

CHAPTER IV

RESULTS

The results of this study are presented as follows:

1. The viability (% viable cells) and the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts at 3 days and 7 days in each experimental group
2. Comparison of the mean ranks of the viability of the cultured human gingival fibroblasts among experimental groups
3. Comparison of the mean ranks of the viability of the cultured human gingival fibroblasts between 3 days and 7 days
4. Comparison of the mean ranks of the viability of the cultured human gingival fibroblasts among experimental groups at 3 days and 7 days
5. The correlations between the viability of the cultured human gingival fibroblasts and the extent of magnetic field intensity
6. Comparison of the mean ranks of the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts among experimental groups
7. Comparison of the mean ranks of the growth (the rate of new DNA synthesis) of the cultured human gingival between 3 days and 7 days
8. Comparison of the mean ranks of the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts among experimental groups at 3 days and 7 days
9. The correlations between the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts and the extent of magnetic field intensity

1. The viability and the growth of the cultured human gingival fibroblasts at 3 days and 7 days in each experimental group

Table 4.1 Medians (Mdn) and quartile ranges (P_{25}, P_{75}) of viability and growth (the percentage of new DNA synthesis) of the cultured human gingival fibroblasts at day 3 and day 7 in each experimental group

Culture time	Group	Viability (%)			Growth (%)		
		Median	Percentile25	Percentile75	Median	Percentile25	Percentile75
3 days	1	100.00	97.05	100.00	21.00	19.48	20.00
	2	100.00	96.55	100.00	26.04	17.46	29.51
	3	100.00	92.85	100.00	23.19	16.17	31.58
	4	87.00	82.30	100.00	24.28	19.64	31.31
	5	95.80	93.80	100.00	28.32	17.86	30.61
7 days	1	97.25	96.38	99.48	10.57	5.95	16.14
	2	96.85	91.80	98.30	5.56	5.34	19.33
	3	94.10	90.83	97.00	10.28	5.15	15.85
	4	97.80	79.95	99.75	11.15	6.87	15.92
	5	97.75	93.40	99.70	8.10	4.89	15.75

The raw data of the viability and growth of the cultured human gingival fibroblasts under five conditions of static magnetic field at days 3 and 7 of this experiment are presented in Appendix. The magnetic field conditions were classified as follows:

Group 1: Without magnetic field (the control group)

Group 2: High magnetic field of single magnet (the position 1)

Group 3: Low magnetic field of single magnet (the position 2)

Group 4: High magnetic field of attractive magnets (the position 1)

Group 5: Low magnetic field of attractive magnets (the position 2)

The viability was determined by the percentage of viable cells and total cells (sum of viable cells and non-viable cells), and the growth was determined by the

percentage of S phase cells (cells with newly synthesized DNA) and total cells in cell cycle. Medians and quartiles of viability and growth of the cultured human gingival fibroblasts in each experimental group were presented in Table 4.1.

From Table 4.1, the data of viability showed that the viability at 3 days of the cultured human gingival fibroblasts in group 2 and 3 (under single magnetic field) were equal to the group 1 (control experimental group without magnetic field), while the viability of group 4 and 5 (under attractive magnetic field) were noticeably less than the control group. At 7 days, the cell viability of each group showed no apparent difference.

The data of cell growth showed no obvious difference among five groups at 3 days. However, at day 7, the cell growth of group 2 (the cultured human gingival fibroblasts under high single magnetic field) was less than the group 1 (control group), and the group 3 (under low single magnetic field) was quite equal to the group 1. The cell growth of group 4 (under high attractive magnetic field) was the greatest and slightly greater than control group, while the group 5 (under low attractive magnetic field) was less than the control group.

