Proposal for "Grow Iowa" Values Fund Grant Program

Use of Beta-Glucuronides of Vitamin D To Treat Inflammatory Bowel Disease

PI: Jesse P. Goff, BioMedical Sciences, Veterinary Medicine, ISU, jpgoff@iastate.edu ; Goff is a Professor in BioMedical Sciences 515-294-3719

Company Partner(s):
GlycoMyr, Inc., Dr. Jesse P. Goff & Dr. Ronald Horst, 3359 Stagecoach Road, Ames, IA 50010. jpgoff55@gmail.com 515-232-8468, 2 Employees. 1 year in business, Annual sales = $0.

Heartland Assays, Inc. Dr. Ronald Horst, 2325 N. Loop Drive, Suite 6300, Building 6, Ames, IA 50010 Ron.Horst@heartlandassays.com Phone: 515-520-1098, 3 Employees, In Business 3 years, Annual Sales = Confidential.

EXECUTIVE SUMMARY

Mounting evidence implicates vitamin D insufficiency as a factor contributing to autoimmune diseases, including inflammatory bowel disease. GlycoMyr was started by Dr. Jesse Goff and Dr. Ronald Horst. GlycoMyr to develop products to treat and prevent a number of human and animal diseases based on vitamin D compounds found in a plant of the *Solanaceae* family. These plant compounds are ß-glycosides of the hormonal form of vitamin D known as 1,25-dihydroxyvitamin D. They have unique activities affecting both calcium metabolism and cell growth and differentiation. GlycoMyr, working with Heartland Assays, has synthesized glucuronide analogs of these compounds, which are more stable than the native plant compounds, and has tested these compounds in rats and human cancer cell lines. In the course of these studies we discovered oral dosing of these compounds delivers the active vitamin D compounds almost exclusively to the lower intestine. By delivering the vitamin D compounds directly to the affected cells we can provide a therapeutic dose of vitamin D to the cells of the lower intestine involved in inflammatory bowel disease. **Because these glucuronide compounds are not available for absorption in the upper intestine, we also can reduce systemic absorption and development of high blood calcium, which precludes current use of the native hormone, 1,25-dihydroxyvitamin D.** GlycoMyr's competitive strength, at this point, is that we have synthesized glucuronide forms of vitamin D compounds with robust bioactivity that can be developed for a variety of applications and products. One goal is to test ß-glucuronides of 1,25-dihydroxyvitamin D as a treatment for inflammatory bowel disease. To date the compounds have been tested in rats and we know we can deliver high doses to the lower intestine with reduced systemic activity. Funding is sought to move this project to the next step – testing their effectiveness in animal models of inflammatory bowel disease.

Technical Objectives

Inflammatory Bowel Disease (**IBD**), which includes Crohn's disease and ulcerative colitis, affects ~ 1 in 1000 people in North America. IBD, particularly Crohn's disease, is an autoimmune disorder. The immune cells (Th1 lymphocytes) of the lower intestinal tract **inappropriately** secrete cytokines such as tumor necrosis factor (TNF)-α, and interferon (IFN)-γ in response to bacterial antigens. This induces excessive inflammation and destruction of normal gut tissues.

Vitamin D deficiency occurs in nearly 80% of Crohn's patients. Because Vitamin D absorption is sub-optimal in Crohn's patients, previous work in such patients focused on the role lack of the renal hormone, 1,25-dihydroxyvitamin D_3 (**1,25-D**), produced from vitamin D, played in calcium metabolism and bone health. Now studies suggest vitamin D deficiency may be a cause of IBD rather than the result of IBD! It is clear many tissues of the body, including immune cells and intestinal epithelial cells, can convert 25-hydroxyvitamin D (**25-D**), derived from vitamin D, to 1,25-D. Here it has an autocrine/paracrine role in regulating apoptosis and cell differentiation. In immune cells 1,25-D generally has an anti-proliferative effect and down-regulates production of Th1 cell inflammatory cytokines (Cantorna et al., 2004). Studies in mice also demonstrate 1,25-D acts within intestinal lining cells and is essential in maintaining the integrity of the intestinal mucosal barrier (Kong et al., 2008). In mouse models of induced IBD, mice that are vitamin D deficient or do not possess the vitamin D receptor (VDR) develop much more severe IBD. In wild type mice that are vitamin D replete, treatment with large doses of the hormone 1,25-D can reduce the symptoms and lesions of IBD in these models.

