Biomarker / *Species*	Tracer substrate (route)	Bio fluid/Tissue / *Marker isotope/ratios*	Validation / *Publication date*	Translation to clinic / *Sponsor*
<u>Serine oxidation glycine cleavage</u> / *In vitro, animals, human cells*	$[U-^{13}C_6]$-D-glucose (P.O., I.P.)	*Cells, SOG pathway fingerprint*	*In vitro*, animals, humans *October, 2013*	Plasma marker for alternate ATP synthesis *Academic, Pharmaceutical*
<u>Regulation/Activation of AMP-activated protein kinase</u> / *In vitro, Mice*	$[U-^{13}C_6]$-D-glucose (P.O., I.P.) $[U-^{13}C_{16}]$-palmitate (P.O.)	*Plasma, liver, muscle, adipose <u>Glucose</u>/<u>lactate</u> cross-labeling via malate shuttling (^{13}C-M_2)*	*In vitro* and animals *April, 2013*	Plasma marker for liver, muscle and adipose *Academic, Pharmaceutical*
<u>miR-1 and miR-206 regulation by NRF2 in tumorigenesis</u> / *Mice*	$[U-^{13}C_6]$-D-glucose (P.O., I.P.)	*Tumors, organs <u>Ribose</u>/<u>glutamine</u> cross-labeling via direct glucose oxidation/pyruvate carboxylase (^{13}C-M_1)*	*In vitro* and animals *July, 2013*	Oncoisotopomer marker/biopsies *Academic*
<u>Metformin's mechanism/efficacy marker for FAS control in cancer</u> / *In vitro human cell lines*	$[1,2-^{13}C_2]$-D-glucose (media)	*Tumor cells <u>Palmitate</u> cross-labeling via FAS in the presence of cholesterol (^{13}C-M_4/M_2)*	*In vitro July, 2013*	Oncoisotopomer marker/biopsies *Foundation*
<u>Hepatic de novo lipo-/sterol synthesis</u> / *Human-infants*	$[1,2-^{13}C_2]$-acetate (P.O., I.V.)	*Plasma <u>Palmitate</u>, stearate, <u>cholesterol</u> cross-labeling from acetate (^{13}C-M_4/M_2)*	*Human June, 2013*	Feeding benefits and adrenal <u>enzyme deficiency</u> *Academic*
<u>SiD_CLAMP</u> / *Mice*	$[U-^{13}C_6]$-D-glucose (P.O., I.V.)	*Plasma <u>Glucose</u> cross-labeling via all gluconeogenic mechanisms and hepatic release (^{13}C-M_{1-6})*	*In vivo, preclinical April, 2013*	<u>Glucose production/insulin sensitivity</u> without infusion of glucose/insulin *Academic, Pharmaceutical*
<u>Precursor product isotope matching (PRISOMATCH)</u> / *In vitro human cell lines*	Low enrichment or natural variations in isotope content	*Plasma, tissues Protein, product turnover*	<u>*In vitro*</u> *(isolated/sorted cells), animals July, 2013*	Real-time turnover/<u>captured proteins</u> *Hirshberg conspiracy to diagnose pancreatic cancer*
<u>Glucagon and Glucagon-Like Peptide 1 Receptor targeting</u> / *Obese rats*	$[U-^{13}C_6]$-D-glucose (P.O., I.V.)	*Plasma, liver, muscle, adipose Glucose, lactate, glutamine cross-labeling via gluconeogenesis, TCA cycle or futile cycles (^{13}C-ΣM)*	*In vivo July, 2011*	Tissue specific drug effect and efficacy markers *Pharmaceutical*
<u>Liver/kidney toxicity markers</u> / *Rats*	$[U-^{13}C_6]$-D-glucose (P.O., I.V.)	*Plasma, liver, brain, kidneys Glucose, lactate, glutamine, fatty acid cross-labeling via gluconeogenesis, citrate shuttling, fatty acid transport (^{13}C-ΣM)*	*In vivo September, 2009*	Targeted Tracer Fate Associations among multiple plasma products *Government (USA)*
<u>Liver cell/mitochondria toxicity markers</u> / *Primary hepatocytes*	$[U-^{13}C_6]$-D-glucose (P.O., I.V.)	*Culture media, hepatocytes Glucose, lactate, glutamine, fatty acid cross-labeling via TCA cycle metabolism, citrate shuttling, fatty acid synthesis (^{13}C-ΣM)*	*In vitro November, 2011*	Targeted Tracer Fate Associations among multiple plasma products *Government (USA)*
<u>Targeted drug resistance in leukemia</u> / - / *Human, cultured cells (clinical samples)*	$[U-^{13}C_6]$-D-glucose (P.O., I.V.)	*Culture media, clinical samples of CML cells Glucose, lactate, glutamine cross-labeling and drug dosing (^{13}C-ΣM)*	*In vitro April, 2009*	Targeted Tracer Fate Associations and drug dosing *Pharmaceutical*
<u>Plasma markers of pancreatic cancer</u> / *Rats*	$[1,2-^{13}C_2]$-D-glucose (P.O., I.V.)	*Plasma, tumors, pancreas, liver Glucose, lactate, glutamine cross-labeling and tumor size (^{13}C-M_n)*	*Plasma, biopsy November, 2005*	Altered hepatic glucose production *Hirshberg conspiracy to diagnose pancreatic cancer*