

Table S1. Observed Gas Production Values of Datasets 1– 25 from Experiment 1 and 2.

Datasets 1 – 7

Time (h)	Observed Gas Production (mL/g DM)						
	1	2	3	4	5	6	7
3	0	1.738	0	0.522	0.029	0.956	3.091
6	11.02	18.54	15.03	18.69	23.88	22.94	26.25
9	27.5	38.6	28.93	33.47	37.5	39.54	41.95
12	35.75	47.69	35.44	39.64	43.23	48.58	49.75
15	40.61	51.63	39.26	43.2	46.44	55.88	56.34
18	44.25	53.72	40.65	45.89	47.83	60.14	61.98
21	46.77	55.26	42.3	45.89	50.78	61.01	62.79
24	52.06	57.75	44.13	45.98	53.29	61.53	63.95
27	53.79	59.66	45.78	46.16	55.03	62.48	63.95
30	54.66	60.85	47.52	46.3	57.19	62.86	65.74
33	55.88	63.46	48.82	47.08	59.36	64.25	67.64
36	57.52	65.48	50.73	47.69	61.01	66.86	68.71
39	60.04	67.45	52.73	48.65	62.57	69.46	70.88
45	64.98	72.53	59.07	51.6	67.6	78.76	77.65
56	79.47	80.12	68.11	58.04	80.18	94.92	88.4
70	102.1	89.21	85.83	78.72	91.03	109.5	100.1
82	113.9	98.14	96.95	92.37	103.1	119.1	109.1
96	129.8	107.6	107.8	106.4	109.6	127.5	113.6
120	129.8	107.6	107.8	106.4	109.6	127.5	113.6

Datasets 8 – 14

Time (h)	Observed Gas Production (mL/g DM)						
	8	9	10	11	12	13	14
3	1.819	0	0	0	0	0.348	0
6	20.19	7.118	4.773	6.081	3.82	14.33	8.069
9	37.87	27.86	20.05	26.41	23.61	32.12	27.42
12	42.81	35.16	28.46	35.01	32.64	34.9	39.22
15	50.86	38.45	34.97	38.57	39.32	40.8	50.41
18	53.64	38.89	36.62	38.57	40.1	43.84	55.01
21	55.25	38.89	37.05	38.57	40.1	43.84	55.99
24	56.52	38.89	38.79	38.57	41.75	44.88	57.37
27	57.48	40.97	38.79	39.03	43.14	46.87	58.42
30	60.16	43.4	41.39	40.25	45.57	48.78	59.28
33	61.81	44.44	42.95	40.65	46.53	50.52	59.63
36	63.8	48.61	47.38	43.78	51.04	57.29	63.97
39	68.14	53.65	51.98	47.25	55.9	64.32	68.83
45	76.97	58.85	56.57	48.99	58.77	71.18	70.13
56	87.89	70.49	67.25	52.38	62.93	83.25	75.34
70	102.3	85.59	81.65	56.81	67.79	95.4	85.75
82	110.6	96.18	92.5	61.24	73.17	105.2	95.29

96	118.6	107.6	104.0	69.06	80.81	114.8	106
120	118.6	107.6	104.0	69.06	80.81	114.8	106