Three factors seem to combine to upset vitamin D metabolism during IBD, leading to inability of vitamin D to regulate the immune response in the lower gut properly.

1. **Low serum levels of 25-D.** This does not provide enough substrate for the 1-alpha hydroxylase enzyme that produces 1,25-D to produce the active compound within target cells. This could easily be fixed by increased dietary vitamin D.
2. **Loss of the 1-alpha hydroxylase enzyme that produces 1,25-D within these cells.** For some unknown reason prolonged vitamin D deficiency can result in loss of this enzyme activity so that even if we correct vitamin D deficiency with increased vitamin D in the diet- it does not cure the condition. In short term studies, treating mice with large doses of 1,25-D ameliorates IBD by delivering a therapeutic level of 1,25-D to the intestinal cells (Froicu and Cantorna, 2007). These doses overcome problems with synthesis and/or degradation of the hormone within the intestinal cells. *Unfortunately, prolonged use of 1,25-D at these doses in human IBD is precluded due to development of life threatening hypercalcemia (high blood calcium).*
3. **In patients with IBD the enzyme that destroys 1,25-D is up regulated (Liu et al., 2008).** This enzyme is known as vitamin D 24-hydroxylase. Because it is hyperactive it destroys any 1,25-D made in the cell or supplied pharmacologically nearly as fast as the cell can be treated. Slowing the enzyme would give the active 1,25-D compound more time to regulate cell function – which is what it does in normal cells.

A. Addressing the Problem

1. **Targeting 1,25-D to the affected tissues of the lower intestine.**
Conjugating glucuronic acid to drugs in a Beta (B)-linkage can prevent absorption of the drug until the drug is released following hydrolysis by B-glucuronidase. This enzyme is normally produced only by bacteria residing in the lower intestine. We have worked with Heartland Assays Inc, (Ames, IA) to synthesize several B-glucuronide conjugates of 1,25-D and 25-D. We have demonstrated that the glucuronide form of 1,25-D is stable in upper intestine duodenal contents but quickly hydrolyzed to glucuronic acid and 1,25-D in the ileum/colon. Oral administration of these compounds should allow us to deliver an effective dose of 1,25-D to ileum and colon cells to mitigate IBD. Because the glucuronide form is inactive and more water soluble, we also bypass the normal sites of 1,25-D absorption in the small intestine. This reduces entry of 1,25-D into the blood, reducing systemic effects, including hypercalcemia.

2. **Slow 1,25-D destruction with competitive inhibitors of 24-hydroxylase enzyme.**
Very high levels of 1,25-D have had to be used in previous studies to ameliorate IBD in mice (Froicu and Cantorna, 2007). This is, in part, due to the rapid destruction of 1,25-D as a result of increased levels of the vitamin D 24-hydroxylase enzyme (Liu et al., 2008). In vitro evidence demonstrates the effectiveness of 1,25-D can be enhanced within cells if the cells are also treated with a competitive inhibitor of the vitamin D 24-hydroxylase enzyme, such as 25-D (Reinhardt and Horst, 1989). We have also synthesized B-glucuronides of 25-D, which will be used to deliver high amounts of 25-D exclusively to the lower intestine with the goal of potentiating the action of 1,25-D on cells of the ileum and colon. This may allow us to get therapeutic effects with an even lower dose of 1,25-D, again reducing the risk of hypercalcemia.

