

**FAKULTAS KEDOKTERAN  
UNIVERSITAS PEMBANGUNAN NASIONAL “VETERAN” JAKARTA**

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**ANALISIS GEN BAX PADA PROLIFERASI ADIPOSE MESENCHYMAL STEM CELL  
DENGAN SCAFFOLD NANOFIBER PHA/SILK DENGAN BERBAGAI KOMBINASI**

(xii + 69 halaman, 12 tabel, 4 bagan, 8 lampiran)

**ABSTRAK**

**Pendahuluan**

Penyakit degeneratif, salah satunya kerusakan tulang rawan akibat usia, pola hidup tidak sehat, genetik, obesitas, dan merokok masih umum terjadi dan dapat menyebabkan tulang rawan menipis. Penelitian ini bertujuan untuk mengevaluasi kapabilitas adipose mesenchymal stem cells (ADSCs) saat ditambahkan dengan *scaffold nanofiber* PHA/Silk terhadap regenerasi jaringan yang kemudian akan digunakan untuk terapi regeneratif dengan risiko yang lebih minimal dibandingkan terapi operatif.

**Metode**

ADSCs berasal dari sel adiposa jaringan lemak manusia yang diambil dengan menggunakan prosedur *liposuction*. Sel adiposa kemudian diproses menjadi ADSCs. Kemudian ADSCs dikultur dan dilakukan pasasi. ADSCs dikombinasikan dengan *scaffold nanofiber* PHA (*Polyhydroxyalkanoates*)/Silk dengan rasio 4:0, 3:1, 1:1, 1:3, dan 0:4. ADSCs dengan *scaffold* dilakukan isolasi RNA, sintesis cDNA, dan dilakukan *Real Time* PCR untuk mendeteksi apakah terdapat ekspresi gen Bax (gen pro-apoptosis) pada setiap perlakuan.

**Hasil**

Hasil *fold change* kontrol tanpa *scaffold* yaitu 1, ADSCs + *scaffold* PHA/Silk 4:0 dan 1:1 yaitu 0,001, ADSCs + *scaffold* PHA/Silk 3:1 yaitu 0,002, ADSCs + *scaffold* PHA/Silk 1:3 yaitu 0,948, dan ADSCs + *scaffold* PHA/Silk 0:4 yaitu 0,851.

**Kesimpulan**

Hasil penelitian menunjukkan adanya penurunan ekspresi gen Bax pada seluruh perlakuan. Ekspresi gen Bax yang tinggi menandakan tingkat apoptosis yang tinggi. Apoptosis dapat menginisiasi terjadinya proliferasi sel (*Apoptosis-Induced Proliferation*) melalui aktivasi dari jalur JNK yang melibatkan MAPK (*Mitogen-Activated Kinases*). ADSCs + *scaffold* PHA/Silk 1:3 memiliki tingkat ekspresi gen Bax paling tinggi yang menandakan bahwa tingkat proliferasinya juga meningkat. ADSCs + *scaffold* PHA/Silk 4:0 dan 1:1 memiliki tingkat ekspresi gen Bax paling rendah yang menandakan bahwa tingkat proliferasinya juga rendah.

**Referensi** : 60 (2013 - 2023)

**Kata Kunci** : ADSCs, Bax, Apoptosis, *Scaffold* PHA/Silk

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**Undergraduate Thesis, January 2024**

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**BAX GENE ANALYSIS IN ADIPOSE MESENCHYMAL STEM CELL  
PROLIFERATION ON PHA/SILK NANOFIBER SCAFFOLD WITH VARIOUS  
COMBINATION**

(xii + 69 pages, 12 table, 4 chart, 8 appendices)

**ABSTRACT**

**Introduction :**

Degenerative diseases, one of which is cartilage damage due to age, unhealthy lifestyles, genetics, obesity and smoking, are still common and it can cause bone cartilage to weaken. This research was conducted to determine adipose mesenchymal stem cells (ADSCs)'s ability with the addition of PHA/Silk nanofiber scaffolds to regenerate tissue which will then be used for regenerative therapy with minimal risks compared to operative therapy.

**Method :**

ADSCs originate from human adipose tissue cells taken using a liposuction procedure. Adipose cells will then be processed into ADSCs. Then ADSCs were cultured and passaged. ADSCs were combined with PHA (Polyhydroxyalkanoates)/Silk nanofiber scaffolds with ratios of 4:0, 3:1, 1:1, 1:3, and 0:4. ADSCs with scaffolds were subjected to RNA isolation, cDNA synthesis, and Real Time PCR was carried out to detect whether there was expression of the Bax gene (pro-apoptotic gene) in each treatment.

**Result :**

The fold change result of the control without scaffold is 1, ADSCs + PHA/Silk scaffold 4:0 and 1:1 is 0.001, ADSCs + PHA/Silk 3:1 scaffold is 0.002, ADSCs + PHA/Silk 1:3 scaffold is 0.948, and ADSCs + PHA/Silk 0:4 scaffold is 0.851.

**Conclusion :**

The results showed a decrease in Bax gene expression in all treatments. High expression of the Bax gene indicates a high level of apoptosis. Apoptosis can initiate cell proliferation (Apoptosis-Induced Proliferation) through activation of the JNK pathway which involves MAPK (Mitogen-Activated Kinases). ADSCs + PHA/Silk 1:3 scaffold had the highest level of Bax gene expression, indicating that their proliferation rate was also increased. ADSCs + PHA/Silk 4:0 and 1:1 scaffolds had the lowest levels of Bax gene expression, indicating that their proliferation levels were low.

**Reference** : 60 (2013 - 2023)

**Key words** : ADSCs, Bax, Apoptosis, PHA/Silk Scaffold