Datasets 15 – 20

Time (h)	Observed Gas Production (mL/g DM)					
	15	16	17	18	19	20
0	0	0	0	0	0	0
1	0.91	1.213	1.972	2.882	2.882	0.758
2	1.972	2.578	4.246	15.32	17.14	14.86
3	5.156	5.915	7.431	25.18	31.09	26.09
4	7.583	9.099	10.16	31.39	38.82	32
5	9.554	11.53	12.44	38.07	44.44	38.82
6	11.07	13.5	14.26	42.92	49.14	45.35
7	13.04	15.77	16.23	49.14	54.6	51.26
8	14.41	17.14	17.59	54.45	59.6	58.54
9	15.77	18.81	19.41	59.45	63.54	64.76
12	17.9	22.14	23.96	72.64	74.92	82.96
15	19.41	24.27	27.45	82.65	87.36	97.52
18	21.08	26.84	30.63	88.27	93.72	104.6
21	23.05	28.97	33.52	92.36	98.43	110
24	24.87	30.79	35.94	96.3	102.4	113.7
27	26.24	32.76	37.61	99.18	106.3	117.5
30	27.3	34.12	38.22	101.6	109.8	120.3
33	28.82	36.09	38.22	104	114	122.5
36	29.72	37.31	38.22	105.9	117.2	124.4
39	31.85	38.52	39.43	107.4	119.5	125.9
42	32.91	40.34	40.8	110.3	122.2	126.8
45	34.88	41.71	42.62	112.7	125	127.8
48	35.49	43.53	44.44	114.5	127.5	128.5
51	37	45.35	46.1	116.8	129.7	129.1
54	38.52	47.01	47.92	117.8	130.6	129.5
57	40.8	47.62	50.5	119.7	132.2	130
60	42.31	50.05	52.63	121.3	133.6	130.7
63	44.28	50.5	54.75	122.8	135.1	131.6
66	46.1	53.99	57.18	124.1	135.9	132.7
69	47.92	55.36	59.45	125.1	137.4	132.5
72	49.14	56.72	61.42	126.5	138.8	133

Datasets 21 – 25

Time (h)	Observed Gas Production (mL/g DM)				
	21	22	23	24	25
0	0	0	0	0	0
1	0.455	3.336	3.64	1.82	1.972
2	15.01	15.92	17.59	12.74	13.35
3	32	25.33	29.72	26.39	29.72
4	40.19	32.61	37.31	37.91	40.19
5	46.56	41.86	44.44	48.99	48.23
6	51.87	50.5	50.5	58.09	54.9
7	58.09	59.45	56.57	65.67	60.66
8	63.7	67.03	61.72	72.64	66.58
9	70.37	74.31	67.49	77.95	72.04
12	89.02	94.03	83.41	96.61	90.99
15	105.4	103.1	94.63	108.9	103.1
18	111.6	110.7	101.2	116.5	110.9
21	117.7	116.9	107.1	122.5	117.7
24	121.8	123	112.4	128.2	123.1
27	125.7	129.7	118.9	131.3	127.7
30	127.8	133.6	122.2	132.7	129.4
33	130.7	136.8	125	134.2	131.6
36	133.9	139.2	128.2	135.4	133.5
39	136.5	141.6	130.9	136.8	135.3
42	138.5	143	132.7	139.1	138.5
45	139.7	143.8	133.9	140.3	140.3
48	140.3	144.7	135.4	141.2	141.6
51	140.7	145.4	136	142.1	142.9
54	141.5	145.9	136.8	143.2	144.4
57	142	146.5	137.7	143.9	145.3
60	143.3	146.8	138.8	144.4	146
63	144.7	147.3	139.2	144.7	146.7
66	146.7	148.8	141.6	145.7	148.6
69	147.1	149.2	142.4	145.9	148.8
72	148	149.2	142.9	145.7	148.9

Table S2. Final parameter estimates from fitting the simple Mitscherlich (Eqn. 1) to Dataset 1–25.

Dataset	Parameter		
	c	T	A
1	0.0138	0	163.5
2	0.0333	0	103.1
3	0.0171	0	124.2
4	0.0187	0	114.2
5	0.0260	0	111.79
6	0.0245	0	132.6
7	0.0350	0	109.9
8	0.0247	0	123.7
9	0.0146	0	133.2
10	0.0136	0	133.3
11	0.0394	0	63.9
12	0.0318	0.4	79.8
13	0.0176	0	133.8
14	0.0308	0	103.1
15	0.0270	0	52.6
16	0.0330	0	57.4
17	0.0370	0	58.4
18	0.0710	0	120.6
19	0.0680	0	133.3
20	0.0829	0.6	132.1
21	0.0797	0.3	144.5
22	0.0781	0.5	148.7
23	0.0718	0	140.3
24	0.0927	0.6	143.9
25	0.0793	0.3	146.0

Table S3. Final parameter estimates from fitting the France model (Eqn. 2) to Dataset 1–25.

