TASK ORDER NUMBER: W81XWH-19-9-0007-0024

MTEC RESEARCH PROJECT NUMBER: 2019-453

EGS NUMBER: MT17008.138

TITLE: Development of an Oxygen Carrier for Use in Hemorrhagic Shock Resuscitation

PRINCIPAL INVESTIGATOR: W. Richard Light, PhD, CSO

PERFORMING ORGANIZATION: VirTech Bio, Inc., 27 Strathmore Rd, Natick, MA 01760
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CONTRACTING ORGANIZATION: Medical Technology Enterprise Consortium (MTEC)

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6. AUTHOR(S)
Kim Vandegriff, W. Richard Light, Phil Farabaugh, Joseph Tucker

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8. PERFORMING ORGANIZATION REPORT

2019-453

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U.S. Army Medical Research and Development Command
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Annual Technical Status Report for

Development of An Oxygen Carrier for Use in Hemorrhagic Shock Resuscitation

Research Project No. 2019-453-001

EGS Number: MT17008.138

Reporting Period: Effective Date – 25 JUL '20

MTEC Research Project Awardee
Research Project Lead: W. Richard Light, PhD, CSO

Other Research Project Team Member(s): Joseph Tucker, Bjorn K. Song, Kim D. Vandegriff, Ashok Malavalli, Wayne Dion, Andres Benitez, Bill Light

Research Project Technical POC: Rick Light
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Phone Number: 508-314-4397
Email address: rick.light@virtechbio.com

Submitted: July 27, 2020

1. Project Status

a. Accomplishments

Product Name Update: The name of the product has been changed from the early development phase using VIR-IV1 to VTB's new trademarked product name, OxyBridge™. This product name will be used from hereon.

Provisional Patent: Based on the findings previously reported on a potential synergistic effect between plasma products and Oxybridge on coagulation during hemorrhagic shock, a provisional patent was filed in June 2020 with the United States Patent Office, New Provisional Patent Application No 63/043668 (Compositions and Methods for Treating Hemorrhagic Shock).

Task 1a – Studies Completed – OxyBridge / plasma studies. Reported in Q2 Progress Report
OxyBridge is formulated in a modified Lactated Ringer's Solution (LRS), with potential for coagulopathy dilutional effects. As such, in-vitro resuscitation studies were designed to study potential coagulopathies. These studies used OxyBridge manufactured at the benchtop-scale at VTB's laboratory. This first in-vitro study was completed in a joint study between VTB and Song Biotechnologies, LLC and was funded by this grant. A second complimentary in vitro study was also completed in joint between VTB and Michael A. Meledeo, CIV USARMY MEDCOM AISR, with VTB supplying the necessary supplies. While this study was not directly funded by this grant, the results provided confirmation of the results from first study. There was no coagulopathy noted beyond the expected dilutional effect. There was apparent synergy between plasma and OxyBridge. Successful results from these coagulation studies provided the first milestone for Check Point 1 to move forward to Task 1c.

This work was to be presented at MHSRS 2020, but this meeting was cancelled. Nevertheless, the Abstract was electronically published by the meeting organizers.

Task 1b – Ongoing: FDA Pre-IND meeting (VirTech Bio, Biologics Consulting).
VTB had engaged the services of Biologics Consulting, Virginia to prepare our Pre-IND FDA Briefing Package to a meeting. As reported in Q3, Biologics Consulting had prepared a GAP analysis for VTB's development program and the pre-clinical, clinical and chemistry and manufacturing sections had been drafted and were in the process of being finalized when the COVID-19 pandemic shifted worldwide attention. Current military imperatives are promoting early resuscitation of wounded warriors, as well as reaction to the COVID-19 emergency. This has led to a sense of urgency within the FDA encouraging cooperation with the DoD and early participation. As such, Biologics Consulting in discussions with the CSO and CEO of VTB decided to move beyond an Interact Meeting directly to a Pre-IND meeting. Biologics Consulting and VTB are now finalizing the Pre-IND briefing document. The Pre-clinical, CMC (Chemistry Manufacturing and Controls) and Clinical Sections have been drafted and are currently under review at Biologics Consulting, with anticipation to submit to FDA in August/September 2020.

Task 1c: Manufacturing Process Finalization (VirTech Bio).

