Supplementary Material

1 Supplementary Table 1- Primary Symptoms Scoring Criteria Table

Items	Primary Symptoms Scoring Criteria			
	0 point	2 points	4 points	6 points
Fever	Normothermia	39℃＜ temperature≤40℃	40℃＜ temperature≤41℃	41℃＜ temperature≤42℃
Dyspnea	None	Presence of mild shortness of breath (brisk breathing)/mild chest and abdominal breathing (depth of breath slightly above normal)	Visible abdominal/thoracic-abdominal breathing; visible deepening/exertion of breathing	Respiratory failure with mechanical ventilation
Cough	None	Lower frequency (occasional)	Frequency general (5-15 times/min)	Higher frequency(1-5 times/min)

2 Supplementary Table 2- Secondary Symptoms Scoring Criteria Table

Items	Secondary Symptoms Scoring Criteria			
	0 point	1 points	2 points	3 points
Psychological condition	Normal spirit, both eyes are flexible, bright, agile, wagging tail from time to time	Mildly depressed, with hazel eyes, slow movements, and a tendency to lie down and be lazy	Moderate depression, closed eyes, diminished perception, slowed movement	Severe depression with impaired consciousness, slowness of perception, coma and drowsiness
Food intake	Normal feed intake	Reduction in feed intake by less than	Reduction in feed intake by more	Cessation of feeding

		half.	than half.	
Sputum coughing	None	—	Present	—
Nasal discharge	None	—	Present	—

3 Supplementary Table 3- Laboratory Test Indicator Scoring Scale

Items	Grading Standard	
	0 points	3 points
WBC	Normal	Abnormal
NEUT#	Normal	Abnormal
NEUT%	Normal	Abnormal
LYM#	Normal	Abnormal
LYM%	Normal	Abnormal

4 Supplementary Table 4- Lung Imaging Scoring Criteria

Parts/ Items		Grading Standard
lungs	Left side of upper lung field	Grade 0: no signs of pneumonia (0 points)
	Right side of upper lung field	Grade I: slightly heavier or increased lung texture (1 point)
	Left side of lung	Grade II (mild): thickening and blurring of the lung texture, or

	center field	fibrous streaks (2 points)
	Right side of lung center field	Grade III (moderate): patchy infiltrative shadows, slightly increased density (3 points)
	Left side of lower lung field	Grade IV (severe): patchy infiltrative shadows with increased density (4 points)
	Right side of the lower lung field	Grade V (very severe): large patchy homogeneous hyperdense shadow (5 points)
Pleural effusion		None (0 points); small amount (blunted rib diaphragm angle) (1 point); large amount (2 points)
Pleural thickening adhesions		None (0 points); Present (2 points)
mesenchymal change		None (0 points); Present (ground glass or lattice shadow) (2 points)
Totals		

1. Dogs were subjected to chest radiographs in the ventrodorsal recumbency and lateral positions, and the lung radiographs were evaluated in the form of a zonal score, which was divided into the left upper lung field, the right upper lung field, the left middle lung field, the right middle lung field, the left lower lung field, and the right lower lung field. The area of each field of view was scored on a 0 to V scale. The degree of pleural effusion, pleural thickening and adhesion, and interstitial changes were also graded and evaluated, and the sum of the scores of all items was used as the totals.

5 Supplementary Table 5- Comprehensive Efficacy Evaluation Weights

Serial Number	Items	Weights (%)
1	Clinical Symptom Score	50
2	Laboratory Test Score	30
3	Radiographic Score	20

1. Composite Efficacy Score = Clinical Symptom Score * 50% + Laboratory Test Score * 30% + Radiographic Score * 20%

6 Supplementary Table 6- Clinical Symptom Score Results on assessment days

Assessment day	D0	D4	D7	D14
AB4 group	10.5(8,13.5)	8.5(6,12)	7.5(2,11)	0(0,0)
CXL group	10(8,13)	10(6.5,14)	6.5(4.5,9.5)	0(0,2)
Placebo group	10(8,13.5)	12(8.5,17.5)	8.5(6,14)	2(0,8)
Test Statistics	χ^2=0.147	χ^2=4.676	χ^2=2.129	H=5.919
p value	0.864	0.012	0.127	0.052

7 Supplementary Table 6.1- Clinical Symptom Score Results with post-hoc comparisons of Day 4

Group	95% CI lower bound	95% CI upper bound	*p* value
AB4 group-CXL group	-2.071	4.571	1.000
CXL group-Placebo group	0.721	7.362	0.012
AB4 group-Placebo group	-6.112	0.529	0.129

1.post-hoc comparisons were performed using the Bonferroni method.

