Sensitivity of the cervical and the caudal fold tuberculin tests with *Mycobacterium bovis* in infected cattle of Argentina

Isabel N. de KANTOR*, A.C. ODEÓN**, P.E. STEFFAN**, M.J. AUZA**, C.R. MADRID** and N. MARCHEVSKY*

**Summary:** A group of 1,974 cattle from Balcarce, Province of Buenos Aires (Argentina) was tuberculin tested in the neck with 0.1 mg of bovine PPD. In a second test carried out 35 days later, two doses of bovine PPDs from different laboratories and one dose of avian PPD were given to 90 of the cattle having shown a 5 mm or more increase in skin fold thickness, and to 25 that were to be slaughtered for sanitary reasons other than tuberculosis. Inoculations were made in the neck and the caudal fold.

After reading the results of the test, the animals were killed and examined for evidence of *M. bovis* infection; cultures of lymph nodes and other tissues were made. The results of the test performed on the 24 bovines with positive cultures for *M. bovis* were compared to determine the sensitivity of the simple and comparative tests with both bovine PPDs assayed.

On the basis of the results, it was concluded that the caudal fold test performed with 0.2 mg of a bovine PPD with high biological activity was: (a) more sensitive than the comparative cervical test with bovine and avian PPDs; (b) as sensitive as the simple cervical test with a bovine PPD of moderate biological activity (0.1 mg); and (c) slightly less sensitive than the simple cervical test with the same high potency PPD at a lower dose (0.1 mg), although the difference was not statistically significant.

The advantages of the caudal fold as a test site are the facility and speed with which cattle can be inoculated. Under normal field conditions in an infected area of Argentina, the caudal fold test with 0.2 mg of bovine PPD of controlled potency showed high sensitivity. As demonstrated by other authors, it is also highly specific. The test as performed in this trial is therefore recommended as a standard tuberculin test for cleaning infected herds in Argentina.

* Pan American Zoonoses Center (PAHO/WHO), C.C. 3092, Correo Central, 1000 Buenos Aires, Argentina.

** National Institute of Agriculture and Livestock (INTA), Balcarce, Province of Buenos Aires, Argentina.
INTRODUCTION

Intradermal tuberculin testing is the usual method for detecting tuberculous infection in cattle. Over the years different reagents and techniques have been used, ranging from subcutaneous injection of Koch's old tuberculin prepared from \textit{M. tuberculosis} with assessment of the test by determining the animal's temperature on repeated occasions, to the PPD prepared from \textit{M. bovis} (the etiological agent of bovine tuberculosis) with reading of test results by measuring the degree of tissue reaction in millimeters at the injection site. The tuberculin test, however, is not perfect and its degree of effectiveness depends on several variables, such as:

- the quality of the reagent employed;
- the type of test;
- the criteria for interpretation, and
- the epidemiological situation.

To assure the success of a bovine tuberculosis eradication programme in a particular environment of any region or country, it is essential to determine first which method will be most effective for tuberculin testing of cattle.

In a previous tuberculin testing trial carried out on a herd of infected cattle in the province of Buenos Aires, Argentina (6), the sensitivity of different PPDs and tuberculin testing methods was determined on the basis of post mortem examinations and biological study of tissue samples from different organs of each animal. It was concluded that:

- The tuberculin test has a higher sensitivity with \textit{M. bovis} PPD than with \textit{M. tuberculosis} PPD.
- The potency of the tuberculins used should be checked.
- The comparative test may have a lower sensitivity than that of the simple cervical test, depending on the criteria used to interpret the results.
- In herds or regions found to be infected, either highly sensitive tests, or interpretation criteria that increase sensitivity, should be adopted.

The caudal fold has been successfully used in several countries as the site for tuberculin tests. It has the advantage of enabling quick and easy inoculating without requiring that the animals be totally restrained. In view of this and the conclusions of the paper mentioned earlier, we set the following objectives for our study:

1. To determine the potency of the bovine PPD produced at the Pan American Zoonoses Center (PAHO/WHO) (used as reference preparation by Latin American laboratories) as compared to a standard bovine PPD in experimen-
tally sensitized guinea pigs and naturally infected cattle, and to correlate the results obtained in the two species.

2. To compare the sensitivity of the tuberculin test in the caudal fold using bovine PPD, with that of the simple and comparative cervical tests.