- During Y1 Q2, VTB performed a sufficient number of OxyBridge pilot runs to implement standard statistical evaluations to assess process control in the laboratory and initiate Technology Transfer to the CMO (Fujifilm Diosynth Biotechnologies).
- These studies showed that the current OxyBridge pilot-scale production process is robust.
- VTB has transferred safety documents, and process documents to Fujifilm and have weekly videoconferences to coordinate future activities, including review of the process development plan to insure it meets their needs for tech transfer.

- Budgetary discussions are underway, initial non-GMP production runs at Fujifilm are now planned to begin fourth quarter 2020.

b. Reportable Outcomes

- To date, 15+ pilot lots have been produced, and VTB continues production of OxyBridge at the VirTech Bio (VTB) Production Laboratory, with analytical characterization of the product at the VTB Analytical Laboratory.
- The analytical documentation system has been uploaded to the MediaLab, and documents remain under review in-house. Documentation and quality standards to the level appropriate for support of pre-clinical studies have advanced.
- OxyBridge manufacturing and characterization were performed that allowed in vitro coagulation studies as described above under Task 1.a.
- Two in vitro coagulation studies at separate laboratories have been performed and demonstrate only minor dilutional impact with OxyBridge.
- Manufacturing process details have been transferred to FujiFilm.
- Regulatory documents for an FDA meeting are under draft, with an expected completion date by the end of July, 2020.

Presentation at Conferences:

During Y1 Q1, two Abstracts on OxyBridge characterization and use were accepted and presented at International Scientific conferences:

- ISOTT (31-JUL-2019)[1]
- MHSRS (20-AUG-2019)[2]

During Y1 Q2, one Abstract on OxyBridge use was presented at the International Scientific conference:

- ISBS (23-NOV-2019)[3]

During Y1 Q3, two abstracts on the coagulation properties of OxyBridge were submitted to Military International Scientific conference:

- MHSRS (cancelled but Abstracts subject to publication)[4]

Paper Accepted for Publication:

- Song, BK, Light, WR, Vandegriff, KD, Tucker, J, and Nugent, WH. Systemic and microvascular comparison of Lactated Ringer's Solution, VIR-HBOC, and alpha-alpha crosslinked Hemoglobin-Based Oxygen Carrier in a rat 10% topload model. Art Cells, Nanomed, Biotech, accepted for publication, 2020.

New discoveries, inventions, or patent disclosures, and specific applications.

- OxyBridge + plasma provisional patent
- Indication for use in Acute Respiratory Distress Syndrome (ARDS), non-infectious or infection

[1] Vandegriff KD, Song BK, Nugent WH, Tucker J, and Light WR. VIR-IV1: a novel highly polymerized oxygen carrier. *ISOTT Meeting Abstract*, July 2019.

[2] Light WR, Vandegriff KD, Light W, Benitez A, Tucker J, Nugent WH, Song BK, Malavalli A. 72-Hour survival in a rat hemorrhagic shock model with VIR-IV1 versus crystalloid. *MHSRS Meeting Abstract*, August 2019.

[3] Vandegriff KD, Song BK, Nugent WH, Tucker J, and Light WR. VirTech Bio's Progress and Future Plans with a Large Human Hemoglobin Polymer. *ISBS Meeting Abstract*, 2019.

[4] Light WR, Nugent W, Tucker J, Vandegriff K, Macko A, Song BK. Impact of Controlled and Uncontrolled Hemorrhage (Two-Hit Model) and Resuscitation on Coagulopathy and Hemostasis in Rats. MHSRS Meeting Abstract, 2020.

c. Progress Detail (Y1, Annual Q1-Q4)

Task 1a: Ex Vivo Coagulation Impact Study – Reported in Q2 Progress Report

- Results were analyzed from the in vitro coagulation impact study performed with Michael A. Meledeo, CIV USARMY MEDCOM AISR (Coagulation and Blood Research Department, US Army Institute of Surgical Research) in collaboration with VTB. This study was not funded by this grant, but the data are provided in support for Check Point 1.
- Solutions tested included whole blood as control (n=6) and test articles, including 1) crystalloid (LRS), 2) OxyBridge, 3) fresh frozen plasma (FFP), 4) plasma and OxyBridge, and included a complete arm with dilution with PlasmaLyte as comparators.
- As noted previously, there was no coagulopathy noted beyond dilution.
- There was an apparent synergy between plasma and OxyBridge.

