The Influence of Poly Lactic-co-Glycolic Acid (PLGA) Scaffold with Concentrated Growth Factor (CGF) on Human Osteoblast Cells: A Pilot Study

[1]Mohd Noh NZ, [1]Mohamed NAH, [1]Noor E
[1]Faculty of Dentistry, Universiti Teknologi MARA, Sungai Buloh Campus, Malaysia

Background

PLGA is a synthetic polymer that is well known for its use in drug delivery while CGF is the third generation of platelet concentrate product that are rich in growth factors.

Objective

To investigate the effect of PLGA scaffold with CGF on the biological behavior of human osteoblast cells (HOBs) as a model for bone regeneration.

Materials and Methods

Preparation of PLGA microspheres with double solvent evaporation method

10ml blood was collected from marginal ear vein of the rabbit and centrifuged to obtain the CGF (Table Top Centrifuge Kubota 2420)

Figure 1: Marginal ear vein of rabbit

CGF was centrifuged together with PLGA microspheres at 1000 rpm for two minutes (Table Top Micro-refrigerated centrifuge model 3500)

HOBs (HFOB1.19, AddexBio T0004005) were cultured and incubated with

i) CGF alone

ii) PLGA microspheres alone

iii) CGF + PLGA microspheres

for 24, 48 and 72 hours

Cells proliferation was assessed by MTS assay

Figure 2: CGF formed after centrifugation

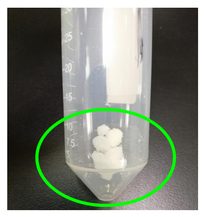

Figure 3: PLGA microspheres particles

Discussion

PLGA: excellent scaffold for drug delivery and tissue engineering procedures

SEM observation : PLGA microspheres were presented with **pores** that can act as a **scaffold and passage** for growth factors

CGF: autologous source of growth factors

Conclusion

The use of PLGA scaffold with CGF has the potential to induce better human osteoblast cells proliferation and regenerative activity to facilitate better bone regeneration.

Results

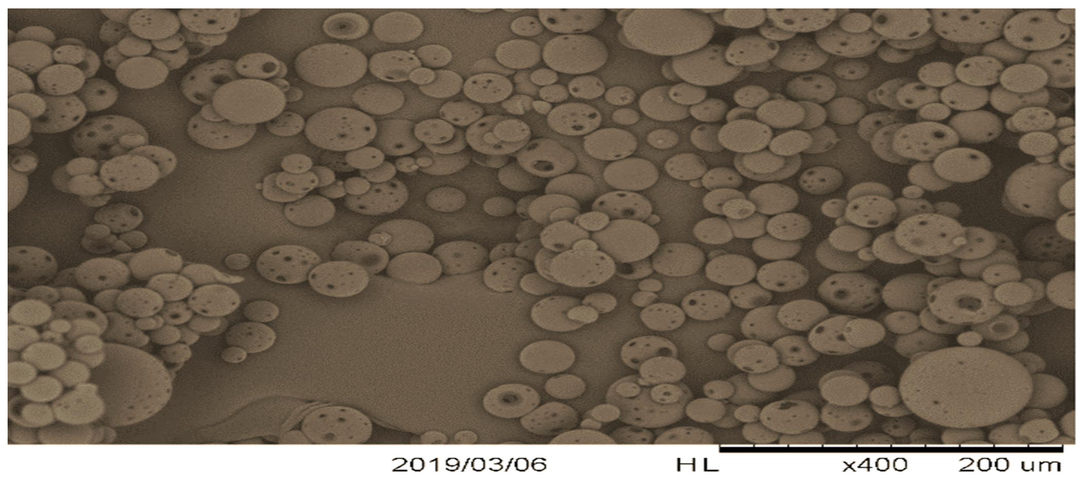

Figure 4: SEM observation of PLGA microspheres (x 400 magnification)

Table 1: Mean difference of HOBs proliferation among treatment groups

Comparison	Mean difference (95% CI)	p-value
Control - CGF	0.01 (-0.12, 0.15)	0.99
Control - CGF + PLGA	-0.24 (-0.37, -0.10)	0.00
Control - PLGA	-0.20 (-0.34, -0.07)	0.01
CGF - CGF + PLGA	-0.25 (-0.39, -0.11)	0.00
CGF - PLGA	-0.22 (-0.35, -0.08)	0.00
CGF + PLGA - PLGA	0.03 (-0.10, 0.17)	0.85

F-stat (df) =22.79 (3), p-value= <0.05
Repeated measures ANOVA between group analysis was applied followed by post hoc multiple comparisons
Level of significance was set at 0.05 (two-tailed)

Table 2: Comparison of mean HOBs proliferation among treatment groups based on time

Time	Treatment	Mean	95% CI
24 hours	Control	0.17	0.16, 0.17
	CGF	0.13	0.12, 0.14
	CGF + PLGA	0.24	0.24, 0.25
	PLGA	0.20	0.19, 0.21
48 hours	Control	0.13	-0.05, 0.31
	CGF	0.14	-0.04, 0.32
	CGF + PLGA	0.61	0.43,0.79
	PLGA	0.58	0.40, 0.76
72 hours	Control	0.21	0.14, 0.28
	CGF	0.19	0.12, 0.26
	CGF + PLGA	0.36	0.29, 0.43
	PLGA	0.33	0.26, 0.40

Repeated measure ANOVA between group analysis with regard to time was applied
Assumptions of normality, homogeneity of variances and compound symmetry were checked and fulfilled
(F= 29.00, p-value < 0.001)

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