**MATERIALS AND METHODS**

**PPD tuberculins used:**

(a) Two bovine PPDs:

(i) Pan American Zoonoses Center PPD, batch CPZ 1-76, 1 mg/ml (CB), produced from *M. bovis* strain AN5 of the Central Veterinary Institute, Rotterdam.

(ii) Weybridge Central Laboratory PPD 291 (freeze-dried working standard) reconstituted at 1 mg/ml (WB).

(b) *M. avium* PPD:

Pan American Zoonoses Center PPD, batch CPZ 1-75, 0.5 mg/ml 25 000 IU/ml (CA).

**Potency of CB relative to CA:**

The potency of CB relative to CA was assessed on batches of 12 guinea pigs sensitized with:

(a) Killed dry bacilli, suspended in paraffin oil (*M. bovis* AN5), 2 mg each, by intramuscular injection.

(b) Viable bacilli, suspended in physiologic saline solution (*M. bovis* AN5), 0.01 mg each, by intramuscular injection.

**Tuberculin testing trial in cattle:**

The trial was conducted in Balcarce, Province of Buenos Aires, on 1,974 cattle comprising Aberdeen Angus and Hereford breeds of different ages, but not over 12 years old. Each was given 0.1 ml of CB in the neck. Ninety were considered as reactors and were singled out for the test, together with 25 animals selected for slaughter for various reasons (brucellosis or poor sanitary status), making a total of 115. Thirty-five days after the first injection a series of inoculations was made into each animal, as described in Table I.

Before intradermal injection of the tuberculin, the hair at the selected sites of the neck was clipped and the thickness of the skin fold at the site of injection was measured with calipers to the nearest millimeter. Disposable syringes of 0.1 ml and 25-gauge needles, 3/8 inches long, were used for the injections. Reactions were read 72 hours later by calculating the difference in the skin thickness before and after the injection.
**TABLE I**

*Description of the tuberculin tests*

<table>
<thead>
<tr>
<th>Tuberculin</th>
<th>Dose</th>
<th>Inoculation site</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB (M. bovis PPD produced in CPZ)</td>
<td>0.1 mg</td>
<td>neck, right</td>
<td>Day 1, selection</td>
</tr>
<tr>
<td></td>
<td>0.1 mg</td>
<td>neck, right</td>
<td>Day 35, simultaneous</td>
</tr>
<tr>
<td></td>
<td>0.2 mg</td>
<td>neck, right</td>
<td>Day 35, simultaneous</td>
</tr>
<tr>
<td>WB (M. bovis PPD produced in Weybridge)</td>
<td>0.1 mg</td>
<td>neck, left</td>
<td>Day 35, simultaneous</td>
</tr>
<tr>
<td></td>
<td>0.2 mg</td>
<td>neck, left</td>
<td>Day 35, simultaneous</td>
</tr>
<tr>
<td>CA (M. avium PPD produced in CPZ)</td>
<td>0.05 mg</td>
<td>neck, right</td>
<td>Day 35, simultaneous</td>
</tr>
<tr>
<td>CB</td>
<td>0.1 mg</td>
<td>neck, right</td>
<td>Day 35, simultaneous</td>
</tr>
<tr>
<td>CB</td>
<td>0.2 mg</td>
<td>neck, left</td>
<td>Day 35, simultaneous</td>
</tr>
</tbody>
</table>

Concentrations of 0.1 mg and 0.2 mg of each of the bovine PPDs were inoculated into the neck of each animal to determine the potency of the CB PPD compared to that of the WB PPD.

Concentrations of 0.1 mg and 0.2 mg of the CB PPD were injected into the caudal fold of each animal to compare the sensitivity of this site of injection with the one on the neck.

The 115 cattle under study were slaughtered within 15 days following the test. A careful post mortem examination of each was performed and the macroscopic lesions similar to those caused by tuberculosis were recorded. Samples of retropharyngeal, bronchial, mediastinal and mesenteric lymph nodes were collected from each animal. When lesions were observed, samples were also collected from other lymph nodes or organs (liver and lung). Part of these samples was placed in 10% formalin for histopathological study and another part was sent, under refrigeration, to the bacteriology laboratory for the relevant tests.

**Statistical analysis:**

The measurements recorded for the seven inoculations on the 24 infected cattle were analyzed according to Scheffé’s method for multiple comparisons of the mean values observed.

