APPENDIX A

ANOVA data of the preliminary characterization testing

APPENDIX A.1

Blood absorption rate testing

Table 8. One-way ANOVA of blood absorption rate

One-way ANOVA: Blood absorption rate versus Ratio

Source	DF	SS	MS	F	P
Ratio	7	1155.936	165.134	1573.53	0.000
Error	72	7.556	0.105		
Total	79	1163.492			

S = 0.3240 R-Sq = 99.35% R-Sq (adj) = 99.29%

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev
1	10	2.520	0.444	-+---------+---------+---------+-------- *)
2	10	0.020	0.000	(*)
3	10	3.380	0.689	(*
4	10	0.020	0.000	(*)
5	10	0.020	0.000	(*)
6	10	2.560	0.409	*)
7	10	0.020	0.000	(*)
Gauze	10	12.000	0.000	*)
				-+---------+---------+---------+-------- 0.0 3.5 7.0 10.5

Pooled StDev = 0.324

APPENDIX A.2

The maximum volume of blood absorption testing

Table 9. One-way ANOVA of the maximum volume of blood absorption

One-way ANOVA: Maximum volume of blood absorption versus Ratio

Source	DF	SS	MS	F	P
Ratio	7	13.78150	1.96879	1201.29	0.000
Error	72	0.11800	0.00164		
Total	79	13.89950			

S = 0.04048 R-Sq = 99.15% R-Sq (adj) = 99.07%

Individual 95% CIs For Mean Based on Pooled StDev

Level	N	Mean	StDev	-+---------+---------+---------+--------
1	10	1.2100	0.0738	(*
2	10	0.0000	0.0000	(*)
3	10	0.3300	0.0483	*)
4	10	0.0000	0.0000	(*)
5	10	0.0000	0.0000	(*)
6	10	0.7400	0.0516	(*)
7	10	0.0000	0.0000	(*)
Gauze	10	0.3400	0.0516	(*

-+---------+---------+---------+--------
0.0 0 0.35 0.70 1.05

Pooled StDev = 0.0405

APPENDIX A.3

The equilibrium swelling ratio testing

Table 10. One-way ANOVA of the equilibrium swelling ratio

One-way ANOVA: Equilibrium swelling ratio versus Ratio

Source	DF	SS	MS	F	P
Ratio	6	338629662	56438277	2410.96	0.000
Error	63	1474771	23409		
Total	69	340104432			

S = 153.0 R-Sq = 99.57% R-Sq (adj) = 99.53%

Individual 95% CIs For Mean Based on Pooled StDev

Level	N	Mean	StDev	---------+---------+---------+--------+--
1	10	7717.5	194.9	(*
2	10	621.0	33.9	*)
3	10	2097.2	77.2	*)
4	10	2270.6	88.3	*)
5	10	1065.2	28.6	*)
6	10	2974.0	315.9	(*
7	10	1647.9	101.7	*)

---------+---------+---------+--------+--
2000 4000 6000 8000

Pooled StDev = 153.0

APPENDIX A.4

Biodegradation testing

Table 11. One-way ANOVA of the biodegradation in 7 days

One-way ANOVA: Biodegradation versus Ratio

Source	DF	SS	MS	F	P
Ratio	6	35010.36	5835.06	5832.45	0.000
Error	63	63.03	1.00		
Total	69	35073.39			

S = 1.000 R-Sq = 99.82% R-Sq (adj) = 99.80%

Individual 95% CIs For Mean Based on Pooled StDev

Level	N	Mean	StDev	----+---------+---------+---------+-----
1	10	86.48	1.09	*)
2	10	100.00	0.00	*
3	10	68.75	1.17	*)
4	10	59.24	1.04	(*
5	10	100.00	0.00	*
6	10	63.68	1.17	*
7	10	33.41	1.41	(*