<u>Specific Aims and Tasks are as follows:</u>

1. **To determine the maximal tolerable oral dose of the candidate B-glucuronide of 1,25-D over a prolonged period of time (4wks) in mice, with and without combined treatment with B-glucuronide of 25-OHD.**
2. **Test the hypothesis that administration of B-glucuronides of 1,25-D, alone or in combination with B-glucuronide of 25-D, can prevent or ameliorate symptoms of IBD in mouse models (feed dextran sodium sulfate water to induce IBD). Our treatment would supply 1,25-D to cells that may no longer make adequate amounts, and slow the rate of destruction of 1,25-D in those cells by providing 25-OHD in high enough doses to act as a competitive inhibitor of vitamin D 24-hydroxylase.**
3. **Pursue patents to cover use of glucuronides for treatment of IBD.**

Commercial Objectives

There is no cure for IBD such as Crohn's disease which affects 1 in 1000 Americans- therapy is based on reducing the inflammatory cell response using glucocorticoids and immunosuppressants such as cyclosporine and in many cases, surgical resection of the gut. Estimated costs are $18,022 per IBD patient/year. About 28% of this cost is related to doctor visits and prescription drugs (Yu et al., 2008). This means there are potentially 300,000 customers who have a record of spending about

$1.5 billion on palliative treatments for this disease each year.

Our immediate commercial goal is to develop in vivo data to support a patent claim. The patent would cover use of glycosides/glucuronides to target delivery of 1,25-D and 25-D activity to the lower intestine site for the treatment/prevention of IBD. The studies outlined above use purified compounds for "treating" IBD patients. We also have the glycosides of 1,25-D isolated from plants, which we hope to develop as "preventative herbal supplements" for general public consumption.

We are already testing the glucuronides of vitamin D for anti-cancer activity thanks to a GIVF obtained last year. Our "targeted delivery" of vitamin D may prove useful for IBD and also prove beneficial to colon cancer. Development of herbal supplements for "prevention" rather than "treatment" of colon cancer will also be pursued.

The challenge for us is to develop the type of data in animal models of IBD to convince investors, such as pharmaceutical firms, that further development through human phase I and II clinical trials is warranted. GlycoMyr is a two-man operation now. However, once the patent is pending and the data on mouse studies is published the prospect of attracting investors to further fund this research company is greatly enhanced. Subsequent steps would involve hiring more specialized chemists and pharmacologists to help in the synthesis/isolation of the glucuronides of 1,25-D and other vitamin D compounds followed by larger scale manufacture of these compounds.

There are a number of possible pitfalls to our plan. Will it reduce clinical signs and lesions of inflammatory bowel disease without causing life threatening hypercalcemia? Our competitiors are focusing on designing new analogs of 1,25-D that are selectively able to turn on the vitamin D response elements responsible for "curing" inflammatory bowel disease, while not turning on the vitamin D response elements that initiate hypercalcemia. So far this has not been accomplished. Currently Schering – Plough and Roche have active teams working on these types of compounds. A number of start-up companies also claim to have the sought after non-hypercalcemic analog of vitamin D (see addendum document for "Novacea") and are garnering a great deal of financial backing. We feel making a non-hypercalcemic analog will be difficult and have focused instead on targeted delivery of 1,25-D and blocking 1,25-D destruction – ideas which seem not to have occurred to the big companies yet. Even if these other companies succeed they may still desire the "targeting" to cells the glucuronide technology developed by Goff and Horst of GlycoMyr can offer their compounds. ***Because the 1,25-$(OH)_2$D glucuronide delivers active compound only to the lower intestine, the problem of hypercalcemia developing in patients, which has greatly limited the use of 1,25-$(OH)_2$D to date, is reduced***.