8 Supplementary Table 7- Radiographic Score Results on assessment days

Assessment day	D0	D4	D7	D14
AB4 group	14(11.5,16.5)	15(10.5,17)	12(4.5,16.5)**	7.5(5,10)***

CXL group	15(12.5,17)	13.5(11,17)	11.5(8.5,14.5)	3.5(0.5,10)
Placebo group	14.5(13,17)	17(15,18.5)	15.5(13,21)	12(8,15.5)
Test Statistics	H=1.078	H=6.694	*F*=7.585	H=15.202
p value	0.583	0.035	0.001	0

1. The mark "***" indicates that the AB4 group is statistically significant from the Placebo group ($p < 0.001$).

9 Supplementary Table 7.1- Radiographic Score Results with post-hoc comparisons of Day 4

Group	95% CI lower bound	95% CI upper bound	*p* value
AB4 group-CXL group	-3.00	3.00	0.788
CXL group-Placebo group	-6.00	-1.00	0.015
AB4 group-Placebo group	-6.00	0.00	0.045

1.post-hoc comparisons were performed using the Mann-Whitney U test, with α adjusted for the number of comparisons (α=0.05/3=0.0167).

10 Supplementary Table 7.2- Radiographic Score Results with post-hoc comparisons of Day 7

Group	95% CI lower bound	95% CI upper bound	*p* value
AB4 group-CXL group	-3.383	5.049	1.000
CXL group-Placebo group	-9.549	-1.118	0.008
AB4 group-Placebo group	-10.383	-1.951	0.002**

1.post-hoc comparisons were performed using the Bonferroni method.

2. The mark "**" indicates that the AB4 group is statistically significant from the Placebo group ($p < 0.01$).

11 Supplementary Table 7.3- Radiographic Score Results with post-hoc comparisons of Day 14

Group	95% CI lower bound	95% CI upper bound	*p* value
AB4 group-CXL group	-1.00	5.00	0.13
CXL group-Placebo group	-7.00	-2.00	0.004
AB4 group-Placebo group	-10.00	-3.00	0.000***

1.post-hoc comparisons were performed using the Mann-Whitney U test, with α adjusted for the number of comparisons (e.g., α=0.05/3=0.0167).

2. The mark "***" indicates that the AB4 group is statistically significant from the Placebo group ($p < 0.001$).

12 Supplementary Table 8- Laboratory Test Score Results on assessment days

Assessment day	D0	D4	D7	D14
AB4 group	3(0,6)	3(0,6)	1.5(0,6)	0(0,0)***
CXL group	3(0,6)	0(0,4.5)	1.5(0,4.5)	0(0,0)
Placebo group	0(0,6)	6(0,7.5)	3(0,7.5)	6(0,9)
Test Statistics	H=0.459	H=0.5.166	H=3.167	H=17.489
p value	0.795	0.076	0.205	0

1.post-hoc comparisons were performed using the Bonferroni method.

2.The mark "***" indicates that the AB4 group is statistically significant from the Placebo group ($p < 0.001$).

13 Supplementary Table 8.1- Laboratory Score Results with post-hoc comparisons of Day 4

Group	95% CI lower bound	95% CI upper bound	*p* value
AB4 group-CXL group	0.00	0.00	0.712
CXL group-Placebo group	-6.00	0.00	0.001
AB4 group-Placebo group	-6.00	0.00	0.000***

1.post-hoc comparisons were performed using the Mann-Whitney U test, with α adjusted for the number of comparisons (α=0.05/3=0.0167).

2.The mark "***" indicates that the AB4 group is statistically significant from the Placebo group (*p* < 0.001).

14 Supplementary Table 8.2- The absolute counts and log-transformed values of WBC, NEUT, and LYM

Assessment day	Group	WBC ($\times10^9\cdot L^{-1}$)	NEUT ($\times10^9\cdot L^{-1}$)	LYM ($\times10^9\cdot L^{-1}$)	Log-WBC	Log-NEUT	Log-LYM
Day 0	AB4	8.39(6.5,10.64)	4.51(3.21,6.42)	2.01(1.66,2.53)	0.94±0.19	0.69±0.23	0.3±0.22
	CXL	6.91(4.77,9.02)	4.49(3.03,6.36)	1.54(1.28,1.95)	0.83±0.18	0.64±0.2	0.2±0.21
	Placebo	8.2(5.96,11.48)	5.64(3.78,7.73)	1.62(1.07,1.92)	0.92±0.17	0.76±0.2	0.16±0.19
Day 4	AB4	12.81(10.34,17.48)	7.23(5.37,10.59)	3.64(2.91,4)	1.14±0.17#	0.91±0.21#	0.5±0.16