Dataset	Parameter			
	c	d	T	A
1	0.0050	0.0190	0	246.8
2	0.0090	0.0729	0	128.6
3	0.0027	0.0245	0	255.8
4	-	-	-	-
5	0.0048	0.0535	0	166.8
6	0.0053	0.0495	0	193.2
7	0.0079	0.0803	0	139.2
8	0.0080	0.0487	0	159.5
9	0.0050	0.0212	0	201.0
10	0.0082	0.0144	0	160.3
11	0.0159	0.0749	0	72.3
12	0.0256	0.0188	0	82.5
13	0.0093	0.0246	0	161.5
14	0.0193	0.0389	0	111.2
15	0.0270	0	0	52.6
16	0.0076	0.0454	0	90.5
17	0.0041	0.0451	0	117.9
18	0.0506	0.0687	0.18	123.7
19	0.0379	0.0956	0.13	140.2
20	0.0829	0*	0.56	132.1
21	0.0797	0*	0.32	144.5
22	0.0781	0*	0.47	148.7
23	0.0634	0.032	0.16	141.4
24	0.0927	0*	0.56	143.9
25	0.0775	0.0064	0.30	146.2

* Reverted to simple Mitscherlich (Eqn. 1), $d = 0$

Table S4. Final parameter estimates from fitting the double Mitscherlich model (Eqn. 3) to Dataset 1–25.

Dataset	Parameter					
	A_1	c_1	T_1	A_2	c_2	T_2
1	60.3	0.0928	3.1	84.3	0.0264	43.4
2	61.9	0.1455	2.9	62.9	0.0169	33.3
3	47.6	0.1433	3.0	81.4	0.0184	35.4
4	47.5	0.1923	3.0	78.6	0.0214	44.8
5	56.2	0.1597	2.8	66.4	0.0224	34.3
6	64.6	0.1574	3.0	72.7	0.0284	35.9
7	67.6	0.1479	2.7	52.3	0.0311	37.5
8	60.8	0.1405	2.8	66.8	0.0273	34.6
9	42.8	0.1601	3.4	83.9	0.0194	32.4
10	43.7	0.1143	3.6	80.7	0.0182	33.6
11	41.5	0.0165	3.4	40.4	0.0142	31.6
12	47.0	0.1224	3.6	42.3	0.0192	29.5
13	48.2	0.1524	3.1	76.4	0.0263	31.1
14	63.8	0.1135	3.6	75.9	0.0107	34.4
15	52.6*	0.0270*	0	0	0	0
16	57.4*	0.0332*	0	0	0	0
17	58.4*	0.0369*	0	0	0	0
18	109.7	0.0903	0.3	38.7	0.0164	37.2
19	112.6	0.0986	0.2	45.0	0.0187	25.7
20	132.1*	0.0829*	0.6*	0	0	0
21	142.4	0.0832	0.4	11.2	0.0477	55.6
22	148.7*	0.07812*	0.5*	0	0	0
23	138.6	0.0744	0.1	5.0	0.4023	61.8
24	141.5	0.0969	0.6	6.9	0.0383	43.0
25	140.4	0.0881	0.4	14.7	0.0289	38.9

* Reverted to simple Mitscherlich (Eqn. 1), $A_2 = 0$.

Table S5. Final parameter estimates from fitting the Mitscherlich + linear (Eqn. 4) to Dataset 1–25.

Dataset	Model				
	A_1	c	T_1	β	T_2
1	63.7	0.0776	2.8	0.9361	35.9
2	60.9	0.1494	2.9	0.5779	25.1
3	46.7	0.1476	3.0	0.7831	27.4
4	47.2	0.1959	3.0	0.8249	35.9
5	50.4	0.2152	3.0	0.6922	18.1
6	66.7	0.1389	2.9	0.8325	29.8
7	67.5	0.1452	2.6	0.6160	27.7
8	64.6	0.1111	2.5	0.7229	28.7
9	45.2	0.1330	3.3	0.8139	28.0
10	50.1	0.0771	3.1	0.7222	31.4
11	42.0	0.1583	3.4	0.3400	28.1
12	51.5	0.0952	3.5	0.3720	27.6
13	71.8	0.0475	0.6	0.6026	32.7
14	65.5	0.1057	3.6	0.5385	32.8
15	27.5	0.0932	0.5	0.4916	29.1
16	35.4	0.0856	0.5	0.4781	28.7
17	42.8	0.0714	0.3	0.6583	43.7
18	109.6	0.0906	0.3	0.4733	34.8
19	114.3	0.0954	0.1	0.5361	23.7
20	131.6	0.0839	0.6	0.1346	57.5
21	140.5	0.0859	0.4	0.1968	36.6
22	147.7	0.0794	0.5	0.0402	33.1
23	130.4	0.0848	0.2	0.02497	21.1
24	141.5	0.0969	0.6	0.1557	40.0
25	140.4	0.0879	0.4	0.2689	36.4

