# Osteoinduction Ability of Human Adipose-Derived Mesenchymal Stem Cell with Chitosan Scaffold Combination Towards Blood Serum Phosphorus Levels

*by* Tamara Yuanita

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Dian Agustin Wahjuningrum[1], Nindya R A Marhendra[2], M. Roelianto[1], Ari Subiyanto[1], Irmaleny[3], Fery Setiawan[4], Syania E Febriyanti[2], Setyabudi[1]*, Tamara Yuanita[1], Swadheena Patro[5], Anuj Bhardwaj[6,7]

1. Department of Conservative Dentistry, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia
2. Resident of Department Conservative Dentistry, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia
3. Department of Conservative Dentistry, Faculty of Dentistry, Universitas Padjajaran, Bandung, Indonesia
4. Doctoral Student, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia
5. Department of Conservative and Endodontics. Faculty of Dentistry. Kiit University. India
6. Adjunct Professor at Department of Conservative Dentistry, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia
7. Department of Conservative Dentistry and Endodontics, College of Dental Science and Hospital, Rau, Indore.

**Abstract**

Reconstruction of extensive bone tissue damage is a treatment with complication. Moving the autologous tissue can cause problems in the repair of extensive tissue damage, so the principle of tissue engineering is used as an alternative to reconstruct damage to the tissue because it has many advantages. The combination of Human Adipose-Derived Mesenchymal Stem Cell (hADMSC) and chitosan scaffold is expected to trigger osteoinduction that can be expressed by osteogenic markers such as phosphorus levels in blood serum.

Objectives to prove osteoinduction in a combination of hADMSC and chitosan scaffold using blood serum phosphorus levels. This study used 12 groups with 5 sample each. Groups 1 to 4 were the negative control group at day 1,3,7, and 14. While groups 5 to 8 were the positive control group at day 1,3,7, and 14. Groups 9 to 12 were treatment groups at day 1,3,7, and 14. In the negative control group bone was only removed, in positive control group, bone was removed and chitosan scaffold was added, and in treatment group, bone was removed then, hADMSC and chitosan scaffold combination was added.

Blood collection will be carried out in each group for examination of phosphorus levels in the blood serum. There were differences in phosphorus levels in blood serum in each group even though statistically there were only significant differences on day 14. The combination of hADMSC and chitosan scaffold caused a significant change in blood serum phosphorus levels on day 14 which means it triggers osteoinduction.

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## Introduction

Background

Tissue engineering is the application of the principles and methods of a homeostasis technique and science to a basic understanding of structural and functional relations in normal and pathological mammalian networks as well as the development of biological replacement to restore, maintain, or improve tissue function[1]. Tissue engineering is used in regenerative medicine which aims to repair and replace damaged or lost tissue by initiating natural regeneration processes such as osteoinduction which plays an important role in bone tissue regeneration[2,3].

Reconstruction of extensive bone tissue damage is one of the most difficult treatments for operators today[4]. The gold standard for improving bone repair is transplantation of fresh autologous bone[5]. However, when transferring autologous tissue such as bone graft it can cause complications because of the limited supply of

*Corresponding author:
Setyabudi.
Faculty of Dental Medicine, Universitas Airlangga
St. Mayjen Prof. Dr. Moestopo No. 47, Surabaya, Indonesia
E-mail: setyabudi@fkg.unair.ac.id

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