Results

- No coagulopathy was observed beyond expected dilutional effects.
- There was no pattern of statistical difference between the HBOC treatments, LRS, or appropriate dilutional control as noted by hematocrits (HCT, %).
- No adverse effects on platelet count [(PT (s)].
- No evidence of induced red blood cell lysis.
- No evidence of impact on fibrinogen.
- VIR-HBOC increased the total hemoglobin concentration whereas LRS decreased it.
- There were instances in which an apparent synergistic effect was observed between FFP and HBOC.

Conclusions:

- No unexpected coagulopathy observed in vitro or in vivo.
- Dilutional coagulopathy mitigated with plasma (FFP or Fresh).
- VIR- HBOC + Plasma may be more effective than either alone in achieving hemostasis after severe active bleed.

Task 1b – Ongoing: FDA Pre-IND meeting (VirTech Bio, Biologics Consulting). VTB had engaged the services of Biologics Consulting, Virginia to prepare our Pre-IND FDA Briefing Package to a meeting. Previously as reported in Q3, Biologics Consulting had prepared a GAP analysis for VTB's development program and the pre-clinical, clinical and chemistry and manufacturing sections had been drafted and were in the process of being finalized when the COVID-19 pandemic shifted worldwide attention. Current military imperatives are promoting early resuscitation of wounded warriors, as well as reaction to the COVID-19 emergency. This has led to a sense of urgency within the FDA encouraging cooperation with the DoD and early participation. As such, Biologics Consulting in discussions with the CSO and CEO of VTB decided to move beyond an Interact Meeting directly to a Pre-IND meeting. Biologics Consulting and VTB are now finalizing the Pre-IND briefing document. The Pre-clinical, CMC (Chemistry Manufacturing and Controls) and Clinical Sections have been drafted and are currently under review at Biologics Consulting, with anticipation to submit to FDA in August 2020.

Task 1c: Manufacturing Process Finalization (VirTech Bio).

- During Y1 Q2, VTB performed a sufficient number of OxyBridge pilot runs to implement standard statistical evaluations to assess process control in the laboratory and initiate Technology Transfer to the CMO (Fujifilm Diosynth Biotechnologies).
- These studies showed that the current OxyBridge pilot-scale production process is robust.

- VTB has transferred safety documents, and process documents to Fujifilm and have weekly videoconferences to coordinate future activities, including review of the process development plan to insure it meets their needs for tech transfer.
- Budgetary discussions are underway. Initial non-GMP production runs at Fujifilm are now planned to begin fourth quarter 2020.

2. Future Plans

The timeline has shifted for reasons discussed in Section 3.

Task 1b (Y1Q4)

Pre-IND Meeting Briefing Document will be submitted to the FDA with potential to plan a meeting date.

Task 1c (Y2Q1) Milestones:

- Small-scale process robustness characterization completed.
- CMO review of pilot-scale manufacturing processes to assure that the process development plan meets the CMO's needs for technology transfer.
- Technology Transfer to CMO for pilot scale Manufacturing.

Task 1D (Y1Q4) Milestones:

- Start of CMO engineering runs

3. Problems / Issues

a. Current Problems / Issues

Provide a description of current problems or issues that may impede performance or progress of this project along with proposed corrective action. This may include administrative, technical, and/or logistical issues.

- Technology transfer to the CMO (FujiFilm) got off to a slow start due to logistical issues on the CMO's part and time/logistical constraints at VTB. Uncertainty with the COVID-19 pandemic has also hampered efforts substantially. However, in Q3, activity increased with regular teleconferences occurring, and while there has been a delay, there is confidence of achieving the goals. The schedule has been updated in Tables 1 and 2 below to clarify. The long-lasting effect of the pandemic is still unclear, but the tables reflect best faith estimates.
- We changed our Regulatory Strategy to bypass an initial Interact Meeting to move directly to a Pre-IND meeting with the plan to expedite a Phase 1 human safety trial in ARDS. This is in response to the COVID-19 pandemic, based on the enhanced effects of cell-free hemoglobins on oxygen. The overall process was slow to start due to time/logistical constraints at VTB but has resumed with the schedule updated in Tables 1 and 2. To implement this change, Biologics Consulting prepared a GAP analysis for VTB's development program and met with the CSO and CEO of VTB to discuss alignment of the current plan with suggested improvements. Biologics Consulting, and VTB are now working to complete the Pre-IND briefing document. The pre-clinical section, CMC (Chemistry Manufacturing and Controls) and Clinical Sections have been drafted with the expectation to submit to FDA in Aug, 2020. Moving from an FDA Interact Briefing document to a Pre-IND Briefing Document requires more data and information on CMC and Clinical trial designs.