	CXL	8.69(7.33,11.16)	4.96(4.31,6.17)	2.78(1.91,3.26)	0.94±0.12	0.69±0.13	0.43±0.17
	Placebo	16.16(9.67,28.46)	8.32(5.89,18.99)	3.43(2.65,4.3)	1.21±0.24#	0.99±0.26#	0.51±0.18
	AB4	14.62(10.1,18.51)	10.02(6.61,14)	2.81(2.19,3.34)	1.14±0.14	0.97±0.17	0.41±0.13
Day 7	CXL	13.87(10.51,15.91)	9.11(6.68,10.93)	3.2(2.54,4.31)	1.13±0.12	0.94±0.15	0.51±0.14
	Placebo	17.63(10.28,23.82)	10.36(7.18,16.81)	3(2.31,3.65)	1.23±0.21	1.06±0.23	0.46±0.16
	AB4	11.06(9.75,14.26)	7.27(5.48,9.66)	2.45(2.26,2.95)	1.06±0.09*	0.85±0.13*	0.41±0.11
Day 14	CXL	11.02(9.92,12.78)	7.38(6.4,8.27)	3.03(2.22,3.39)	1.05±0.07*	0.85±0.11*	0.45±0.14
	Placebo	14.8(10.22,22.46)	10.66(6.08,15.77)	2.49(2.26,2.71)	1.18±0.23	1±0.29	0.4±0.13

1. The absolute values of complete blood count (CBC) parameters were log-transformed (logarithm transformation) prior to analysis and compared using ANOVA to ensure suitability for statistical analysis.

2. An asterisk ("*") indicates statistical significance compared to Placebo group on the same day ($p < 0.05$), a hashtag ("#") indicates statistical significance compared to the CXL group on the same day ($p > 0.05$), and data without any markers indicate no statistical significance.

15 Supplementary Table 9- Composite Efficacy Score(Weighted) Results on assessment days

Assessment day	D0	D4	D7	D14
AB4 group	8.75(6.5,11.5)	8.7(6.8,10.9)	7.25(2.85,9.6)	0.7(0.1,2)
CXL group	8.75(7,11.65)	8.45(5.75,9.8)	6.2(4.3,8.35)	1.8(1.1,4)

Placebo group	9.4(7.3,10.85)	10.95(7.85,14.7)	9.1(6,12.55)	4.6(1.9,9.1)
Test Statistics	H=0.09	*F*=5.599	*F*=4.238	H=15.599
p value	0.956	0.006	0.018	0.000

16 Supplementary Table 9.1- Composite Efficacy Score(Weighted) Results with post-hoc comparisons of Day 4

Group	95% CI lower bound	95% CI upper bound	*p* value
AB4 group-CXL group	-3.444	1.702	1.000
CXL group-Placebo group	-5.952	-0.806	0.006
AB4 group-Placebo group	-5.081	0.065	0.058

1.post-hoc comparisons were performed using the Bonferroni method.

17 Supplementary Table 9.2- Composite Efficacy Score(Weighted) Results with post-hoc comparisons of Day 7

Group	95% CI lower bound	95% CI upper bound	*p* value
AB4 group-CXL group	-2.665	3.148	1.000
CXL group-Placebo group	-5.765	0.048	0.055
AB4 group-Placebo group	-6.006	-0.194	0.033*

1.post-hoc comparisons were performed using the Bonferroni method.

2.Marking "*" indicates statistical significance of AB4 group versus Placebo group ($p < 0.05$).

18 Supplementary Table 9.3- Composite Efficacy Score(Weighted) Results with post-hoc comparisons of Day 14

Group	95% CI lower bound	95% CI upper bound	*p* value
AB4 group-CXL group	0	1.6	0.037
CXL group-Placebo group	-4.8	-0.4	0.013
AB4 group-Placebo group	-5.7	-1.2	0.000***

1. post-hoc comparisons were performed using the Mann-Whitney U test, with α adjusted for the number of comparisons (α=0.05/3=0.0167).