2. Comparison of the mean ranks of viability of the cultured human gingival fibroblasts among experimental groups

Table 4.2 Comparison of mean ranks of the cultured human gingival fibroblast cell viability among experimental groups

Group	Number of repeated experiments (N)	Median (P25, P75)	Mean rank	P value*
1	9	100.00 (96.45, 100.00)	27.83	0.58
2	9	98.40 (94.40, 100.00)	24.67	
3	9	97.70 (91.65, 100.00)	22.11	
4	9	96.60 (82.30, 100.00)	18.17	
5	9	96.70 (93.80, 100.00)	22.22	
Total	45			

* Kruskal-Wallis test

The Kruskal–Wallis test was used to determine the statistical difference of the cultured human gingival fibroblast cell viability among five experimental groups at $P < 0.05$. There were no statistically significant differences of the mean ranks of cell viability among five experimental groups ($P=0.58$).

3. Comparison of the mean ranks of viability of the cultured human gingival fibroblasts between 3 days and 7 days

The Mann-Whitney U test was used to determine the statistical difference of the viability of the cultured human gingival fibroblasts between 3 days and 7 days at $P < 0.05$.

Table 4.3 Comparison of the mean ranks of viability of the cultured human gingival fibroblasts between 3 days and 7 days

Culture time	Number of repeated experiments (N)	Median (P25, P75)	Mean rank	P value*
3 days	25	100.00 (93.80, 100.00)	26.04	
7 days	20	96.65 (93.70, 98.70)	19.20	0.07
Total	45			

* Mann-Whitney U test

From Table 4.3, there was no statistically significant difference of the mean ranks of cell viability between 3 days and 7 days ($P=0.07$).

4. Comparison of the mean ranks of viability of the cultured human gingival fibroblasts among experimental groups at 3 days and 7 days

The Kruskal–Wallis test was used to determine the statistical difference of the viability of the cultured human gingival fibroblasts among five experimental groups at $P < 0.05$.

Table 4.4 Comparison of the mean ranks of viability of the cultured human gingival fibroblasts among experimental groups at 3 days and 7 days

Culture time	Group	Number of repeated experiments (N)	Median (P25, P75)	Mean rank	P value*
3 days	1	5	100.00 (97.05, 100.00)	15.60	0.33
	2	5	100.00 (96.55, 100.00)	15.00	
	3	5	100.00 (92.85, 100.00)	14.60	
	4	5	87.00 (82.30, 100.00)	8.40	
	5	5	95.80 (93.80, 100.00)	11.40	
7 days	1	4	97.25 (96.38, 99.48)	12.38	0.53
	2	4	96.85 (91.80, 98.30)	9.75	
	3	4	94.10 (90.83, 97.00)	6.25	
	4	4	97.80 (79.95, 99.75)	11.63	
	5	4	97.75 (93.40, 99.70)	12.50	

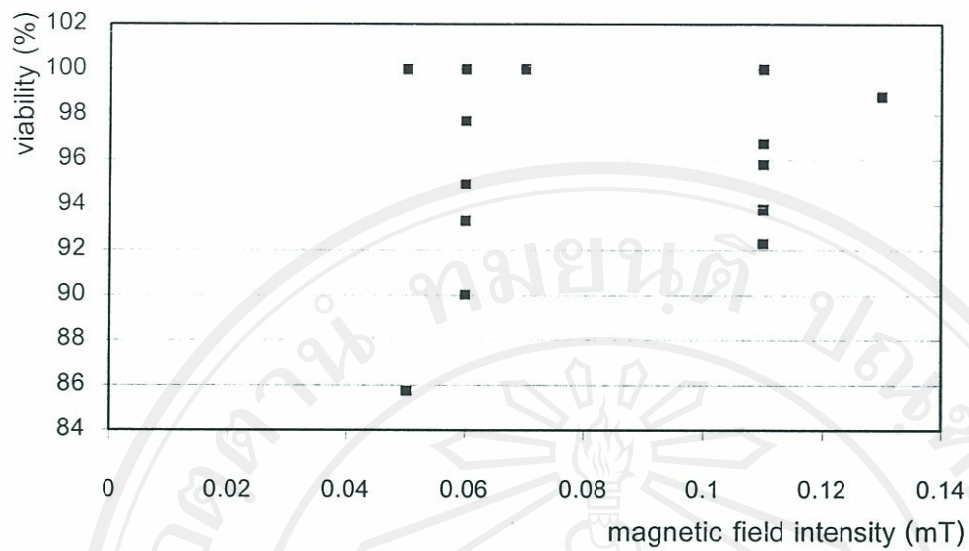
* Kruskal-Wallis test

From Table 4.4, it was shown that the mean ranks of cell viability among five experimental groups were not statistically significant different at both 3 days ($P=0.33$) and 7 days ($P=0.53$).