Vitamin D therapy represents a new way to regulate activity of the immune cells. It is not traditional immunosuppressive therapy, which blocks all immune function-sometimes resorting to killing certain types of immune cells. This **restores normal function** to cells that have gone out of control. Iowa can be at the forefront of this new paradigm in treatment of conditions such as inflammatory bowel disease. With luck we may now have the basic drugs needed to start a profitable pharmaceutical company. GlycoMyr is also pursuing treatment of cancer, especially colon cancer, with this approach. Our approach is to apply this technology to as many of the vitamin D responsive diseases as possible. If just one disease responds to this "targeted delivery" of 1,25-D at levels that avoid hypercalcemia we will generate great investor interest.

Budget

CATEGORY	AMT REQUESTED	ISU COST-SHARE	GlycoMyr COST-SHARE	Heartland Assay COST-SHARE	TOTAL
Salaries	12,000		60,000	30,000	102,000
Benefits					
Personnel Sub-total	12,000		60,000	30,000	102,000
Equipment					
Lab Supplies				34,000	34,000
Field Supplies					
Other Supplies & Services	72,657			14,000	86,657
Travel	5,000				5,000
Publication					
Miscellaneous					
TOTAL	89,657		60,000	78,000	227,657

Budget Justification:
Grow Iowa Value Fund
1. Cost to establish mouse models of Inflammatory Bowel Disease at ISU Veterinary College Vivarium. =$22,657.
2. We will also need to synthesize another 10 mg of the 1,25-D glucuronide and 50 mg of the glucuronide of 25-D. The GIVF received last year for our cancer work allowed us to learn to synthesize these compounds for approximately half the cost of last year. Pre-cursors must be purchased from Sigma Synthesis Services. Heartland Assays performs final conjugation and purification and is offering these at cost. Cost of 10 mg of the 1,25-D and 50 mg of the 25-D glucuronides **-$50,000**
3.Technician 1/2 time – 1/4 of salary of person to help feed and care for mice and assist with tissue harvesting and preparation. $12,000.
4.Travel by Goff to scientific meetings - $5,000
Total GIVF= $89,657

Heartland Assay, Inc: "In Kind" Contribution
Dr. Horst will spend 10% of his time over next two years synthesizing and purifying ß-glucuronides of 1,25-$(OH)_2$D and 25-OH D **($30,000).**
Reagents, solvents, use of chromatography equipment provided by Heartland Assay for this project for determining levels ß-glucuronides of 1,25-$(OH)_2$D in tissues. **($ 34,000)**
Heartland Assay will contribute assays of 1,25-$(OH)_2$D and the glucuronides on normal and inflamed tissue of control and treated mice. **($ 14,000). Total = $78,000**

GlycoMyr, Inc: Cash. Will provide cash for Goff's salary (cash to ISU) over the summer months of 2010 **($48,000**) and will provide cash funds to cover ¼ time technical help to match that requested of GIVF **($12,000**). The technician may be a GlycoMyr employee, an ISU employee, or student labor, depending on funding from other sources that could perhaps move the position to a full time employee. **Total = $60,000**

Supporting documents

1. News Release on Novacea – start-up company that developed an analog of 1,25-D (non-hypercalcemic) and received financial backing from Schering-Plough
2. Letter from GlycoMyr pledging $60,000 cash toward this IBD project
3. Letter from Heartland Assays, Inc pledging $78,000 in kind toward this IBD project

Novacea Receives $60 Million Under Schering-Plough Agreement For Asentar

SOUTH SAN FRANCISCO, CA - July 10, 2007 — Novacea, Inc. (NASDAQ: NOVC), today announced that it has received $60 million from Schering-Plough Corporation (NYSE: SGP) under the terms of the previously announced worldwide development and commercialization agreement for Asentar™ (DN-101). The payment from the closing of this transaction follows the early termination by the United States Federal Trade Commission of the waiting period under the Hart-Scott-Rodino Antitrust Improvements Act of 1976.

Under the terms of the development and commercialization agreement, Novacea received an upfront payment of $60 million, including $35 million as reimbursement for past research and development expenses and a license fee of $25 million. In addition, pursuant to a related stock purchase agreement, Schering-Plough purchased $12 million of Novacea common stock. The development and commercialization agreement provides Novacea with potential pre-commercial milestone payments of up to $380 million, and royalties on worldwide sales of Asentar based on tiered royalty percentage rates.