Figure S1: Observed (●) and predicted gas production profiles resulting from fitting Equations (1) – (4) to Dataset 1 – 7, horses displaying clinical signs of laminitis, from Experiment 1.

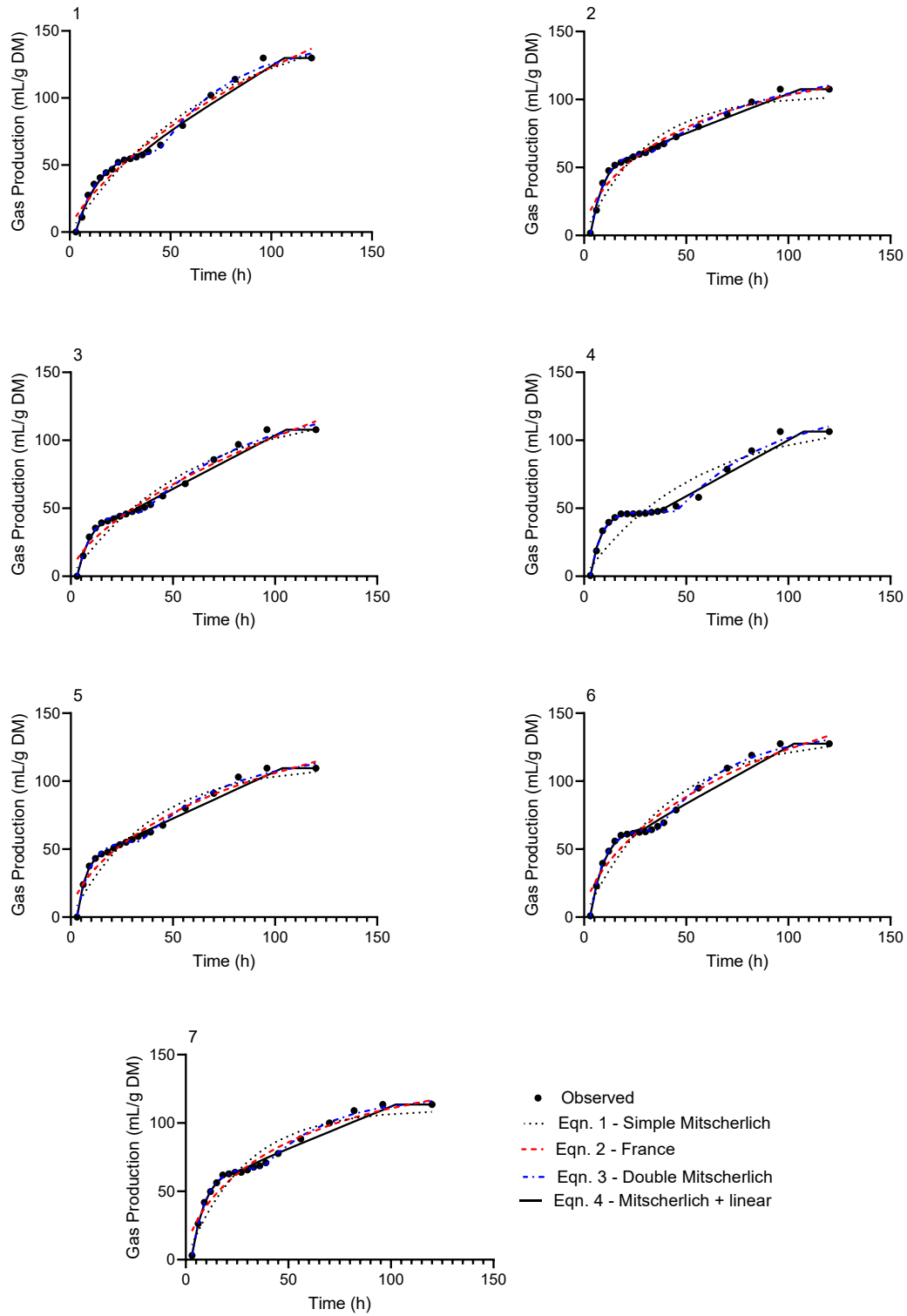


Figure S2. Observed (●) and predicted gas production profiles resulting from fitting Equations (1) – (4) to Datasets 8 – 14, clinically normal horses, from Experiment 1.