2. The mark "***" indicates that the AB4 group is statistically significant from the Placebo group ($p < 0.001$).

19 Supplementary Table 10- Fever Recovery Time analysis results

Groups	Median	95% CI lower bound	95% CI upper bound	chi-square test	Significance
AB4 group	5*	3.13	6.87	—	—
CXL group	2	1.07	2.93	0.12	0.729
Placebo group	5	1.40	8.60	4.161	0.041

1. Logarithmic Rank Test was used for statistical analysis;

2. Marking "*" indicates that AB4 group and Placebo group are statistically significant, while unmarking indicates no statistical significance.

20 Supplementary Table 11- Cough Recovery Time analysis results

Groups	Median	95% CI lower bound	95% CI upper bound	chi-square test	Significance
AB4 group	12	10.33	13.67	—	—
CXL group	10	8.08	11.92	0.358	0.55
Placebo group	12	11.32	12.68	3.467	0.063

1. Logarithmic Rank Test was used for statistical analysis;

2. Marking "*" indicates that AB4 group and Placebo group are statistically significant, while unmarking indicates no statistical significance.

21 Supplementary Table 12- Dyspnea Recovery Time analysis results

Groups	Median	95% CI lower bound	95% CI upper bound	chi-square test	Significance
AB4 group	6*	3.94	8.06	—	—
CXL group	9	7.94	10.06	0.547	0.459
Placebo group	10	8.09	11.91	5.114	0.024

1.Logarithmic Rank Test was used for statistical analysis;

2. Marking "*" indicates that AB4 group and Placebo group are statistically significant, while unmarking indicates no statistical significance.

22 Supplementary Table 13-Summary Table of Hematology Data

	Group	Day 0	Day 7	Day 14	Reference range
WBC ($\times 10^9 \cdot L^{-1}$)	AB4	8.39 (6.5, 10.64)	14.62 (10.1, 18.51) *	11.06 (9.75, 14.26)	6.00～17.00
	CXL	6.91 (4.77, 9.02)	13.87 (10.51, 15.91) *	11.02 (9.92, 12.78) *	

	Placebo	8.2 (5.96, 11.48)	17.63 (10.28, 23.82) *	14.8 (10.22, 22.46) *	
	AB4	4.51 (3.21, 6.42)	10.02 (6.61, 14) *	7.27 (5.48, 9.66)	
NEUT ($\times 10^9 \cdot L^{-1}$)	CXL	4.49 (3.03, 6.36)	9.11 (6.68, 10.93) *	7.38 (6.4, 8.27) *	3.62～12.30
	Placebo	5.64 (3.78, 7.73)	10.36 (7.18, 16.81) *	10.66 (6.08, 15.77) *	
	AB4	2.01 (1.66, 2.53)	2.81 (2.19, 3.34)	2.45 (2.26, 2.95)	
LYM ($\times 10^9 \cdot L^{-1}$)	CXL	1.54 (1.28, 1.95)	3.2 (2.54, 4.31) *	3.03 (2.22, 3.39) *	0.83～4.91
	Placebo	1.62 (1.07, 1.92)	3 (2.31, 3.65) *	2.49 (2.26, 2.71) *	
	AB4	0.79 (0.45, 0.95)	1.09 (0.78, 1.37) *	0.9 (0.65, 1.07)	
MON ($\times 10^9 \cdot L^{-1}$)	CXL	0.5 (0.38, 0.86)	0.72 (0.5, 0.91)	0.74 (0.57, 0.87)	0.14～1.97
	Placebo	0.73 (0.51, 0.96)	1.63 (0.66, 2.79) *	1.28 (0.64, 3.06) *	
	AB4	5.21 (4.67, 5.47)	5.28 (4.59, 5.95)	5.86 (5.53, 6.35) *	
RBC ($\times 10^{12} \cdot L^{-1}$)	CXL	5.86 (5.08, 6.35)	5.85 (5.41, 6.72)	6.12 (5.51, 6.61)	5.10～8.50
	Placebo	5.14 (4.8, 6.95)	5.23 (4.88, 6.11)	5.62 (5.26, 6.5)	

