Summary of Studies Supporting USDA Product Licensure

Establishment Name	Boehringer Ingelheim Animal Health USA Inc.
USDA Vet Biologics Establishment Number	124
Product Code	4465.24
True Name	Bovine Rhinotracheitis-Virus Diarrhea-Parainfluenza 3-Respiratory Syncytial Virus Vaccine, Killed Virus, Leptospira Canicola-Grippotyphosa-Hardjo-Icterohaemorrhagiae-Pomona Bacterin
Tradename(s) / Distributor or Subsidiary (if different from manufacturer)	Triangle 10 HB - Boehringer Ingelheim (Canada) Ltd. Triangle 10 HB - No distributor specified Triangle 9 + Type II BVD - Zoetis Inc.
Date of Compilation Summary	April 10, 2019

Disclaimer: Do not use the following studies to compare one product to another. Slight differences in study design and execution can render the comparisons meaningless.

Study Type	Efficacy
Pertaining to	Bovine Virus Diarrhea (BVD)
Study Purpose	Demonstration of efficacy against BVD Type 1 (respiratory disease)
Product Administration	
Study Animals	Bovine
Challenge Description	BVD isolate NY-1, Type 1b
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	November 20, 1996

Study Type	Efficacy
Pertaining to	Bovine Virus Diarrhea (BVD)
Study Purpose	Demonstration of efficacy against BVD Type 2 (respiratory disease)
Product Administration	
Study Animals	Bovine
Challenge Description	BVD strain IAF 103/BT-4A-2, Type 2a
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	July 14, 2003

Study Type	Efficacy
Pertaining to	Infectious Bovine Rhinotracheitis (IBR)
Study Purpose	Demonstration of efficacy against IBR (respiratory disease)
Product Administration	
Study Animals	Bovine
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. Study data, however, are no longer available.
USDA Approval Date	November 20, 1996

Study Type	Efficacy
Pertaining to	*Leptospira canicola*
Study Purpose	Demonstration of efficacy against *Leptospira canicola*
Product Administration	
Study Animals	Bovine
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	December 16, 1991

Study Type	Efficacy
Pertaining to	*Leptospira grippotyphosa*
Study Purpose	Demonstration of efficacy against *Leptospira grippotyphosa*
Product Administration	
Study Animals	Bovine
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	December 16, 1991

Study Type	Efficacy
Pertaining to	*Leptospira hardjo*
Study Purpose	Demonstration of efficacy against *Leptospira hardjo*
Product Administration	
Study Animals	Bovine
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	December 16, 1991

<table>
<tr><td>Study Type</td><td>Efficacy</td></tr>
<tr><td>Pertaining to</td><td>Leptospira hardjo</td></tr>
<tr><td>Study Purpose</td><td>Demonstration of efficacy against Leptospira borgpetersenii serovar hardjo-bovis</td></tr>
<tr><td>Product Administration</td><td>Two doses, 21 days apart, Subcutaneously</td></tr>
<tr><td>Study Animals</td><td>27 bovine (14 vaccinates, 13 controls), 6-10 month old heifers</td></tr>
<tr><td>Challenge Description</td><td>Challenged with Leptospira borgpetersenii serovar hardjo-bovis on 62, 63 and 64 days after the second vaccination</td></tr>
<tr><td>Interval observed after challenge</td><td>Cattle were observed daily for 10 days after challenge, then three times weekly for 7 weeks. Urine samples were taken weekly for 8 weeks. On day 62 - 63 after challenge, kidneys were cultured for Leptospira isolation.</td></tr>
<tr><td>Results</td><td>Results of the study are summarized as follows:

Urine cultures were positive for Leptospira on at least one day:
<table>
<tr><th>Group</th><th># Positive / Total</th><th>% Affected</th><th>% Unaffected</th></tr>
<tr><td>Vaccinates</td><td>0 / 14</td><td>0%</td><td>100%</td></tr>
<tr><td>Controls</td><td>13 / 13</td><td>100%</td><td>0%</td></tr>
</table>
Kidney cultures were positive for Leptospira at necropsy:
<table>
<tr><th>Group</th><th># Positive / Total</th><th>% Affected</th><th>% Unaffected</th></tr>
<tr><td>Vaccinates</td><td>0 / 14</td><td>0%</td><td>100%</td></tr>
<tr><td>Controls</td><td>13 / 13</td><td>100%</td><td>0%</td></tr>
</table>