- The delay in manufacturing pre-clinical material has delayed the pre-clinical studies but some lost time will be made up for. Schedule updates are reflected in Tables 1 and 2.
- The long-lasting effect of the pandemic is still not clear but the tables reflect best faith estimates.
- The schedule changes will not have a material effect on the overall budget.

Table 1. Major Task Summary and Updated Timeline Comparison

Task	Milestone/Deliverables	Former Timeline	Current Timeline
Base Agreement	*1A. Ex Vivo Coagulation Impact Study.*	Y1Q1	Completed
	1B. FDA Pre-IND meeting booklet.	Y1Q1	Y1Q4
	1C. Manufacturing Process Finalization. Scale-up, and statistical process control in laboratory. Support for tech transfer.	Y1Q1-Y1Q2	Y1Q2-Y1Q4
	1D. CMO Engineering Runs. Process transferred to a CMO and pre-cGMP material produced for animal studies. Initiate stability study	Y1Q2-Y1Q4	Y1Q4-Y2Q2
	1E. Safety and Coagulation Profile in Rat and Swine Models (4 studies)	Y2Q1-Y2Q4	Y2Q2-Y3Q1

Table 2. Development Program Overview (adapted from Appendix B: Statement of Work (SOW) and Milestone Payment Schedule. The previous timeline is shown by 'x' and the current timeline by grey boxes with 'o'.

Funding Module	Timeline									Study
Base Agree-ment	Year 1 Q				Year 2 Q				3	
	1	2	3	4	1	2	3	4	1	
	x									*In vitro* Coagulation Study - COMPLETED
	Check Point One *Success Criteria - Acceptable coagulopathy profile*									
	x		O							*FDA Pre-IND Meeting*
	x	x	O	O						Manf Process Finalization – Statistical Process control parameters for process transfer
		x	x	O x	O	O				CMO Engineering Runs – Make material for Phase 1 Pre-clinical studies
				x		O				Stability Studies – Engineering lots
	Check Point Two *Success Criteria - Material meets quality specifications. Process is reproducible.*									
					x	O				Uncontrolled Hemorrhage, Hemostasis and Coagulopathy (Rat)
						x	O			Topload Safety/inflammatory/Coag (Swine)
	Checkpoint Three *Success Criteria - Acceptable coagulation profile. Acceptable safety profile (swine). Improved survival*									
							x	O		Survival following Pre-hospital Care Model (Rats)
								x	O	Uncontrolled Hemorrhage, Hemostasis and Coagulopathy (Swine)

b. Anticipated Problems / Issues

We believe the revised schedule detailed in Tables 1 and 2 will be successful. It should be noted that the long-lasting effects of the pandemic is still unclear, but the tables reflect best faith estimates.

4. Financial Health

Each expense category is financially on track per the original plan with the exception of the Contract Manufacturer. The technology transfer process with the CMO has begun. The delays were due to timing and capacity issues at FujiFilm, and we are working with them to develop a timeline that gets everything back on track by the end of Q4 2020. The total expense for this year was $810,824.02 and the cumulative total for the project so far is the same at $810,824.02 since we just completed year 1. There were no expenses for equipment during this year. The total travel expenses were $4,546.56 and $66,308.60 in expenses for our regulatory consultant related to our FDA meetings.

5. Personnel Effort

Personnel – Current Staff	Role	Percent Effort
William Richard Light, CSO	Principal Investigator	46
Joseph Tucker, President	Quality Assurance	29
Kim D. Vandegriff, VP R&D	Scientific Advisor	15
Ashok Malavalli	R&D Manager	26
Andres Benitez	Lab manager	42
Wayne Dion	Lab Technician	41
Bill Light	Lab Technician	73
Phil Farabaugh	Project Coordinator	31

6. Protocol and Activity Status

a. Human Use Regulatory Protocols

TOTAL PROTOCOLS:

No human subjects will be performed to complete this first phase (2 years) of the Statement of work.