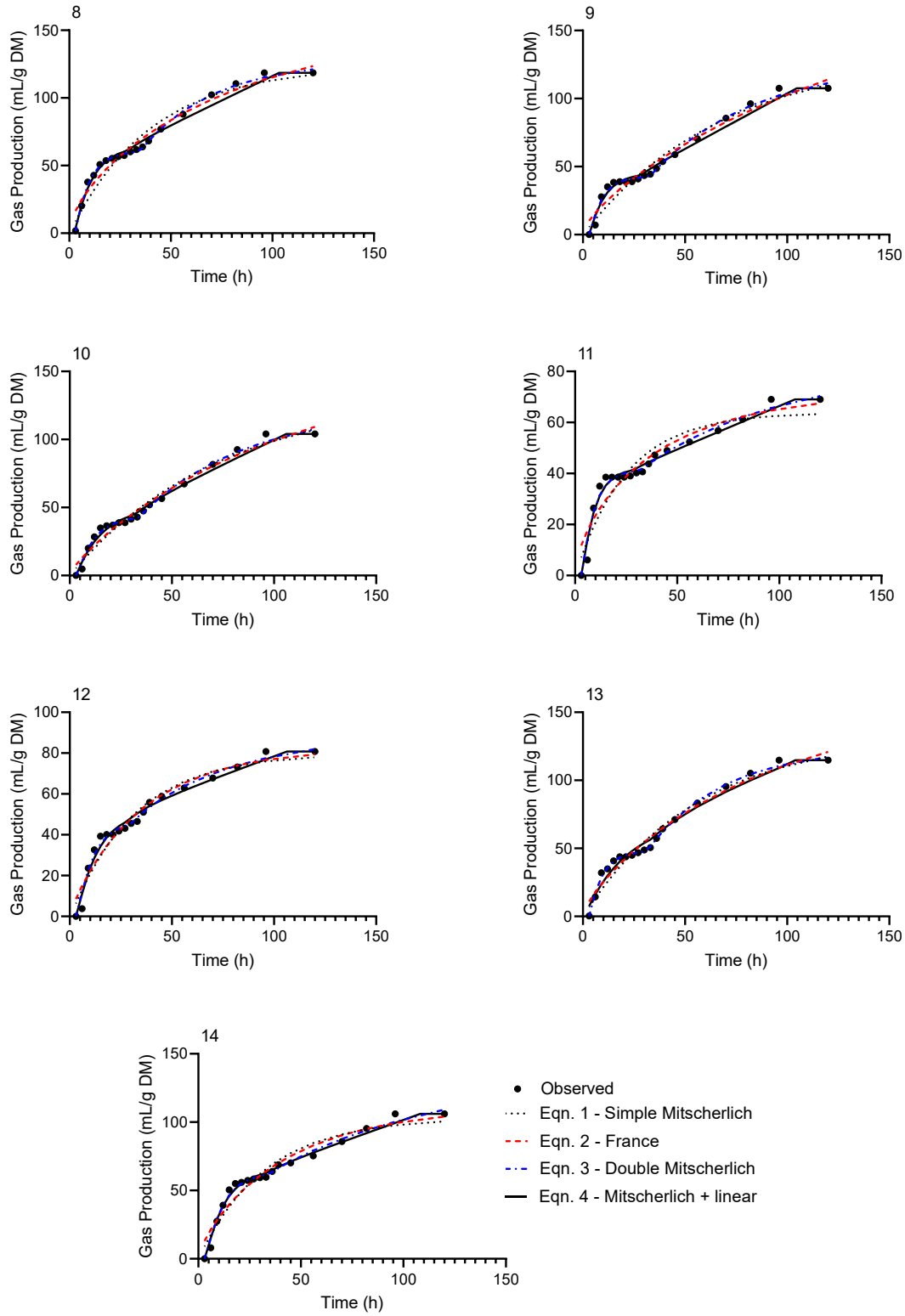
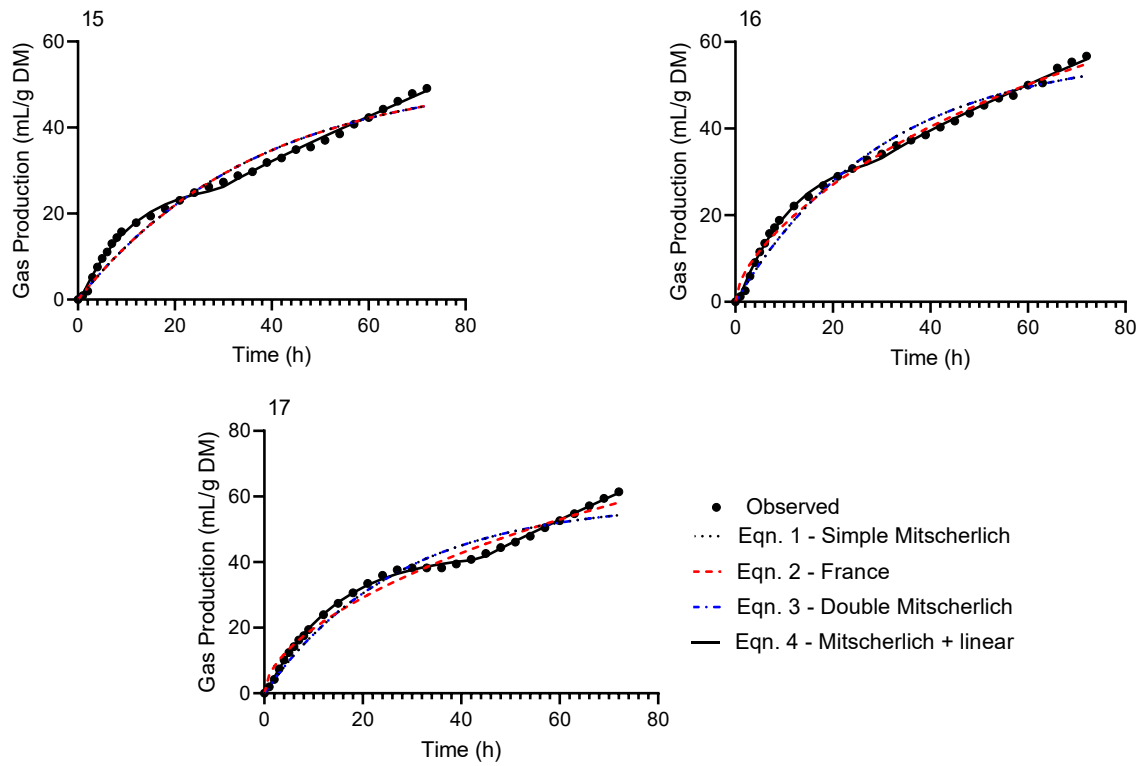
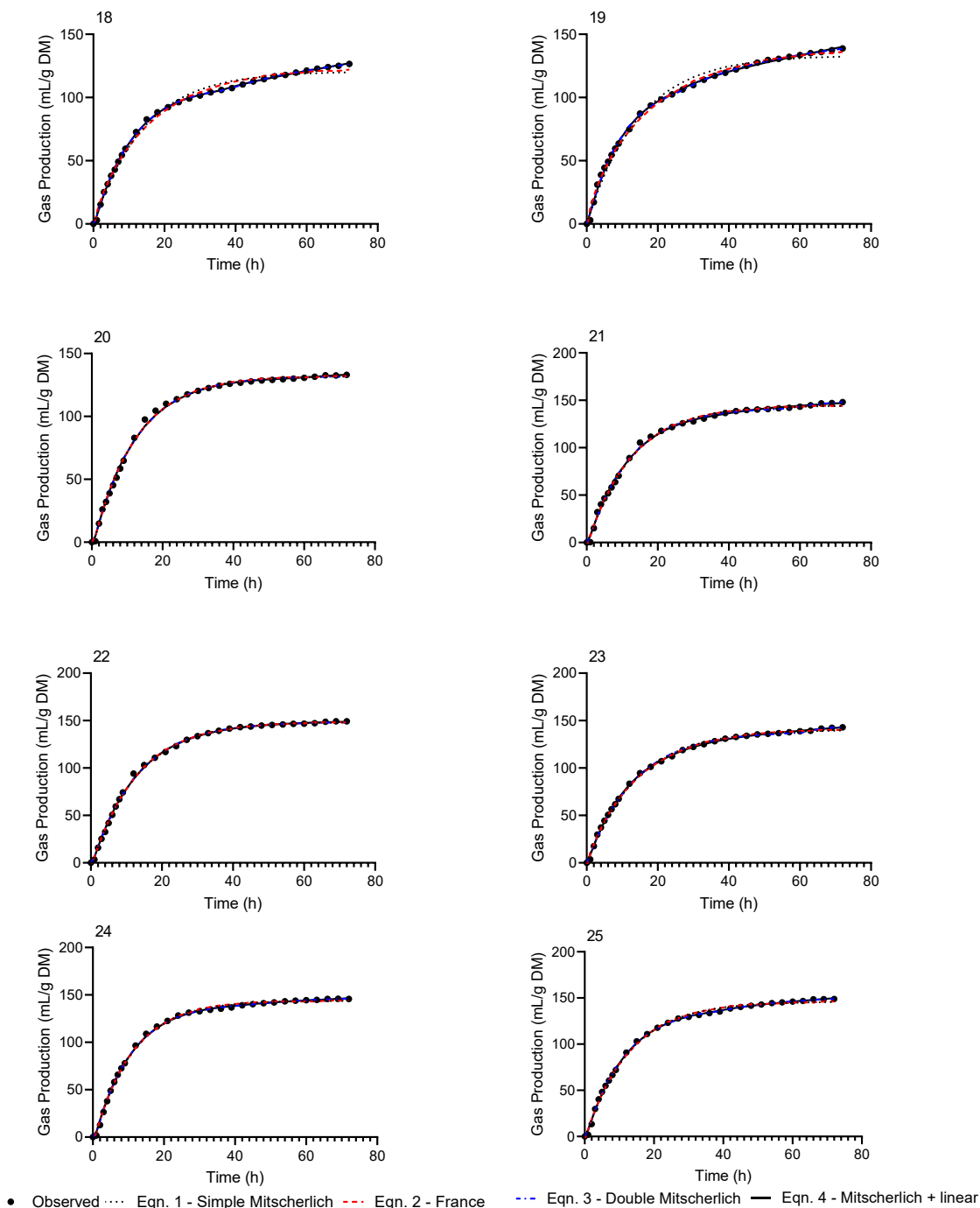


Figure S3. Observed (●) and predicted gas production profiles resulting from fitting Equations (1) – (4) to Dataset 15 – 17, datasets exhibiting atypical dual-phase gas production curves, from Experiment 2.



Double Mitscherlich, Equation (3), whereby best fit was achieved with $A_2 = 0$, therefore reverting to a simple Mitscherlich, viz. Equation (1) in Dataset 15–17.

Figure S4. Observed (●) and predicted gas production profiles resulting from fitting Equations (1) – (4) to Dataset 18 – 25, datasets exhibiting typical single-phase gas production curves, from Experiment 2



Double Mitscherlich, Equation (3), whereby best fit was achieved with $A_2 = 0$, therefore reverting to a simple Mitscherlich, viz. Equation (1) in Dataset 20 and 22.

France, Equation (2), whereby best fit was achieved when $d = 0$, therefore reverting to a simple Mitscherlich, viz. Equation (1) in Dataset 20–22 and 24.