ACOUSTICS2008/657
Dual frequency ultrasound technique enables determination of soft tissue composition and improves reliability of *in vivo* ultrasound bone densitometry

Janne Karjalainen[a], Juha Töyräs[b], Toni Rikkonen[a], Jukka Jurvelin[a] and Ossi Riekkinen[a]
[a]University of Kuopio, POB 1627, 70211 Kuopio, Finland
[b]Kuopio University Hospital, POB 1777, 70211 Kuopio, Finland

Soft tissues diminish reliability of the bone ultrasound backscatter measurements. In this study, the ability of a single broadband transducer dual frequency ultrasound (DFUS) technique to monitor the changes in soft tissue was investigated in a body builder during a 21 week training and dieting period, inducing a weight loss of 16.5 kg (18%). Then, DFUS was applied to correct the errors induced by soft tissues on the measurements of integrated reflection coefficient (IRC) in human distal femur. In DFUS, US reflection from soft tissue-bone interface is determined with two different US frequencies and, by knowing the frequency specific US attenuation and speed in adipose and lean tissues, their content can be determined. The dual energy X-ray absorptiometry (DXA) indicated that significant changes in quantity and composition of soft tissue, but not in bone density, took place during the diet. As compared with DXA, the single transducer DFUS could determine local soft tissue composition ($r^2 = 0.88$, n=8, $p < 0.01$). The change in uncorrected IRC associated significantly with the change in body composition ($r^2 = 0.56$, n=8, $p < 0.05$). The IRC values, corrected by DFUS, showed only minor variation (SD = $\pm$ 1.26 dB) during the diet.