One human protocol is planned for OPTION 2 (Year 4): CLINICAL PHASE 1 PROGRAM. FDA approval has not yet been obtained. In Y1Q4 we plan to have a Pre-IND meeting with the FDA to discuss the entire program continuing to a Phase 1 clinical program to assess safety in humans.

c. Animal Use Regulatory Protocols

TOTAL PROTOCOLS:

Six animal-use research protocol will be required to complete the Statement of Work. They are scheduled to begin in Y2. To date, the IACUC/ACURO process is underway.

PROTOCOLS:

Study 1 (Y2 Q1): Uncontrolled Hemorrhage, Hemostasis and Coagulopathy (Rat) – (Song Biotechnologies, LLC)
Unconscious rats will be subjected to a severe pressure and volume-controlled hemorrhage (primary hit to allow for addition of test material), hypovolemic resuscitation with test material,

severing of tail (uncontrolled hemorrhage; secondary hit to test for hemostasis and coagulopathy), and observed for six-hour survival. The primary hit (i.e. controlled bleed) in combination with fluid resuscitation is intended to uniformly create the acute injury consistent with what is seen in severe trauma patients (e.g. metabolic insult, altered coagulation function, hemodilution), while the secondary hit is intended to simulate a clinically important re-bleed scenario. Hence, the consistency and severity of the primary injury will allow for true in vivo assessment of coagulation function and hemostasis following an uncontrolled hemorrhage and allow for a lower N value to be relevant. Four test groups are being studied. LRS is the standard control, plasma is the colloid control, product, and then product and plasma are being explored for potential synergy.

Treatment Groups (N = 8 per group): 1) LRS, 2) OxyBridge, 3) Plasma, and 4) OxyBridge / Plasma Mixture
Measurements: 1) Cardiovascular, 2) Blood Gasses (ABL90 Flex), and 3) ROTEM and Stago (Coag)

Study 2 (Y2 Q2): Toploaad Safety/inflammatory/Coag (Swine) – (Song Biotechnologies, LLC)
Toxicity, PK/PD, inflammatory marker studies, coag, histopathology, and hypertension (MAP) studies will be performed with swine during a 10% top-load protocol that is sensitive for hypertensive and toxic effects. Swine responses are translatable to human responses and will support Phase 1 clinical trials. Swine will be subjected to a 10% total blood volume bolus (toploaad) with test article and observed for 24 hours. Blood sampling and measurements will occur at baseline, and post-infusion time points: 0, 1, 2, 4, 8, 16, and 24 Hour. Animals will be anesthetized and MAP monitored during the infusion and plus 2 hours post infusion, then the animals will regain consciousness. As a safety study, only 1 arm is being budgeted for this proposal, OxyBridge, but VTB may elect to add a second arm as additional cost share, Plasma.
Treatment Groups (N = 6 per group): 1) OxyBridge, and VTB Potential 2) Plasma.
Measurements: 1) Cardiovascular, 2) Blood Gasses (ABL90 Flex), 3) ROTEM and Stago (Coag), 4) blood sampling for inflammatory markers, 5) Histopathology

Study 3 (Y2 Q3): Survival following Pre-hospital Care Model (Rats) – (Song Biotechnologies, LLC)
Hypovolemic shock followed by hypovolemic resuscitation in in vivo models simulate far-forward combat theater without immediate medical evacuation and/or restorative surgical capacity. Furthermore, in this austere pre-hospital trauma environment, animals are limited (single bolus) in product, and follow the TCCC guidelines of resuscitation volumes. In addition to characterizing the systemic (cardiovascular and blood gasses) impact of test articles, this study will also look for minimal dose required for resuscitation. Pre-ported rats will be subjected to a two-step 60% total blood volume (TBV) withdrawal and resuscitated with treatment solutions at different percentages of total blood volume (hypovolemic resuscitation) when mean arterial pressure drops below 25 mmHg and seconds from demise. To emulate follow on care, following one hour of point of injury rats will be given as much fluid as possible to maintain a pressor response (MAP) above 60 mmHg. Hence, resuscitant will be titrated to MAP for as much fluid as required for up to 4 hours (versus the single dose used in 'Study 1'), and then animals will be placed in a cage for observation for up to 72 hours. Five test groups are being studied. LRS is the standard control, plasma is the colloid control, product at the same volume as the controls, product at half the volume as the controls to test for potency, and then product and plasma are being explored for potential synergy.