----+---------+---------+---------+-----
40 60 80 100

Pooled StDev = 1.00

APPENDIX B

The results of the preliminary characterization testing

APPENDIX B.1

Blood absorption rate testing

Table 12. Raw data of blood absorption rate of each ratio in 10 times

Rep.	CS:Gel:RS ratio															
	1:0:0		0:1:0		0:0:1		1/2:1/2:0		0:1/2:1/2		1/2:0:1/2		1/3:1/3:1/3		Gauze	
	sec	ml/m	sec	ml/m	sec	ml/m	sec	ml/m	sec	ml/m	sec	ml/m	sec	ml/m	sec	ml/m
1	5	2.4	0	0	4	3.0	0	0	0	0	5	2.4	0	0	1	12.0
2	6	2.0	0	0	3	4.0	0	0	0	0	6	2.0	0	0	1	12.0
3	6	2.0	0	0	4	3.0	0	0	0	0	4	3.0	0	0	1	12.0
4	4	3.0	0	0	3	4.0	0	0	0	0	5	2.4	0	0	1	12.0
5	4	3.0	0	0	3	4.0	0	0	0	0	5	2.4	0	0	1	12.0
6	4	3.0	0	0	3	4.0	0	0	0	0	4	3.0	0	0	1	12.0
7	5	2.4	0	0	3	4.0	0	0	0	0	4	3.0	0	0	1	12.0
8	5	2.4	0	0	4	3.0	0	0	0	0	5	2.4	0	0	1	12.0
9	6	2.0	0	0	5	2.4	0	0	0	0	4	3.0	0	0	1	12.0
10	4	3.0	0	0	5	2.4	0	0	0	0	6	2.0	0	0	1	12.0
Avg.	**4.9**	**2.52**	0	0	**3.7**	**3.38**	0	0	0	0	**4.8**	**2.56**	0	0	**1.00**	**12.0**
SD	**0.8**	**0.44**	0	0	**0.82**	**0.69**	0	0	0	0	**0.79**	**0.41**	0	0	**0.00**	**12.0**

APPENDIX B.2

The maximum volume of blood absorption testing

Table 13. Raw data of the maximum volume of blood absorption (ml) of each ratio in 10 times

Rep.	CS:Gel:RS ratio							
	1:0:0	**0:1:0**	**0:0:1**	**1/2:0:1/2**	**1/2:0:1/2**	**1/2:0:1/2**	**1/3:1/3:1/3**	**Gauze**
1	1.2	0	0.3	0	0	0.7	0	0.3
2	1.1	0	0.4	0	0	0.8	0	0.3
3	1.3	0	0.3	0	0	0.8	0	0.4
4	1.2	0	0.3	0	0	0.7	0	0.3
5	1.3	0	0.4	0	0	0.7	0	0.3
6	1.2	0	0.3	0	0	0.8	0	0.4
7	1.3	0	0.3	0	0	0.7	0	0.4
8	1.2	0	0.3	0	0	0.7	0	0.3
9	1.1	0	0.4	0	0	0.8	0	0.4
10	1.2	0	0.3	0	0	0.7	0	0.3
Avg	**1.21**	0	**0.33**	0	0	**0.74**	0	**0.34**
SD	**0.07**	0	**0.05**	0	0	**0.05**	0	**0.05**

APPENDIX B.3

The percentage of equilibrium swelling ratio testing

Table 14. Raw data of the percentage of equilibrium swelling ratio of each ratio in 10 times

Rep.	CS:Gel:RS ratio						
	1:0:0	**0:1:0**	**0:0:1**	**1/2:0:1/2**	**1/2:0:1/2**	**1/2:0:1/2**	**1/3:1/3:1/3**
1	7,752.42	651.30	2,190.67	2,086.81	1,059.92	3,074.90	1,613.91
2	7,930.77	650.90	2,178.49	2,262.55	1,022.56	3,268.28	1,615.17
3	7,551.47	605.93	2,098.15	2,268.89	1,106.80	2,985.71	1,720.80
4	7,694.07	576.72	1,969.96	2,223.25	1,094.35	2,574.39	1,748.80
5	7,950.96	609.65	2,059.34	2,256.83	1,050.79	3,281.99	1,534.33
6	7,738.15	632.14	2,042.81	2,384.77	1,021.40	3,304.07	1,697.86
7	7,288.73	580.00	1,999.64	2,287.22	1,068.38	2,488.01	1,500.97
8	7,799.73	584.28	2,153.23	2,223.86	1,065.89	3,076.30	1,822.59
9	7,631.62	666.51	2,166.41	2,399.24	1,093.39	2,562.86	1,664.77
10	7,837.12	652.17	2,113.79	2,312.69	1,068.05	3,123.13	1,560.39
Avg	**7,717.46**	**620.96**	**2,097.25**	**2,270.61**	**1,065.15**	**2,973.97**	**1,647.90**
SD	**194.92**	**33.87**	**77.21**	**88.25**	**28.61**	**315.94**	**101.68**