**RESULTS**

Potency of CB PPD compared to WB PPD, as determined in guinea pigs (the 95% confidence intervals are indicated between parentheses):
(a) Killed bacilli suspended in paraffin oil (M. bovis, strain AN5), 122% relative potency (102.5-143.0).

(b) Live bacilli, in physiological saline, 135% relative potency (112.8-159.1).

Sensitivity of the tuberculin test in cattle:

Of the 115 cattle examined, M. bovis was detected by culture in 24 (20.9%). Of these, 19 had shown macroscopic lesions upon necropsy. The 115 cases were divided into two groups:

1. With confirmed infection: the 24 cases with M. bovis culture.

2. Exposed: the 91 remaining cases, without apparent lesions or M. bovis culture, but which were part of an infected herd. Table II shows the average increase in skin thickness (in mm) for each series of tuberculin injections.

The analysis of data on the sensitivity of the tuberculin tests was restricted to the 24 cattle with positive cultures (group 1).

For the first inoculation of CB (0.1 mg) in the neck, an increase in skin fold thickness of 5 mm or more was considered a positive reaction. Seven tuberculin injections were administered simultaneously to each animal only 35 days after the first test, and resulted in an overall drop in response. The reactions were comparatively smaller than those of the first inoculation. For the simple test, any increase in skin thickness was considered a positive reaction. Even so, sensitivity (percentage of positive cases among infected animals) decreased from 95.8% in the first test, to 87.5% in the second, which was also performed in the neck with 0.1 mg of CB (Table III). In spite of this, the data obtained were considered valid for comparing the sensitivity of the simultaneous tests.

Sensitivity of the bovine PPDs in the simple tests:

The results of the tests previously described are shown in Table III. Two comparisons can be made:

(a) The sensitivity of the test in the neck, depending on whether CB or WB was used as a reagent (CB₁ vs WB₁).

(b) The sensitivity of the test in the caudal fold as compared with the sensitivity of the test in the neck (CB₁ vs CB₂). The results of the statistical analysis are shown in Table V.

CB₁ vs WB₁: the test in which CB was used was more sensitive than that with WB. Figure 1 shows the results of these tests recorded on a scattergram. The reactions to WB can be read on the horizontal scale, and the reactions to CB on the vertical scale. The dots above the diagonal line represent the animals with a larger response to CB, and the dots below the diagonal line represent those with a larger response to WB. In 70.8% of the animals, the response to CB was larger than that to WB, or resulted in a positive response
### TABLE II

Mean values of the tuberculin responses of 115 cattle, Balcarce (Argentina)

<table>
<thead>
<tr>
<th>Cattle group</th>
<th>No.</th>
<th>Simultaneous tuberculin tests</th>
<th></th>
<th></th>
<th>First* cervical test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cervical test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CB</td>
<td>CA</td>
<td>WB</td>
<td>CB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 mg</td>
<td>0.2 mg</td>
<td>0.05 mg</td>
<td>0.1 mg</td>
</tr>
<tr>
<td>1. Infected confirmed</td>
<td>24</td>
<td>4.98</td>
<td>6.33</td>
<td>2.39</td>
<td>3.46</td>
</tr>
<tr>
<td>2. Exposed</td>
<td>91</td>
<td>1.39</td>
<td>1.67</td>
<td>1.49</td>
<td>1.01</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>2.14</td>
<td>2.66</td>
<td>1.71</td>
<td>1.52</td>
</tr>
</tbody>
</table>

* Performed 35 days prior to the simultaneous test.
FIG. 1
Results of the simple tuberculin tests in the neck with *M. bovis* CB and WB PPDs in 24 tuberculous cattle
while the WB produced a negative response (two cases). In 16.7%, responses were larger to WB than to CB. In three cases, CB vs CB: the simple test in the neck with 0.1 mg of CB was more sensitive than the test in the caudal fold with 0.2 mg of the same reagent (Table III), although the difference was not significant.