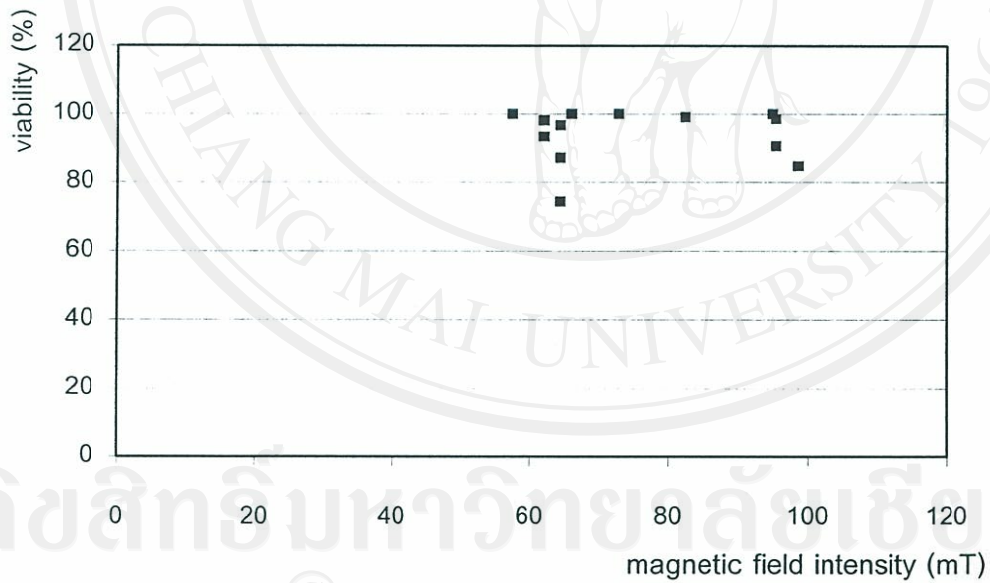
5. The correlations between the viability of the cultured human gingival fibroblasts and the extent of magnetic field intensity

Total samples of the cultured human gingival fibroblasts of each group at both 3 days and 7 days were assembled for further statistical analysis.

The Spearman's rho correlation was analyzed and used to confirm whether there were any relationships between the viability of the cultured human gingival fibroblasts and the extent of magnetic field intensity. Moreover, the scatter diagrams were plotted to show their correlations. X-axis is magnetic field intensity in millitesla unit and the Y-axis is viability in percentage of viable cells. The correlations were separately analyzed for low and high levels of magnetic field intensity.



A) at low level of magnetic field



B) at high level of magnetic field

Figure 4.1 Scatter diagrams between the viability of the cultured human gingival fibroblasts and the extent of magnetic field intensity, A) at low level of magnetic field, B) at high level of magnetic field

Table 4.5 The correlations between the viability of the cultured human gingival fibroblasts and the extent of magnetic field intensity

magnetic field intensity	repeated experiment (N)	correlation coefficient (r)	P value*
Low	18	0.15	0.54
High	18	-0.21	0.41

* Spearman 's rho correlation's test

Table 4.5 and Figure 4.1 showed that there were no statistically significant correlations between the viability of the cultured human gingival fibroblasts and the extent of magnetic field intensity at both low level ($r=0.15$, $P=0.54$) and high level ($r=-0.21$, $P=0.41$) of magnetic field intensity.

6. Comparison of the mean ranks of the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts among experimental groups

The Kruskal–Wallis test was used to determine the statistical difference of the cell growth of the cultured human gingival fibroblasts among five experimental groups at $P < 0.05$.

