started in 2006 and data from annual testing were collected until 2011. A total of 4,285 CCST records, 2,033 of them from VH and 2,252 from TC were available for the analysis. At the beginning of the study (M0) and later annually (M12, M24, M36, M48, M60), all animals, both vaccinated and non-vaccinated, older than 6 weeks were tested. The CCST was carried out by the Official Veterinary Services according to European legislation (EU Council Directive 64/432/CEE and RD 2611/1996). Vaccination was carried out as described before (1). Briefly, one ml of Silirum® Map vaccine (CZ Veterinaria, S.L.; Porriño, Spain) was administered subcutaneously into the chest area of all the animals at the moment of joining the trial, and then to all new calves older than 1 month. Each dose contained 2.5 mg of heat-killed 316F Map strain and mineral oil as adjuvant. Animals from unvaccinated herds were considered as controls.

RESULTS
When all records were analysed together regardless the time since vaccination and age, 8.9% of the animals from the VH were positive to bovine Skin Test (bST), while only 0.8% scored positive in the TC group. From a comparative perspective, 0.14% of the vaccinated animals were scored as positives, while only 0.04% got that qualification in the TC farms. No lesion of tuberculosis was ever found in slaughtered animals in the post-mortem inspection carried out by the Official Public Health Veterinary Services. In addition, we saw that the percentage of positivity to bST ranged between 20.42% in the M24 and 4.63% detected in the M48 in vaccinated farms. However, the TC herds didn’t exceed the 0.74% (M36) in the annual samplings. When the analysis was done in reference to the CCST the main reactivity was found in the M12 with a 0.58% of positives, while in the TC herds only appeared one positive along the study (Figure 1).
Results according to time elapsed since joining the Program.
Animals joined the program at the time of first testing and vaccination (VH) or just first testing (TC). According to this criterion, significant differences in the percentage of bST positives were found in VH between pre-vaccination (M0), and <6 and 36 months after vaccination; however, such differences were not observed in animals that had been vaccinated more than 36 months ago. On the other hand, no significant difference in the bST or in the CCST regarding time from joining the trial was found among TC strategy animals.

Even though, individually, an increased proportion of reactors might persist as long as three years after vaccination, the overall proportion substantially decreased by the third year of vaccination. This can be explained because the majority of animals were vaccinated as adults at the beginning of the intervention. In the following years, since only the replacers are vaccinated, the overall reactivity in the herd quickly diminishes. If only the CCST results are retained, only three positive results were observed out of 2,033 tests. That can be considered irrelevant because it is a very small fraction of the total number of vaccinated animals. Even though paratuberculosis vaccination was ignored, it would be possible to slaughter this small number of cases to verify that they are not real TB cases. Only one of these animals had the CCST repeated one year later and then it was clearly negative.

Results according the age at the moment of joining the Program
According to this approach, we found no significant differences between VH or between the TC.

CONCLUSIONS
The CCST is considered a useful tool for the diagnosis of tuberculosis in animals vaccinated against paratuberculosis. The interference caused by vaccination in the diagnosis of tuberculosis is similar to that caused by natural infection in TC herds.

REFERENCES
(2) Bastida and Juste (2011). Immune Based Ther Vaccines. 31;9:8.

ACKNOWLEDGEMENTS
This study was supported by the projects INIA RTA2005-00147 and MICINN AGL2008-05820, as well as by the Bizkaia and Gipuzkoa County Councils and the Agricultural Department of the Basque Government. Patricia Vázquez had a FPI doctoral fellowship (BES-2007-17170) from the MICINN. The authors wish to thank the farmers and practitioners involved in this study.