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"Development and Testing of Optic Probes for Transcutaneous Raman Spectroscopy Bone Diagnostic"

Steven Goldstein, PhD, Blake Roessler, MD, and Michael Morris, PhD
2009 funding: $75,000

This project is for the development and testing of optic probes to be used in a novel biomedical imaging device for bone diagnostics. The fundamental technology, Transcutaneous Raman Spectroscopy (TRS), has been developed over a decade of research at the UM, and has been shown to have commercial merit.

Raman spectroscopy is a branch of optical spectroscopy commonly practiced in industry and academia. Light is inelastically scattered by chemical components in the specimen. Over the past decade this group has demonstrated applicability of Raman spectroscopy for assessment of bone properties. Bone contains apatitic phosphate, which has a unique Raman signature. As a result, bone-related diagnostics using Raman spectroscopy are facilitated because the unique mineral-specific signal does not arise in any other tissues. This signal difference allows the signal to be detected even through overlying tissue.

Raman spectroscopy for transcutaneous bone measurements in vivo has only recently become feasible through innovations in the instrumentation and data processing methodology. The team has developed methods enabling TRS using specialized fiber-optical probes and multivariate reconstruction techniques.

Of the many potential applications, osteoporosis is the most prevalent disease. Osteoporosis is a major health threat to over 75 million people in the U.S., Europe, and Japan. (2008) It is estimated that approximately 10 million people in the U.S. suffer from osteoporosis and almost 34 million are at risk due to low bone mass. (2008) The TRS technology is uniquely capable of addressing the current limitations in the diagnosis of osteoporosis, and has the potential to enable early screening and detection for preventative treatments. If TRS is successfully adapted to clinical use, it will be possible to improve the diagnosis of osteoporosis. Treatments using more expensive drugs are able to improve outcomes for various failure mechanisms, but current osteoporosis diagnostics do not adequately triage patients for the various treatment options. Early screening and early detection would substantially reduce the incidence rate of fractures and related costs, as well as mortality.

In order to progress to commercialization, a proof-of-principle benchtop prototype must be completed. The Coulter Program funding will help this team to achieve two of the three goals it needs in order to complete the prototype.

A list of all the U-M Coulter funded projects is found on the UM BME Coulter Site.

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