### Table III
**Sensitivity of the simple tuberculin test in 24 tuberculous cattle**

<table>
<thead>
<tr>
<th>Test</th>
<th>PPD used</th>
<th>Dose (mg)</th>
<th>Sensitivity (positivity(^1) percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>CB</td>
<td>0.1</td>
<td>95.8(^2)</td>
</tr>
<tr>
<td></td>
<td>CB</td>
<td>0.2</td>
<td>91.7</td>
</tr>
<tr>
<td></td>
<td>WB</td>
<td>0.1</td>
<td>79.2</td>
</tr>
<tr>
<td></td>
<td>WB</td>
<td>0.2</td>
<td>91.7</td>
</tr>
<tr>
<td>Caudal</td>
<td>CB</td>
<td>0.1</td>
<td>75.0</td>
</tr>
<tr>
<td></td>
<td>CB</td>
<td>0.2</td>
<td>79.2</td>
</tr>
</tbody>
</table>

1. Positivity criterion: any increase in skin thickness.
2. 23 had reactions of more than 5 mm, and 1 showed no reaction.

It was logical to suppose that an increased PPD dose in the caudal fold would result in a higher sensitivity. However, no significant differences were found in the mean reactions obtained with 0.1 and 0.2 mg in the caudal fold (Table V). In this trial, it was not possible to establish regression lines with significant slopes between mean responses and large doses, a *sine qua non* condition to determine the potency of one tuberculin compared to another and—when comparing caudal fold inoculation with neck inoculation of the same CB PPD—to determine the CB concentration required in the caudal fold to obtain a mean reaction equal to that obtained with 0.1 mg in the neck (5).

### Sensitivity of the bovine PPDs in the comparative tests:

The results of the comparative test using CB and WB, as interpreted according to different criteria, are shown in Table IV. The highest sensitivity (75.0%) was attained with CB and positivity criterion C, and the lowest (8.3%) with WB and criterion A. The sensitivity of the comparative tests was therefore lower than that of the simple caudal fold test.
TABLE IV
Sensitivity of the comparative tuberculin test in 24 tuberculous cattle

<table>
<thead>
<tr>
<th>Positivity criterion</th>
<th>Test with CB 0.1 mg</th>
<th>Test with WB 0.1 mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB 0.1 mg</td>
<td>CA 0.05 mg</td>
<td>CA 0.05 mg</td>
</tr>
<tr>
<td>A. Bov. PPD ≥ 2 mm Av. PPD</td>
<td>(15/24) 62.5%</td>
<td>(11/24) 45.8%</td>
</tr>
<tr>
<td>B. Bov. PPD ≥ 4 mm Av. PPD</td>
<td>(9/24) 37.5%</td>
<td>(11/24) 45.8%</td>
</tr>
<tr>
<td>C. Bov. PPD ≥ Av. PPD ²</td>
<td>(18/24) 75.0%</td>
<td>(15/24) 62.5%</td>
</tr>
</tbody>
</table>

1. Positive: reactions to bovine PPD 2 mm or more than to avian PPD.
2. Positive: reactions to bovine PPD equal to or greater than avian PPD.

TABLE V
Statistical analysis

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Site type of test</th>
<th>Measures the influence of</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB₁ vs WB₁</td>
<td>simple cervical</td>
<td>origin of the PPD</td>
<td>highly significant</td>
</tr>
<tr>
<td>CB₁ vs CBₚ</td>
<td>simple cervical</td>
<td>inoculation site</td>
<td>not significant</td>
</tr>
<tr>
<td>CB₀₁,₀₂ vs CB₀₂,₀₂</td>
<td>caudal fold</td>
<td>dose</td>
<td>not significant</td>
</tr>
<tr>
<td>(CB + WB)₀₁,₀₂ vs (CB + WB)₀₂,₀₂</td>
<td>simple cervical</td>
<td>dose</td>
<td>not significant</td>
</tr>
<tr>
<td>(CB + WB)₀₁,₀₂ vs CA₀₁,₀₅</td>
<td>comparative</td>
<td>origin of the PPD</td>
<td>not * significant</td>
</tr>
</tbody>
</table>

* Although not statistically significant, the difference was considerable.

DISCUSSION

The present study analyzes the sensitivity of various tuberculin tests in cattle using *M. bovis* PPD in intradermal inoculations in the neck and the caudal fold. Specificity was not considered, since it would have been very difficult to conduct a valid study in an area where tuberculosis-free herds have yet to be identified.
As regards the specificity of the different tests, we have to refer to reports on trials carried out in other countries, until prevailing conditions are adequate to conduct a local study. Moreover, errors resulting from lack of specificity (false positive responses) are of greater relative importance when bovine tuberculosis is infrequent, than when prevalence is relatively high. In the latter case, the sensitivity of the test, i.e., its capacity to detect the greatest possible number of infected cattle and herds, is of utmost importance to avoid false negative responses.