Schering-Plough also will be responsible for all forward development costs in exploring indications for earlier stages of prostate cancer, such as androgen-dependent prostate cancer and adjuvant therapy and will lead all global commercialization efforts for Asentar. Novacea will provide medical support to Schering-Plough's commercial operations for Asentar in the United States, including deployment of their Medical Science Liaisons, which will be funded by Schering-Plough.

Asentar is essentially 1,25-dihydroxyvitamin D in a preparation for oral use. It is currently being developed as an oral treatment in combination with Taxotereâ (docetaxel) for the treatment of Androgen Independent Prostate Cancer. Prostate cancer is the second leading cause of cancer death in men with approximately 232,000 new cases and 30,000 deaths in the U.S. in 2005. AIPC is an advanced disease state of prostate cancer. Based on results of Novacea's completed Phase 2 clinical trial, known as ASCENT, the use of weekly Asentar in combination with weekly Taxotere may provide AIPC patients with an innovative cancer therapy that may prolong survival with the potential in reducing some of the toxicities and complications normally associated with chemotherapy. Novacea is now evaluating the benefits of Asentar in a 900-patient Phase 3 trial, known as ASCENT-2, which uses overall survival as the primary endpoint and compares weekly Asentar plus Taxotere to the current standard of care in the treatment of AIPC.

GlycoMyr, Inc.

Developing Therapies Based on Plant Glycosides of Vitamin D

Glycomyr, Inc
3359 Stagecoach Rd
Ames, IA 50010

May 20, 2009

From: Jesse Goff DVM, PhD & Ronald Horst, Ph.D.
President and Vice President

Re: "Grow Iowa" Values Fund Grant Program

To Whom It May Concern:

Dr. Jesse Goff, currently a professor at Iowa State University, and Ronald Horst, currently President & CEO of Heartland Assays, Inc. formed a company called GlycoMyr. GlycoMyr was formed to develop novel therapies for cancer and auto immune disorders based on unique glycosides of 1,25-dihydroxyvitamin D Horst and Goff isolated from plants of the *Solanaceae* family some years ago. This joint venture, GlycoMyr, Inc. has data demonstrating these compounds have the unique ability to restrict proliferation of tumor cells and immune cells *in vitro*. The glucuronide technology is ideally suited for delivery of these compounds to tissues with high levels of glucuronidase. Cancer cells often express abnormally high levels of this enzyme and bacteria of the lower intestine produce large amounts of the enzyme. This allows us to target deliver otherwise toxic vitamin D compounds to just those tissues. We now know from studies done in recent months that we can deliver vitamin D compounds almost exclusively to the colon and ileum of the gastro-intestinal tract. In forming GlycoMyr, Jesse Goff and Ronald Horst have sold shares in the company and now have capital to invest into the project. GlycoMyr will pay Iowa State University Goff's summer salary ($48,000) in 2010 to allow him to work on commercial aspects of these projects – ie develop data to solidify a patent position and to entice further investment in GlycoMyr. Dr. Goff will work to develop the mouse models to test these compounds in *in vivo* models of inflammatory bowel disease. He will be assisted in these pursuits by Dr. Ronald Horst of Heartland Assays, Inc. In addition, GlycoMyr will pay for a 1/4 time technician ($12,000) to match the ¼ time technician pay asked for in the GIVF grant. This person will help perform the mouse experiments, which require a great deal of hand labor and observation. Altogether GlycoMyr pledges $60,000 cash toward this project.

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GIVF FY10-4

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May 26, 2009

From: Ronald Horst, Ph.D.
President and CEO Heartland Assays, Inc.

