

FINAL REPORT
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**Preliminary Study: Preparation of Environmentally-Friendly (Green) Polymers from
Animal Fat Triglycerides and Natural Cross-linking Compounds**

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Amount of Award: \$2500

Status: (Project withdrawn - \$2332 returned to the ACREC Holding Account)

Lay Summary: Attempts were made to make high molecular weight, rigid compounds from triglycerides and natural cross-linking compounds. These polymers may have useful properties such as biodegradable containers, plastic parts manufacture, etc.

Objective (s): to produce green polymers (environmentally friendly polymers) from triglycerides that have been enriched with unsaturated acids, by cross-linking them with naturally occurring cross-linking agents. Protocols are being developed to maximize the parameters for polymerization relevant to the water to organic phase ratios and triglyceride to methacrylic acid ratios. Thus far, the amount of incorporation of methacrylic acid into the triglyceride backbone has not exceeded ~ 10-15 %. When amounts exceed 20% the parameters for cross-linking with bifunctional agents will be determined . At present, reactions run in hexane/ water mixtures do not yield methacrylic acid enriched fatty acids at near the levels of reactions conducted in isooctane/ water mixtures.

Project Overview: Triglycerides were enriched with short chain unsaturated acids (primarily methacrylic acid) by interesterification using a fungal lipase. The resultant ene enriched triglyceride was reacted with bidentate ligands in the presence of a free radical initiator to induce cross-linking.

Impacts and Significance: Results indicated a nominally effective interesterification resulted in a triglyceride having approximately 20% enrichment by a short-chain unsaturated acid. This enriched triglyceride was reacted with geraniol or with linalool and the free radical initiator, AIBN at 57C in an O₂ reduced atmosphere. The resulting mixture contained several compounds (by TLC) that were unable to be adequately identified. There was no insoluble polymer observed under the experimental conditions employed.

Future Work: No additional money was requested for this preliminary investigation and it is requested that this mini-project be terminated. It is proposed to continue with student assistance to further refine the enrichment process and produce model compounds as part of an undergraduate research program.

Acknowledgments: Thanks to ACREC and FPRF for \$2500 to fund the preliminary feasibility studies of this nature.

It is requested that this project be withdrawn. The majority of the funding (\$2332) will be returned to the ACREC holding account.