The comparison between the sensitivity of the comparative and single cervical tests and that of the single caudal test using the same bovine PPD, gave the following results:

— The comparative cervical test had a maximum sensitivity of 75%, below the 87.5% attained with the single cervical test. This percentage is consistent with that obtained in a previous study in Balcarce (6), and with the 74.36% found by Roswurm and Konyha (7) in the United States, and suggests that when the comparative test is used for the diagnosis of inconclusive reactors in tuberculosis infected herds, it should be interpreted according to the criterion that gives the highest possible sensitivity.

— In addition, the comparative cervical test was less sensitive than the caudal test with 0.2 mg of PPD (79.2%), and as sensitive as the caudal test with a dose of 0.1 mg (75.0%).

— The single cervical test (0.1 mg) was slightly more sensitive than the caudal test with a 0.2 mg dose—87.5% vs 79.2%. These percentages correspond to the multiple tests performed simultaneously 35 days after the single cervical test in which the percentage of positivity was as high as 95.8%, even with the requirement of 5 mm or more increase in skin thickness. It is therefore highly probable that the actual sensitivity of the caudal fold test was also higher than 79.2%.

— The comparison of the results of the caudal fold test with doses of 0.1 mg and 0.2 mg of bovine PPD showed that, although the sensitivity in the latter case was higher (79.2 vs 75.0%), the difference was not statistically significant. As regards the size of the reactions, the difference was not significant either (Table V). Likewise Francis et al. (2) found no significant differences in the sensitivity of this test between doses of 0.2 and 0.4 mg of bovine PPD produced in Australia. However, because the reactions in tuberculous cattle to the 0.4 mg dose were larger than those to the 0.2 mg dose, the authors favour the use of a 0.3 or 0.4 mg dose of PPD in the caudal test in the areas of Australia where it is particularly important to detect the highest possible number of infected animals. It is of interest to mention that the authors found a specificity of 99% for the caudal test with a 0.4 mg dose. These results show that it is advisable to use a relatively high dose in this test to increase sensitivity while retaining a high specificity (2).
The bovine PPD produced at the Pan American Zoonoses Center (CB) showed a significantly higher potency than the original Weybridge PPD (WB), both in the single and the comparative tests. The exact percentage of the biological activity of WB as compared with CB could not be established because no significant slopes were obtained in the regression lines of the mean responses by relation to the log doses.

In the test performed on guinea pigs, the potency of CB compared to WB amounted to 122% when the guinea pigs had been sensitized with killed bacilli in paraffin oil, and amounted to 135% when they were infected with viable bacilli. Apparently, this last method would correlate better with the results obtained in naturally infected cattle (3).

— Because of the presence of an anergic animal within the group, the sensitivity of the various methods of the tuberculin test used in the trial never reached 100%. The anergy in the tuberculous animals not reacting to the tuberculin test may be due to various reasons: onset of tuberculosis (preallergic period), generalized tuberculosis, malnutrition, concurrent infections, depressed immune responsiveness (1). In the present trial, no macroscopic lesions were observed in the anergic animal; diagnosis was made by culturing *M. bovis* from a sample of the retropharyngeal lymph node. This animal was negative to the first and second tuberculin tests and belonged to the group of 25 assigned for slaughter for infections other than tuberculosis — in most cases brucellosis. It should be considered therefore as a case of initial tuberculosis.

**CONCLUSIONS**

The caudal fold tuberculin test using 0.2 mg of a bovine PPD with a high biological potency was found to have:

(a) a higher sensitivity than the comparative cervical test;

(b) a sensitivity similar to that of the single cervical test performed with 0.1 mg of a bovine PPD of moderate potency (WB);

(c) a slightly lower sensitivity than the single cervical test when using a 0.1 mg dose of the same high potency bovine PPD, although the difference was not statistically significant.