APPENDIX B.4

The percentage of biodegradation testing

Table 15. Raw data of the percentage of biodegradation in 1 day of each ratio in 10 times

Rep.	CS:Gel:RS ratio						
	1:0:0	**0:1:0**	**0:0:1**	**1/2:0:1/2**	**1/2:0:1/2**	**1/2:0:1/2**	**1/3:1/3:1/3**
1	21.01	100.00	40.91	4.01	100.00	12.00	12.01
2	20.86	100.00	42.50	3.76	100.00	11.55	14.09
3	22.34	100.00	42.74	4.43	100.00	12.95	13.25
4	22.46	100.00	41.46	5.26	100.00	12.57	12.21
5	22.42	100.00	40.74	5.47	100.00	12.98	11.93
6	22.38	100.00	40.90	5.93	100.00	11.91	12.05
7	20.49	100.00	42.37	3.62	100.00	14.29	13.71
8	20.35	100.00	42.22	4.09	100.00	13.96	10.26
9	20.58	100.00	43.45	5.43	100.00	11.83	11.38
10	20.64	100.00	44.07	5.45	100.00	11.39	12.30
Avg	**21.35**	**100.00**	**42.14**	**4.75**	100.00	**12.54**	**12.32**
SD	**0.92**	**0.00**	**1.13**	**0.85**	**0.00**	**1.00**	**1.12**

Table 16. Raw data of the percentage of biodegradation in 3 days of each ratio in 10 times

Rep.	CS:Gel:RS ratio						
	1:0:0	**0:1:0**	**0:0:1**	**1/2:0:1/2**	**1/2:0:1/2**	**1/2:0:1/2**	**1/3:1/3:1/3**
1	24.00	100.00	67.04	26.51	100.00	31.88	24.05
2	24.09	100.00	65.28	25.00	100.00	34.16	24.25
3	23.08	100.00	66.20	27.36	100.00	32.09y	25.35
4	25.89	100.00	65.08	27.44	100.00	32.41	23.08
5	25.98	100.00	65.08	26.19	100.00	31.80	24.25
6	24.92	100.00	64.15	27.19	100.00	31.01	23.37
7	24.07	100.00	66.67	26.94	100.00	31.25	23.65
8	25.76	100.00	66.12	27.96	100.00	32.38	24.26
9	24.70	100.00	66.57	24.88	100.00	32.41	24.91
10	23.22	100.00	67.78	24.77	100.00	33.33	24.83
Avg	**24.57**	**100.00**	**66.00**	**26.42**	**100.00**	**32.15**	**24.20**
SD	**1.06**	**0.00**	**1.09**	**1.17**	**0.00**	**0.93**	**0.71**

Table 17. Raw data of the percentage of biodegradation in 7 days of each ratio in 10 times

Rep.	CS:Gel:RS ratio						
	1:0:0	**0:1:0**	**0:0:1**	**1/2:0:1/2**	**1/2:0:1/2**	**1/2:0:1/2**	**1/3:1/3:1/3**
1	84.81	100.00	68.77	60.15	100.00	62.88	33.45
2	85.80	100.00	69.25	60.23	100.00	64.26	34.80
3	88.51	100.00	70.09	58.30	100.00	65.37	34.11
4	86.32	100.00	68.79	58.89	100.00	64.02	34.25
5	87.61	100.00	69.19	59.53	100.00	64.18	35.14
6	87.22	100.00	68.21	59.92	100.00	62.54	34.71
7	86.71	100.00	68.88	57.03	100.00	65.15	33.90
8	85.34	100.00	65.79	58.89	100.00	62.31	32.27
9	86.13	100.00	69.74	60.38	100.00	62.05	34.49
10	86.32	100.00	68.80	59.07	100.00	64.02	32.53
Avg	**86.48**	**100.00**	**68.75**	**59.24**	**100.00**	**63.68**	**33.96**
SD	**1.09**	**0.00**	**1.17**	**1.04**	**0.00**	**1.17**	**0.96**

APPENDIX C

The results of the investigation an effective plasma treatment condition

APPENDIX C.1

Blood absorption rate testing

Table 18. Raw data of blood absorption rate (ml/m) of the CS hemostatic agent with plasma treatment condition in 10 times