Table 4.6 Comparison of the mean ranks of growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts among five experimental groups

Group	Number of repeated experiments (N)	Median (P25, P75)	Mean rank	P value*
1	9	19.32 (10.57, 24.66)	21.89	0.98
2	8	19.08 (8.19, 26.32)	21.25	
3	8	15.94 (8.87, 25.11)	18.75	
4	8	18.09 (10.26, 26.05)	21.00	
5	8	17.86 (10.01, 28.95)	22.00	
Total	41			

* Kruskal-Wallis test

From Table 4.6, there were no statistically significant differences in cell growth among five experimental groups ($P=0.98$).

7. Comparison of the mean ranks of the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts between 3 days and 7 days

The Mann-Whitney U test was used to determine the statistical difference of the cell growth of the cultured human gingival fibroblasts between 3 days and 7 days at $P < 0.05$.

Table 4.7 Comparison of the mean ranks of growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts between 3 days and 7 days

Culture time	Number of repeated experiments (N)	Median (P25, P75)	Mean rank	P value*
3 days	23	26.04 (19.32, 29.16)	29.30	
7 days	18	8.93 (5.51, 16.01)	10.39	< 0.001
Total	41			

* Mann-Whitney U test

Table 4.7 showed a high significant difference between the cell growth of the cultured human gingival fibroblasts at 3 days and 7 days ($P<0.001$). The mean rank of the growth of the cultured human gingival fibroblasts at 3 days (29.30) was higher than that at 7 days (10.39).

8. Comparison of the mean ranks of the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts among experimental groups at 3 days and 7 days

The Kruskal-Wallis test was used to determine the statistical difference of the growth of the cultured human gingival fibroblasts among five experimental groups at $P < 0.05$.

Table 4.8 Comparison of the mean ranks of growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts among experimental groups at 3 days and 7 days

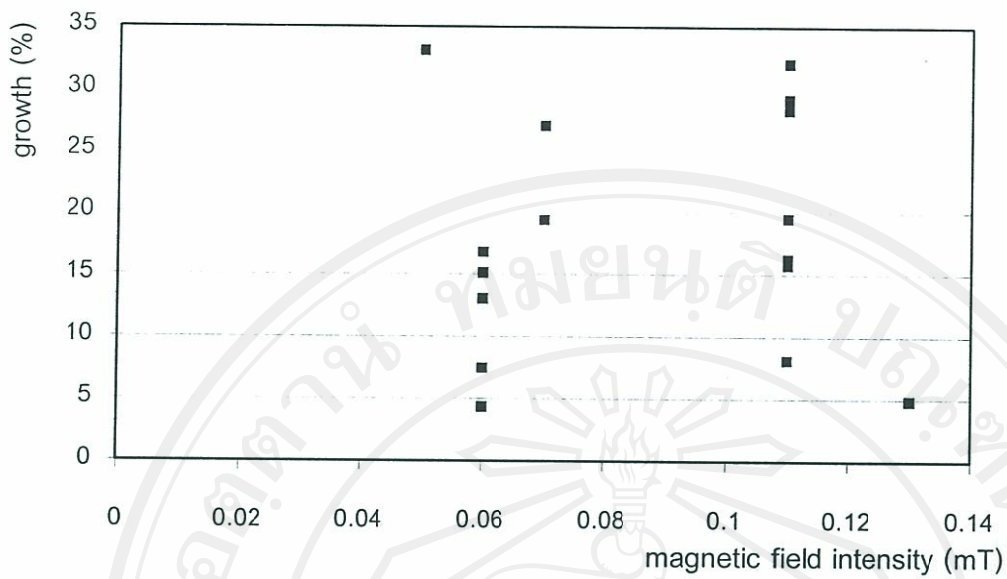
Culture time	Group	Number of repeated experiments (N)	Median (P25, P75)	Mean rank	P value*
3 days	1	5	21.00 (19.48, 33.17)	13.00	0.96
	2	5	26.04 (17.46, 29.51)	10.40	
	3	4	23.19 (16.17, 31.58)	11.00	
	4	4	24.28 (19.64, 31.31)	12.50	
	5	5	28.32 (17.86, 30.61)	13.00	
7 days	1	4	10.57 (5.95, 16.14)	10.00	0.96
	2	3	5.56 (5.34, 19.33)	9.00	
	3	4	10.28 (5.15, 15.85)	9.00	
	4	4	11.15 (6.87, 15.91)	11.00	
	5	3	8.10 (4.89, 15.75)	8.00	