The caudal fold tuberculin test is easily and rapidly performed and interpreted. It has been shown to have good sensitivity and, as reported in a published work (1, 2), also a very high specificity. In the environment of this trial, the use of a 0.2 mg dose of bovine PPD of good biological potency in the caudal fold is therefore advocated as the standard test, particularly for cleaning infected herds. When the comparative test with bovine and avian PPDs is used in the environment of this trial for the diagnosis of inconclusive reactors, the interpretation criterion leading to the highest possible sensitivity should be applied. We believe, however, that even with this interpretation, the diagnostic value of the comparative test is limited.
ACKNOWLEDGEMENTS

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Résumé : Un groupe de 1 974 bovins de Balcarce, dans la province de Buenos Aires (Argentine), a fait l'objet d'une tuberculination à l'encolure avec 0,1 mg de tuberculine purifiée bovine. Trente-cinq jours plus tard, une seconde tuberculination a été pratiquée chez 90 bovins ayant présenté un épaississement du pli cutané de 5 mm ou plus ainsi que 25 bovins devant être abattus pour d'autres motifs sanitaires que la tuberculose. Au cours de cette seconde épreuve, on a utilisé deux doses de tuberculines purifiées bovines produites par deux laboratoires différents, et une dose de tuberculine purifiée aviaire, qui ont été administrées à l'encolure et au pli caudal.

Après lecture des intradermo-tuberculinations (I.D.), les animaux ont été abattus et la présence du bacille tuberculeux a été recherchée par mise en culture de ganglions lymphatiques et d'autres tissus. Les cultures provenant de 24 bovins se sont révélées positives et les résultats des I.D. réalisées sur ces animaux ont été comparés. On a pu ainsi comparer la sensibilité des deux tuberculines bovines utilisées lors des I.D. simples ou comparatives.

Les résultats permettent de conclure que l'I.D. pratiquée au pli caudal avec 0,2 mg d'une tuberculine bovine à activité biologique élevée est :

a) plus sensible que l'I.D. comparative pratiquée à l'encolure avec les tuberculines bovine et aviaire ;
b) aussi sensible que l'I.D. simple pratiquée à l'encolure avec 0,1 mg d'une tuberculine bovine à activité biologique moyenne ; et
c) légèrement moins sensible que l'I.D. simple pratiquée à l'encolure avec une dose moindre (0,1 mg) de la même tuberculine à activité biologique élevée, sans que la différence entre les deux I.D. soit statistiquement significative.

L'I.D. pratiquée au pli caudal présente le double avantage de la facilité et de la rapidité d'exécution. Dans les conditions normales du terrain, dans une zone infectée d'Argentine, l'I.D. au pli caudal avec 0,2 mg de tuberculine bovine à activité contrôlée s'est révélée très sensible. Elle est également très spécifique selon divers auteurs. C'est pourquoi elle est recommandée comme épreuve standard d'intradermo-tuberculine pour l'assainissement des troupeaux infectés en Argentine.

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Resumen: Un grupo de 1974 bovinos de Balcarce, Provincia de Buenos Aires (Argentina) fue tuberculinizado en la tabla del cuello con 0,1 mg de PPD bovino. Noventa, que presentaron reacciones de 5 mm o mayores y 25 animales que debían ser sacrificados por otras razones sanitarias, fueron sometidos 35 días después a una segunda tuberculinización múltiple, en la tabla del cuello y en el pliegue caudal con 2 tuberculinas PPD bovinas de distinta procedencia y un PPD aviar.

Los animales fueron luego sacrificados y examinados para comprobar la infección por M. bovis mediante cultivo de ganglios y órganos. Se evaluaron los resultados de las pruebas en los 24 bovinos infectados y se comparó la sensibilidad de la prueba caudal con la cervical, para la que se utilizaron los dos PPD bovinos estudiados.

Los resultados mostraron que la prueba caudal realizada con 0,2 mg de un PPD bovino de alta potencia biológica posee (a) una mayor sensibilidad que la prueba comparativa cervical; (b) una sensibilidad semejante a la prueba simple cervical hecha con 0,1 mg de un PPD bovino de potencia mediana; (c) una sensibilidad algo menor que la prueba simple cervical efectuada con 0,1 mg del mismo PPD de alta potencia, sin que esta diferencia fuese estadísticamente significativa.

En consecuencia, siendo la prueba caudal con 0,2 mg de PPD bovino de potencia controlada un método de buena sensibilidad, de ejecución sencilla y rápida, y excelente especificidad, según varios autores se la recomienda como prueba estándar para limpieza de rebaños infectados de la Argentina.

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REFERENCES