Rep.	Plasma jet treatment fixed Ar flow rate 4 L/m.												
	Power 10 W						Power 15 W						Non-treated
	O_2 gas 10 ml/m			O_2 gas 30 ml/m			O_2 gas 10 ml/m			O_2 gas 30 ml/m			
	30 s	60 s	90 s	30 s	60 s	90 s	30 s	60 s	90 s	30 s	60 s	90 s	
1	6.0	2.4	1.7	2.4	4.0	4.0	3.0	3.0	4.0	3.0	4.0	1.5	2.4
2	4.0	2.0	2.4	3.0	6.0	4.0	2.4	4.0	3.0	2.0	4.0	1.7	2.0
3	4.0	2.4	2.4	3.0	4.0	3.0	2.4	4.0	3.0	2.4	4.0	2.0	2.0
4	4.0	3.0	1.7	2.4	4.0	3.0	3.0	4.0	4.0	2.0	3.0	1.5	3.0
5	4.0	2.4	2.0	4.0	4.0	2.4	2.4	3.0	6.0	2.0	3.0	1.7	3.0
6	6.0	2.0	2.0	3.0	4.0	2.4	2.0	4.0	4.0	2.0	2.4	1.5	3.0
7	4.0	3.0	2.0	4.0	3.0	4.0	3.0	2.4	4.0	1.7	4.0	1.5	2.4
8	4.0	3.0	1.7	3.0	4.0	3.0	2.4	2.4	3.0	2.4	4.0	1.5	2.4
9	4.0	3.0	2.0	3.0	4.0	2.4	2.4	3.0	4.0	2.0	4.0	1.5	2.0
10	6.0	3.0	2.4	4.0	6.0	3.0	2.0	3.0	4.0	2.0	4.0	1.7	3.0
Avg	**4.60**	**2.62**	**2.03**	**3.18**	**4.30**	**3.12**	**2.5**	**3.28**	**3.9**	**2.15**	**3.64**	**1.61**	**2.52**
SD	**0.97**	**0.43**	**0.28**	**0.61**	**0.95**	**0.66**	**0.38**	**0.66**	**0.88**	**0.36**	**0.60**	**0.17**	**0.44**

APPENDIX C.2

The maximum volume of blood absorption testing

Table 19. Raw data of the maximum volume of blood absorption (ml) of the CS hemostatic agent with plasma treatment condition in 10 times

Rep.	Plasma jet treatment fixed Ar flow rate 4 L/m.												
	Power 10 W						Power 15 W						Non-treated
	O_2 gas 10 ml/m			O_2 gas 30 ml/m			O_2 gas 10 ml/m			O_2 gas 30 ml/m			
	30 s	60 s	90 s	30 s	60 s	90 s	30 s	60 s	90 s	30 s	60 s	90 s	
1	1.1	1.2	1.3	1.1	1.2	1.2	1.1	1.3	1.1	1.2	1.2	1.2	1.2
2	1.3	1.2	1.1	1.2	1.2	1.2	1.1	1.3	1.3	1.2	1.2	1.3	1.2
3	1.2	1.3	1.2	1.2	1.2	1.3	1.1	1.2	1.3	1.2	1.2	1.3	1.3
4	1.2	1.1	1.2	1.3	1.2	1.3	1.2	1.2	1.2	1.3	1.1	1.2	1.2
5	1.3	1.1	1.2	1.2	1.3	1.2	1.3	1.1	1.2	1.3	1.2	1.2	1.3
6	1.1	1.2	1.3	1.3	1.2	1.1	1.2	1.2	1.1	1.1	1.1	1.2	1.2
7	1.2	1.2	1.1	1.1	1.1	1.3	1.2	1.2	1.3	1.2	1.3	1.2	1.3
8	1.2	1.2	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.3	1.1	1.2
9	1.1	1.3	1.2	1.2	1.1	1.2	1.3	1.1	1.2	1.1	1.2	1.1	1.1
10	1.2	1.2	1.3	1.3	1.1	1.1	1.1	1.3	1.3	1.2	1.1	1.1	1.2
Avg	**1.19**	**1.20**	**1.21**	**1.20**	**1.18**	**1.21**	**1.18**	**1.21**	**1.22**	**1.19**	**1.19**	**1.19**	**1.21**
SD	**0.07**	**0.07**	**0.07**	**0.08**	**0.06**	**0.07**	**0.08**	**0.07**	**0.08**	**0.07**	**0.07**	**0.07**	**0.07**