Treatment Groups (N = 8 per group): 1) LRS 20% TBV, 2) Plasma 20% TBV, 3) OxyBridge – 20% TBV, 4) OxyBridge – 10% TBV, 5) Plasma + OxyBridge mixture 20% TBV
Measurements: 1) Cardiovascular, and 2) blood gas (ABL90 Flex)

Study 4 (Y2 Q4): Uncontrolled Hemorrhage, Hemostasis and Coagulopathy (Swine) – (Song Biotechnologies, LLC)

Pre-ported and anesthetized swine will be subjected to a 50% TBV controlled (variable to blood pressure), severe, and otherwise lethal blood withdrawal, and then resuscitated with a hypovolemic 20% TBV infusion during the uncompromised state (near demise). Symptoms of acute coagulopathy of trauma (ACOT) will be evident through measurements such as clot firmness (ROTEM) and prothrombin (Stago). Coagulation will be further affected by the type of resuscitation fluid, and the direct impact on hemostasis will be tested immediately after resuscitation through a dermal incision injury. The secondary injury is not meant to be lethal, but effective enough to display differences in blood volume loss and time to hemostasis between treatment groups. An hour after the dermal injury, the swine will be given as much fluid as possible to maintain a pressor response (MAP) above 60 mmHg for up to 6 hours. Animals will then be brought back to consciousness and be observed for up to 72 hours. Only 3 arms are being budgeted for this proposal, LRS (standard control), OxyBridge (product), and plasma (colloid control), but based on results of study 1, VTB may elect to add a fourth arm as additional cost share, OxyBridge with Plasma.

Treatment Groups (N = 8 per group): 1) LRS, 2) OxyBridge, 3) Plasma, and VTB Potential 4) OxyBridge /
Plasma Mixture Measurement: 1) Cardiovascular, 2) Blood Gasses (ABL90 Flex), and 3) ROTEM and Stago (Coag)

Studies 5 and 6 – Safety Toxicology Studies (Y2 Q3-4): MULTIPLE-DOSE STUDIES (SoBran)
Two studies will be conducted using 1) mixed gender Sprague Dawley rats (250-275g) and 2) male, out-bred swine (50-55 kg).
Animals will be administered a bolus dose of 3.3, 6.6, or 10 ml/kg OxyBridge or LRS volume control via IV injection (at a set volume of 10 mL/kg) once daily for 7 days. Following a 14-day recovery phase after treatment stops, animals will be sampled again and then sacrificed. In-life evaluations (i.e., signs of pain, distress, changes in body weight, food or water consumption, feces, vomiting, etc.) will be conducted daily for all animals throughout the experimental time course. Four treatment groups (control, low, medium, and high dose OxyBridge) of 10-15 animals each will be used. Unscheduled sacrifices or deaths in this study necessitate necropsy.

Multi-Dose PK/TK Studies Detail:
During treatment days, rats within treatment groups will be sub-grouped into sampling time points (i.e., Control Sub-group 1 will be sampled at 2, 6, and 12 hours, while Control Sub-group 2 will be sampled at 1, 4, and 8 hours) to minimize blood draws while providing sufficient data points.

Measurements will include (Cmax), dose-normalized Cmax, time to peak concentration (Tmax), AUC0-t, dose normalized AUC0-t, T1/2, and hematological and biochemical parameters.

STATUS:

- **A protocol for large animal species that will form the basis for future Topload / Toxicology studies (Study 2, 5, and 6) in swine has been developed for initial testing in canine with laboratory grade material.**
- **Our Regulatory Status has been expedited to bypass the Interact meeting with FDA and move directly into a Pre-IND meeting with FDA for planning for Phase 1 Safety trials in human volunteers.**
- **Our interactions with our current CMO (FujiFilm) are on-track, and they are working with us to expedite material manufacturing to meet our FDA schedules to begin a Phase 1 trial.**

Annual Business Status Report for

Development of An Oxygen Carrier for Use in Hemorrhagic Shock Resuscitation

Research Project No. 2019-453-001

EGS Number: MT17008.138

Reporting Period: Effective Date – 25 JUL '20

MTEC Research Project Awardee

Research Project Lead: W. Richard Light, PhD, CSO

Other Research Project Team Member(s): Joseph Tucker, Bjorn K. Song, Kim D. Vandegriff, Ashok Malavalli, Wayne Dion, Andres Benitez, Bill Light