Re: "Grow Iowa" Values Fund Grant Program

To Whom It May Concern:

Heartland Assays, Inc. (HAI) is a dedicated research service laboratory, which performs assays of vitamin D and its metabolites for the medical research community. We have worked with Dr. Goff and I am personally in a joint venture with him to explore the therapeutic potential of vitamin D compounds conjugated to glucuronic acid. This joint venture is called GlycoMyr. Last year HAI worked with Goff and GlycoMyr to synthesize compounds that had some unique properties that allow targeted delivery of vitamin D hormones to cancerous cells in tissue culture. Work with that GIVF grant is continuing to progress and we are happy to take part in that project. Recently the possibility of using this same technology to treat inflammatory bowel disease arose. HAI will work with GlycoMyr to get these studies going and to aid in commercial development of the compounds.

In support of this project, HAI will pay my salary during the 10 % of my time that I will spend on this project, which I value at $30,000. I will prepare more of the vitamin D analogs and help with the synthesis of the glucuronide conjugates. I will perform High Performance Liquid Chromatography (HPLC) isolations of the 1,25-dihydroxyvitamin D glycosides and work out methods that will allow us to assay blood and intestinal tissue levels of the glucuronides. HAI will also contribute material and supplies necessary to do the isolations, including use of its HPLC System. The disposables we will contribute to the project will be worth approximately $34,000 over the next two years. In addition, HAI also will contribute assays of the 1,25-dihydroxyvitamin D concentration in sera and tissue of the experimental mice. If we charged our typical fee for this service it would amount to about $14,000.

In conclusion, HAI is willing to contribute a total of $78,000 toward this project.

We can provide a list of equipment, which is available for this project if the need arose. We feel this project has a good chance of succeeding and even if it does not the scientific knowledge to be gained is exciting and will be of great use.

GROW IOWA VALUES FUND GRANT COMPETITION
COLLEGE REVIEW FORM

PI Name: Jesse Goff

Project Title: Use of Beta-Glucuronides of Vitamin D To Treat Inflammatory Bowel Disease

College Ranking **5 of 8 along with Nara's proposal**

Recommendation: **Fund ___** **Fund if Possible _X__** **Do Not Fund**

SECTION I: TECHNICAL MERIT (60% of recommendation)

Low 1 2 3 4 5 High

Considerations:

- What is the scientific merit of the proposed project?
- Is the project technically feasible to accomplish in the listed time frame?
- Does the budget seem reasonable?
- Does the PI/team of researchers have the qualifications necessary to carry out the work?

Justification:

REVIEWER 1. Qualifications are good. Budget seems reasonable but may be low given the possibility that spontaneous models of colitis may be more appropriate models as opposed to chemical-indiced colitis.

Again, there is expertise in the college with respect to murine models of colitis that would have strengthened this proposal.

REVIEWER 2. This project is focused on the use of vitamin D as a supplement for treating Inflammatory Bowel Disease (IBD). The researchers claim that they have developed vitamin D compounds that can be delivered to the lower intestine where they can exert their effects. This project seeks funds to support studies of the vitamin D compounds in a disease animal model for IBD. The project is feasible within the time frame proposed. There are 3 objectives outlined; to determine maximum tolerable oral doses of the vitamin D compounds; Test the effects of the treatment in the animal disease model (rats); pursue patents (based on the success of the first 2 objectives. The budget seems within reason for the work proposed.

The PI and other team members appear well qualified; they currently have a start-up company in operation focused on development of vitamin both natural and synthesized supplements.

SECTION II: BROADER IMPACTS (30% of recommendation)

Low 1 2 3 4 5 High

Considerations:

- What is the probability that this project could be used to leverage future funding from non-ISU sources?
- What is the potential to increase ISU's research capabilities or capacity?
- What is the potential to enhance learning opportunities for students?

Justification:

REVIEWER 1. No student involvement included. There are faculty in the CVM that have extensive experience with rodent models of colitis that could have been included in this proposal.

This would have been a good opportunity to establish a new collaborative team with added potential.