APPENDIX C.3

The optimization of an effective plasma treatment condition

Table 20. Regression analysis of blood absorption rate with plasma treatment condition

Regression analysis: Blood absorption rate versus Input power, Oxygen flow rate, and treatment time

The regression equation is

Blood absorption rate (ml/m) = 0.176 Input power (W)
+ 0.0191 Oxygen flow rate (ml/m)
+ 0.00606 Treatment time (s)

Predictor	Coef	SE Coef	T	P
Noconstant				
Input power (W)	0.17592	0.02943	5.98	0.000
Oxygen flow rate (ml/m)	0.01908	0.01255	1.52	0.131
Treatment time (s)	0.006057	0.004960	1.22	0.224

S	=	1.45794
PRESS	=	278.091

Analysis of variance

Source	DF	SS	MS	F	P
Regression	3	1070.26	356.75	167.84	0.000
Residual Error	127	269.95	2.13		
Lack of Fit	10	225.15	22.52	58.81	0.000
Pure Error	117	44.80	0.38		
Total	130	1340.21			

Source	DF	Seq SS
Input power (W)	1	1060.69
Oxygen flow rate (ml/m)	1	6.40
Treatment time (s)	1	3.17

APPENDIX D

The result of the comparison properties of the CS hemostatic agent

APPENDIX D.1

The equilibrium swelling ratio testing

Table 21. Raw data of the equilibrium swelling ratio (%) of the CS hemostatic agent compare between with and without plasma treatment in 10 times

Replication	**Plasma treatment condition**	
	Without plasma treatment	**With plasma treatment**
1	7,752.42	9,018.11
2	7,930.77	8,589.82
3	7,551.47	8,780.08
4	7,694.07	8,932.31
5	7,950.96	9,043.92
6	7,738.15	8,524.05
7	7,288.73	9,492.19
8	7,799.25	8,649.60
9	7,631.62	7,962.50
10	7,837.12	8,583.39
Avg	**7,717.46**	**8,757.60**
SD	**194.92**	**405.16**

APPENDIX D.2

The porosity testing

Table 22. Raw data of the porosity (%) of the CS hemostatic agent compare between with and without plasma treatment in 10 times

Replication	**Plasma treatment condition**	
	Without plasma treatment	**With plasma treatment**
1	88.43	89.17
2	88.29	89.27
3	87.70	88.93
4	86.76	89.25
5	88.16	88.29
6	87.24	89.25
7	88.83	89.78
8	87.49	89.83
9	88.84	89.22
10	88.74	89.27
Avg	**88.05**	**89.23**
SD	**0.72**	**0.43**

APPENDIX D.3

The hemoglobin leak testing

Table 23. Raw data of the hemoglobin leak testing of the CS hemostatic agent compare between with and without plasma treatment in 6 times

Rep.	Negative Control	Plasma treatment condition											
		Without plasma treatment						With plasma treatment					
		Hemoglobin leak value (nm)											
		30s	60s	90s	120s	150s	180s	30s	60s	90s	120s	150s	180s
1	2.991	0.788	0.581	0.500	0.425	0.405	0.261	0.544	0.498	0.418	0.241	0.115	0.034
2	2.991	0.780	0.576	0.505	0.420	0.420	0.254	0.540	0.490	0.410	0.232	0.112	0.027
3	2.991	0.775	0.575	0.509	0.417	0.417	0.250	0.538	0.488	0.412	0.248	0.108	0.041
4	2.991	0.778	0.583	0.511	0.421	0.421	0.263	0.532	0.485	0.422	0.246	0.103	0.038
5	2.991	0.773	0.572	0.508	0.428	0.428	0.258	0.546	0.501	0.426	0.237	0.117	0.042
6	2.991	0.782	0.580	0.513	0.419	0.419	0.265	0.535	0.593	0.416	0.239	0.107	0.029
Avg.	**2.991**	**0.799**	**0.578**	**0.508**	**0.422**	**0.403**	**0.259**	**0.539**	**0.509**	**0.417**	**0.241**	**0.110**	**0.035**
SD	**2.991**	**0.005**	**0.005**	**0.005**	**0.004**	**0.004**	**0.006**	**0.005**	**0.042**	**0.006**	**0.006**	**0.005**	**0.006**