See tables on the following pages for data.</td></tr>
<tr><td>USDA Approval Date</td><td>January 14, 2015</td></tr>
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Urine and Kidney Cultures:

Vaccinates:

Animal #	Weekly Urine Observations								Overall Urine Outcome	Overall Kidney Outcome
	1	2	3	4	5	6	7	8		
5	-	-	-	-	-	-	-	-	Negative	Negative
8	-	-	-	-	-	-	-	-	Negative	Negative
15	-	-	-	-	-	-	-	-	Negative	Negative
20	-	-	-	-	-	-	-	-	Negative	Negative
23	-	-	-	-	-	-	-	-	Negative	Negative
26	-	-	-	-	-	-	-	-	Negative	Negative
27	-	-	-	-	-	-	-	-	Negative	Negative
34	-	-	-	-	-	-	-	-	Negative	Negative
38	-	-	-	-	-	-	-	-	Negative	Negative
42	-	-	-	-	-	-	-	-	Negative	Negative
44	-	-	-	-	-	-	-	-	Negative	Negative
46	-	-	-	-	-	-	-	-	Negative	Negative
69	-	-	-	-	-	-	-	-	Negative	Negative
70	-	-	-	-	-	-	-	-	Negative	Negative

Controls:

Animal #	Weekly Urine Observations								Overall Urine Outcome	Overall Kidney Outcome
	1	2	3	4	5	6	7	8		
6	-	+	+	+	+	+	+	+	Positive	Positive
10	-	+	+	+	+	+	+	+	Positive	Positive
18	-	+	+	+	+	+	+	+	Positive	Positive
28	-	+	+	+	+	+	+	+	Positive	Positive
32	-	-	+	+	+	+	+	+	Positive	Positive
41	-	-	+	+	+	+	+	+	Positive	Positive
43	-	+	+	+	+	+	+	+	Positive	Positive
49	-	+	+	+	+	+	+	+	Positive	Positive
50	-	-	+	+	+	+	-	+	Positive	Positive
59	-	+	+	+	+	+	+	+	Positive	Positive
60	-	+	+	+	+	+	+	+	Positive	Positive
67	-	-	+	+	+	+	+	+	Positive	Positive
68	-	+	+	+	+	+	+	+	Positive	Positive

Weekly Urine Observations:
- = Urine sample was negative for *Leptospira*
+ = Urine sample was positive for *Leptospira* (highlighted yellow)

Overall Urine / Kidney Outcome:
Negative = All urine / kidney samples were negative for *Leptospira*
Positive = At least one urine / kidney sample was positive for *Leptospira* (highlighted yellow)

Study Type	Efficacy
Pertaining to	*Leptospira icterohaemorrhagiae*
Study Purpose	Demonstration of efficacy against *Leptospira icterohaemorrhagiae*
Product Administration	
Study Animals	Bovine
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	December 16, 1991

Study Type	Efficacy
Pertaining to	*Leptospira pomona*
Study Purpose	Demonstration of efficacy against *Leptospira pomona*
Product Administration	
Study Animals	Bovine
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	December 16, 1991

Study Type	Efficacy
Pertaining to	Bovine Parainfluenza Type 3 (PI_3)
Study Purpose	Demonstration of efficacy against PI_3
Product Administration	
Study Animals	Bovine
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. Study data, however, are no longer available.
USDA Approval Date	November 20, 1996

Study Type	Efficacy
Pertaining to	Bovine Respiratory Syncytial Virus (BRSV)
Study Purpose	Demonstration of efficacy against BRSV
Product Administration	
Study Animals	Bovine
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	September 7, 1999

Study Type	Safety
Pertaining to	All fractions
Study Purpose	To demonstrate safety under field conditions
Product Administration	
Study Animals	Bovine including pregnant animals at all stages of gestation
Challenge Description	
Interval observed after challenge	
Results	Study data were evaluated by USDA-APHIS prior to product licensure and met regulatory standards for acceptance at the time of submission. No data are published because this study was submitted to USDA-APHIS prior to January 1, 2007, and APHIS only requires publication of data submitted after that date.
USDA Approval Date	January 22, 1998