REVIEWER 2. IBD and diseases of intestines such as Crohn's, are responsible for illness in 1 in every 1000 Americans, treatment approaches for such diseases are limited and the estimates for treatment for these individuals is about $1.5 billion annually. If this product is successful there is potential to capture a significant portion of this market. There is also the potential for these products to be useful in other areas such as colon cancer due to the unique delivery system which allow release of the vitamin in the lower intestine where it can exert its effects.

Potential for research and capacity would appear to be relatively good however the PIs may want to consider newer products beyond vitamin D in order to remain strong in the marketplace, as well as expand their research capabilities.

There may be good potential for student research in understanding models of disease and treatment – this could have application in areas such as biology, microbiology, biochemistry etc.

SECTION III: COMMERCIAL POTENTIAL (10% of recommendation)

Low 1 2 3 4 5 High

Considerations:

- What is the likelihood that new intellectual property will be generated?
- What is the likelihood of eventual commercial success?

Justification:

REVIEWER 1. May be reasonable chances of commercial product making it to the market. There is clearly a need to treat the many forms of intestinal inflammation.

Show be capable of applying for a SBIR or STTR.

REVIEWER 2. New intellectual property will probably be generated on the design of the delivery system and it would appear that the team has already had success in this area.

It would appear that some of the commercial potential has been addressed; the company is already producing Vitamin D products and has identified a novel means of delivering the vitamin to the lower intestine intact to ensure activity in the right region of the gut. The opportunity to tap into a $1.5 billion market also justifies the need for this project.

Proposal Number: FY10-4

PI Name: Jesse Goff

Project Title: Use of Beta-Glucuronides of Vitamin D To Treat Inflammatory Bowel Disease

College Ranking:

College Rating:

Commercial Recommendation: **Fund**

Commercial Potential:

1) Will this project lead to a new Iowa business/company, or increase the sales/profitability of a recently started Iowa company?

please comment on the above:

Proposal builds on FY09 GIVF project where PIs teamed with their start-up companies (Glycomyr (1 year in business) and Heartland Assays (3 years in business) to synthesize vitamin D compounds for cancer treatments. Previous work shows the active compound is delivered to lower intestine, which could be useful as treatment for inflammatory bowel disease without complications of hypocalcaemia when too much vitamin D is absorbed by upper intestine.

Request: $89,657; match $60K "cash" GlycoMyr for Goff, technician salaries; $78K match in-kind from Heartland Assays

YES: Industry partners: Glycomyr (1 year in business) and Heartland Assays (3 years in business)

Yes: If GlycoMyr is able to successfully prove and commercialize the technology, this would be very profitable.

2) Will this project increase the sales or profitability of an existing Iowa business/company ?

No

What is the probability of commercial success:

Early data is promising. In vivo data from proposed study will help move this toward commercialization, but risk is high; costs will be high due to human clinical trials; and time to market likely several years..

3) Are competitors identified, is the advantage of the proposed technology clear.

Yes

Please comment on the above:

YES: Major pharma companies (Schering-Plough and Roche) looking at problem from different perspective. Hypercalceamia limiting factor of those approaches.

4) Is there a clear strategy for entry to the market, start up or existing Iowa business/company.

Please comment on the above:

NO: Data obtained from proposed project critical to support patent filings/claims and attracting investors. No clear information provided on strategy PIs/industry partners plan to move from attracting investors for next stage of research to productization.

Yes: GlycoMyr will commercialize after gaining investment dollars.

5) Please make any other comments related to the commercial potential of this proposal:

This is a promising technology and approach. Good market analysis. Cash match is unclear. Good job listing competitors and why their approach is different.

Intellectual Property Evaluation

1. Have any current ISURF invention disclosures been identified as background IP? No

2. Does this project have the potential to generate new intellectual property? Yes

   (please explain)

3. Based on your current knowledge, without having the opportunity to receive input from the principle investigator or to conduct a market or technology assessment, what will be the barriers to commercializing this technology?

unknown