	AB4	105.5 (97.5, 117.25)	111.5 (102, 124.75)	128 (117, 137.25) *	
HGB ($g \cdot L^{-1}$)	CXL	135.5 (125.75, 149.5)	142 (136, 157) *	153.5 (138, 163.75)	110.00～190.00
	Placebo	114.5 (104.5, 164.75)	118 (108, 142)	130.5 (116, 158.5)	
	AB4	29.25 (27.03, 31.7)	31.3 (27.63, 34.35)	35.95 (32.73, 37.9) *	
HCT (%)	CXL	37 (33.2, 41.18)	38.9 (37.43, 43.35) *	41.45 (36.68, 44.73)	33.00～56.00
	Placebo	31.15 (29.3, 42.93)	33.3 (29.58, 38.2)	36.25 (33.7, 42.28)	
	AB4	134.5 (108.5, 258.5)	143.5 (97.25, 202)	238.5 (131, 321.5) *#	
PLT ($\times 10^9 \cdot L^{-1}$)	CXL	242 (150.75, 271.5)	262 (202.5, 307.5) *	245 (221, 311.75) *	117.00～490.00
	Placebo	259.5 (220.25, 290.25)	269 (245.25, 354.5)	384 (306, 561.25) *	

1.The reference range data were obtained from the Mindray BC-5000VET hematology analyzer.

2.For normally distributed data, a Paired t-test was used, while the Wilcoxon Signed-Rank Test was applied for non-normally distributed data.

3.The Bonferroni correction was applied to adjust the significance level to p = 0.025 in order to reduce Type I errors.

4.An asterisk ("*") indicates statistical significance compared to D0 (paired test), a hashtag ("#") indicates statistical significance compared to the placebo group on the same day, and data without any markers indicate no statistical significance.

23 Supplementary Table 14-Summary Table of Blood Biochemistry Data

	Group	Day 0	Day 7	Day 14	Reference range
Tbil	AB4	0.93(0.75,1.2)	0.95(0.76,1.25)*	1(0.71,1.42)*#	0.00~15.00
	CXL	1.06(0.59,1.37)	0.63(0.14,1.1)	0.57(0.24,0.84)	
	Placebo	0.81(0.5,1.14)	1.12(0.73,1.52)*	1.08(0.58,1.34)	
ALT	AB4	18.7(15.5,31.25)	17.25(14.4,26.35)*	17.05(14.1,24.55)*#	8.00~100.00
	CXL	49.4(41.05,57.25)	44.5(37.55,55.25)	39.65(31.35,43.55)*	
	Placebo	33.1(29.55,40.65)	33.4(29.8,45.55)	30.5(26.75,38.05)	
AST	AB4	14.95(12.9,15.85)	12.1(9.8,14.2)*#	14.15(11.65,16.95)	0.00~50.00
	CXL	36(28.45,41.6)	21.25(18.95,35.1)	21.5(19.6,24.15)*	
	Placebo	19.9(17.8,23.1)	25(16,36.6)*	23.5(16.55,28.95)	
ALP	AB4	93.1(76.4,134.5)	97.35(87.2,141.7)	104.9(77.35,132.55)	23.00~337.00
	CXL	93.85(67,114.55)	82.25(56.05,97.85)*	94.1(60.55,160.05)	
	Placebo	133.7(103.45,198.75)	154.75(62.35,253.4)	237.45(146.55,373.1)*	
TP	AB4	54.21(51.22,57.45)	57.04(55.08,59.97)	57.19(56.41,61.4)*#	48.00~82.00
	CXL	69.47(65.93,74.43)	71.72(67.28,75.95)	67.95(64.54,72.87)	
	Placebo	65.94(54.3,71.45)	65.63(58.52,72.68)	67.51(63.41,74.48)*	
CRE	AB4	48.8(44.1,67.15)	41(31.45,62.55)	48.9(41.75,56.25)	27.0~159.0

A	CXL	64.6(58.65,68.7)	68.25(63.55,72.85)	60.95(59.15,73.95)	
	Placebo	55.9(30.3,67.15)	50.25(38.6,65.75)	45.7(37.25,58.1)	
	AB4	2.85(2.05,3.27)	2.79(1.93,4.16)	3.86(2.93,4.39)*#	
UREA	CXL	4.3(2.85,6.37)	4.74(4.2,6.62)	4.58(4.37,6.5)	2.50~10.40
	Placebo	3.92(2.51,5.04)	3.68(2.32,4.77)	5.15(3.5,6.34)	

1.The reference range data were obtained from the Mindray BS-240 automatic biochemical analyzer.

2. For normally distributed data, a Paired t-test was used, while the Wilcoxon Signed-Rank Test was applied for non-normally distributed data.

3. The Bonferroni correction was applied to adjust the significance level to $p = 0.025$ in order to reduce Type I errors.

4. An asterisk (“*”) indicates statistical significance compared to D0 (paired test), a hashtag (“#”) indicates statistical significance compared to the placebo group on the same day, and data without any markers indicate no statistical significance.