



DEPARTMENT OF MECHANICAL ENGINEERING Purdue School of Engineering and Technology

SUMMER 2005 SEMINAR SERIES

Date: **Thursday, June 23, 2005**

Time: **10:00 am - 11:00 am**

Room: **SL 165**

Reception at **9:45 am (cookies and refreshments served)**
Everyone is invited

An Investigation of Mechanical Environment around a Tooth Root Using Finite Element Analysis (Thesis Defense)

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Abstract. Root resorption or root shortening results in a permanent loss of tooth structure from the root apex. One of the factors that results in root resorption is mechanical. In this study a finite element model of dental structures composed of teeth, periodontal ligament (PDL), and bone tissue has been developed to investigate a mechanical environment around a tooth root. Geometry for each component of the dental structures was obtained from micro computerized tomography (microCT) scan images. Material properties for bone tissue were obtained from the microCT scan images. Fiber-reinforced elements were used to model the PDL since it is of a natural composite material. Contact elements were used around surface areas of tooth and bone tissue. Load and boundary conditions for the finite element model were obtained from an experimental study at the Indiana University School of Dentistry. Simulations were performed to investigate the effect of the direction of a load on stress and strain distributions around the tooth root and in the PDL. The results indicated that the direction of the load plays an important role on stress and strain magnitudes around the tooth root and in the PDL but does not affect stress and strain distributions around the tooth root and in the PDL. The same simulations were performed on two specimens to see the effect of specimen geometry on the distribution of stress and strain around a tooth root and in the PDL. The simulation results from both specimens showed that magnitudes of stress and strain were sensitive to the specimens, but stress and strain distributions were not sensitive to the specimens.

About the Speaker. Kittisak Koombua is a Master's candidate at the Advanced Engineering and Manufacturing Laboratory of Mechanical Engineering Department, IUPUI. He received his Bachelor of Engineering (Mechanical Engineering) from Chulalongkorn University, Thailand. He is currently a research assistant at the Advanced Engineering and Manufacturing Laboratory of Mechanical Engineering Department, IUPUI. His thesis advisors are Dr. Jie Chen (major advisor), Dr. Thomas Katona, and Dr. Hazim El-Mounayri.