* Kruskal-Wallis test

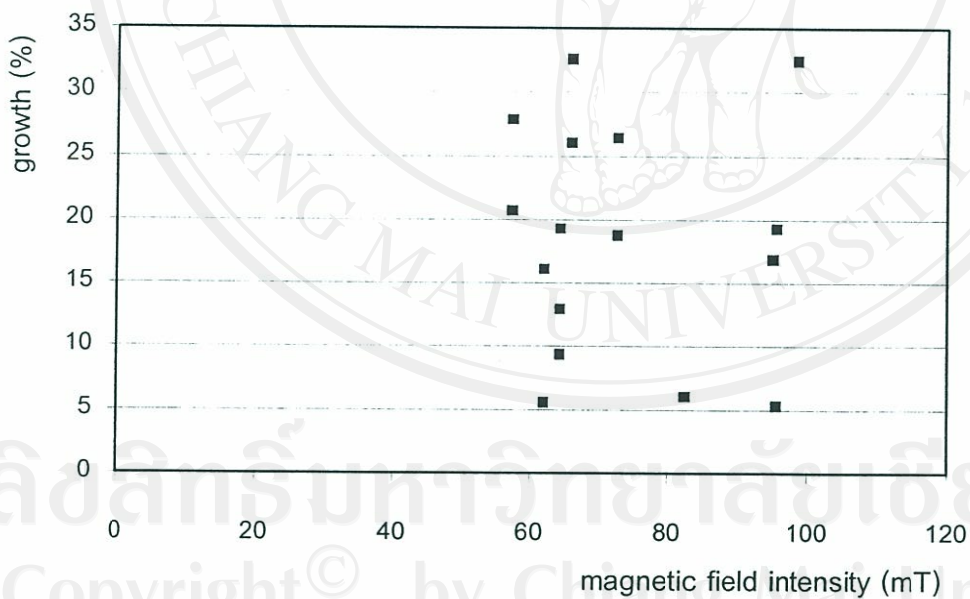
From Table 4.8, there were no statistically differences of the growth of the cultured human gingival fibroblasts among five experimental groups at both 3 days ($P=0.96$) and 7 days ($P=0.96$).

9. The correlations between the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts and the extent of magnetic field intensity

Further statistical analysis, the Spearman's rho correlation and the scatter diagrams were performed to determine the correlations between the growth of the cultured human gingival fibroblasts and the extent of magnetic field. In the scatter diagram, X-axis is referred to magnetic field intensity in millitesla unit, while Y-axis is referred to the rate of new DNA synthesis of the cultured human gingival fibroblasts in percentage, which determine the growth of cells.



A) at low level of magnetic field



B) at high level of magnetic field

Figure 4.2 Scatter diagrams between the growth of the cultured human gingival fibroblasts and the extent of magnetic field intensity, A) at low level of magnetic field B) at high level of magnetic field

Table 4.9 The correlations between the growth (the rate of new DNA synthesis) of the cultured human gingival fibroblasts in each group and the extent of magnetic field intensity

magnetic field intensity	repeated experiments (N)	correlation coefficient (r)	P value*
Low	16	0.05	0.85
High	16	0.01	0.98

* Spearman's rho correlation's test

Table 4.9 and Figure 4.2 showed that there were no statistically significant correlations between the growth of the cultured human gingival fibroblasts and the extent of magnetic field intensity at both low level ($r=0.05$, $P=0.85$) and high level ($r=0.01$, $P=0.98$) of magnetic field intensity.