Research Project Business POC:
Joseph Tucker
27 Strathmore Rd
Natick, MA 01760
Phone Number: 508-627-0485
Email address: joe.tucker@virtechbio.com

Submitted: July 27, 2020

1. Current Staff

Personnel – Current Staff	Role	Percent Effort
William Richard Light, CSO	Principal Investigator	46
Joseph Tucker, President	Quality Assurance	29
Kim D. Vandegriff, VP R&D	Scientific Advisor	15
Ashok Malavalli	R&D Manager	26
Andres Benitez	Lab manager	42
Wayne Dion	Lab Technician	41
Bill Light	Lab Technician	73
Phil Farabaugh	Project Coordinator	31

2. CURRENT EXPENDITURES

A. Cost Reimbursable Contract:

Contract Expenditures	Current ANNUAL Expenditures	*Cumulative To Date Expenditures*
Labor (Personnel and Fringe)	$329,976.39	$329,976.39
Supplies/Materials	$46,902.11	$46,902.11
Travel	$3,626.19	$3,626.19
Equipment	$	$
Subcontractors and Consultants	$52,885.55	$52,885.55
Other Direct Costs	$101,370.76	$101,370.76
Indirect Costs	$111,925.46	$111,925.46
Total	**$646,686.48**	**$646,686.48**

B. Fixed Priced Contracts: Complete only if your contract is Fixed Priced.

MTEC Milestone Number	Milestone Description	Due Date	Government Funds
1		1/15/20	$1.00
2		2/15/20	$1.00
	Total Expenditures		$2.00 (Should reflect what has been invoiced for)

C. Cost Share Contributions: Complete only if you're reporting Cost Share:

Funding Source (Cash)	This Period	Cumulative to Date
Cash	$0.00	$0.00
Labor Dollars	$43,686.44	$43,686.44
Indirect Labor Rates (Overhead/Fringe Benefits)	$40,065.91	$40,065.91
Travel	$920.37	$920.37
General & Administrative Services	$28,408.16	$28,408.16
Equipment (New)	$0.00	$0.00
Material	$11,904.37	$11,904.37
Other Direct Costs	$25,729.24	$25,729.24
Consultants	$13,423.05	$13,423.05
Sub-Total	$164,137.54	$164,137.54
Funding Source (In-Kind)	**This Period**	**Cumulative to Date**
Use of Existing Equipment (Estimated fair market value)	$0.00	$0.00
Use of Existing Software (Estimated fair market value)	$0.00	$0.00
Intellectual Property (Estimated fair market Value)	$0.00	$0.00
Space (Land or buildings)	$0.00	$0.00
Sub-Total	$0.00	$0.00
Cost Share Total	$164,137.54	$164,137.54

3. STATUS OF MILESTONES – FILL OUT FOR ALL CONTRACT TYPES (all project milestones are to be included)

MTEC Milestone Number	Milestone Description	Due Date	% Completed this Reporting Period	Cumulative % Complete
1	**Process Study Design, Contact with FDA, in vitro coag initiation**	**8/30/19**	**100%**	**100%**
2	**Process Robust Studies, conc, pH, FDA Pre-IND package, in vitro coag execution**	**9/30/19**	**100%**	**100%**
4	**Process Robust Studies, glut, temp, time, FDA Pre-IND Meeting, in vitro coag report**	**10/31/19**	**100%**	**100%**
5	**Process Robust std, hold, RX time, Boro**	**12/2/19**	**70%**	**70%**
6	**Transfer Product Information, specs (CMO)**	**12/31/19**	**100%**	**100%**
8	**Transfer Manufacturing, Analytical Protocols, CMO**	**1/31/20**	**70%**	**70%**

9	**Review Method, Draft Protocols (CMO)**	**03/02/20**	**30%**	**30%**
10	**Develop Protocols (CMO)**	**03/30/20**	**0%**	**0%**

4. DEVIATION FROM PROJECT PLAN

The delay in the tech transfer process at Fujifilm continued into Q3 of 2020, which has kept us from catching up on our milestones. We continue to work with FujiFilm to expedite our work despite the issues presented by Covid-19. We have also adjusted our Regulatory Strategy and with the support of Biologics Consulting, this should lead to an expedited human Phase 1 Safety Trial. This is explained in more detail in Section 3 including a revised schedule (Tables 1 and 2).