APPENDIX D.4

The biodegradation testing

Table 24. Raw data of the biodegradation (%) in 1, 3, and 7 days of the CS hemostatic agent compare between with and without plasma treatment in 10 times

Replication	Plasma treatment condition					
	Without plasma treatment			With plasma treatment		
	Biodegradation (%)					
	1 day	3 days	7 days	1 day	3 days	7 days
1	21.01	24.00	84.81	49.42	66.02	93.63
2	20.86	24.09	85.50	48.45	67.44	94.88
3	22.34	23.08	88.51	49.03	67.34	93.87
4	22.46	25.89	86.32	48.85	66.93	94.59
5	22.42	25.98	87.61	49.24	65.60	93.66
6	22.38	24.92	87.22	49.04	65.34	95.08
7	20.49	24.07	86.71	49.23	67.19	94.32
8	20.35	25.76	85.34	48.85	67.44	94.49
9	20.58	24.70	86.13	48.28	65.63	94.59
10	20.64	23.22	86.32	50.19	67.05	93.51
Avg	**21.35**	**24.57**	**86.48**	**49.06**	**66.60**	**94.26**
SD	**0.92**	**1.06**	**1.09**	**0.53**	**0.85**	**0.56**

APPENDIX D.5

The biodegradation testing

Table 25. Raw data of the percentage cell viability of the CS hemostatic agent compare between with and without plasma treatment in 10 times

Rep.	Plasma treatment condition								Control		
	With plasma treatment				Without plasma treatment						
	540 nm	630 nm	Exc. OD	% Cell via	540 nm	630 nm	Exc. OD	% Cell via	540 nm	630 nm	Exc. OD
1	0.764	0.109	0.655	106.07	0.881	0.127	0.754	122.11	0.936	0.129	0.807
2	0.955	0.146	0.809	131.01	0.745	0.103	0.642	103.97	0.823	0.108	0.715
3	1.061	0.165	0.896	145.10	0.618	0.081	0.537	86.96	0.868	0.116	0.752
4	0.778	0.104	0.674	109.15	0.796	0.113	0.683	110.61	0.810	0.106	0.704
5	0.716	0.109	0.607	98.30	0.625	0.081	0.544	88.10	0.710	0.127	0.583
6	0.836	0.125	0.711	115.14	0.571	0.069	0.502	81.30	0.474	0.084	0.390
7	0.882	0.165	0.717	116.11	0.920	0.131	0.789	127.77	0.647	0.110	0.537
8	0.848	0.122	0.726	117.57	0.671	0.087	0.584	94.57	0.532	0.087	0.445
9	0.658	0.106	0.552	89.39	0.821	0.115	0.706	114.33	0.734	0.129	0.605
10	0.617	0.103	0.514	83.24	0.754	0.108	0.646	104.62	0.771	0.134	0.637
Avg.	0.812	0.125	0.686	**111.11**	0.740	0.102	0.639	**103.43**	0.731	0.113	0.618
SD	0.135	0.025	0.114		0.117	0.021	0.096		0.145	0.018	0.134

CURRICULUM VITAE

Author's name	Mrs Jureeporn Jaifu
Date/Year of Birth	9 May 1989
Place of Birth	Lamphun Province, Thailand
Education	2011, Bachelor of Nursing, Boromarajonani college of Nursing, Chiang Mai Thailand 2007, High School, Chak Kham Khanathon, Lamphun, Thailand
Publication	Jureeporn Jaifu, Kittiya Thunsiri, Suruk Udomsom, Dheerawan Boonyawan, Wassanai Wattanautchariya, "Blood Absorption Improvement of a Naturally-derived Hemostatic Agent by Atmospheric Pressure Plasma Jet", Journal material today proceeding 2017 (In press), The First Materials Research Society of Thailand International Conference (MRS' 2017), 30 October–3 November 2017, The Empress Hotel, Chiang Mai, Thailand.
Experience	2017, registered nurse at labour room and nursery care unit department, Bangkok Rayong Hospital 2016, registered nurse at GI clinic department, Chiang Mai Ram Hospital 2015, registered nurse at labour room department, Lamphun Hospital