

# ETA VitalTAG

*"Save time, save  
lives"*

Team 15  
April 12<sup>th</sup>, 2016

A. Andre Chang, COO  
Jeetinder Ghataurah, CEO  
Richard Chen, CTO  
Tony Yuen, CFO



# Outline

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# Team Members

- Jeetinder Ghataurah, CEO
  - Data Collection
  - Documentation Control
- Andre Chang, COO
  - Industrial Product Design
  - Enclosure Design
- Richard Chen, CTO
  - PCB Design
  - Algorithm Development
- Tony Yuen, CFO
  - Software Development
  - Firmware Development

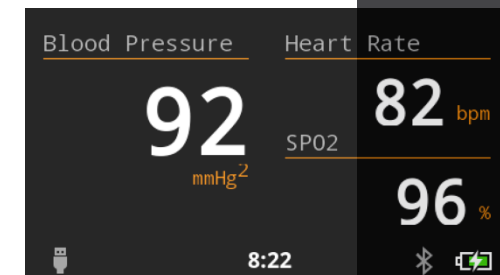
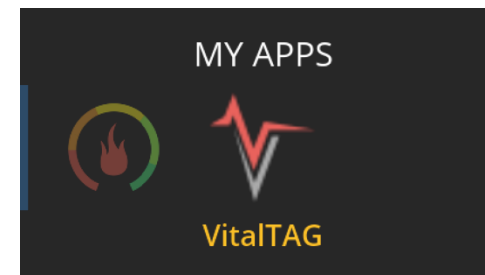


# Background

- In most 9-1-1 calls paramedics are **NOT** first on the scene
- First responders are not trained to measure vitals (i.e. firefighters, life guards, etc.) unless measured by a device
- 2014 GVRD paramedic 90th percentile response time was 33.3 minutes for all calls and 13.3 minutes for life-threatening calls [1]
- Paramedics optimally spend 2-2.5 minutes measuring vital signs per victim
- Rudimentary tools and refined abilities used to measure vitals
- Blood pressure measurements take 45-60 seconds
- BPM is estimated by counting heart beats for 15 sec using watches and touch

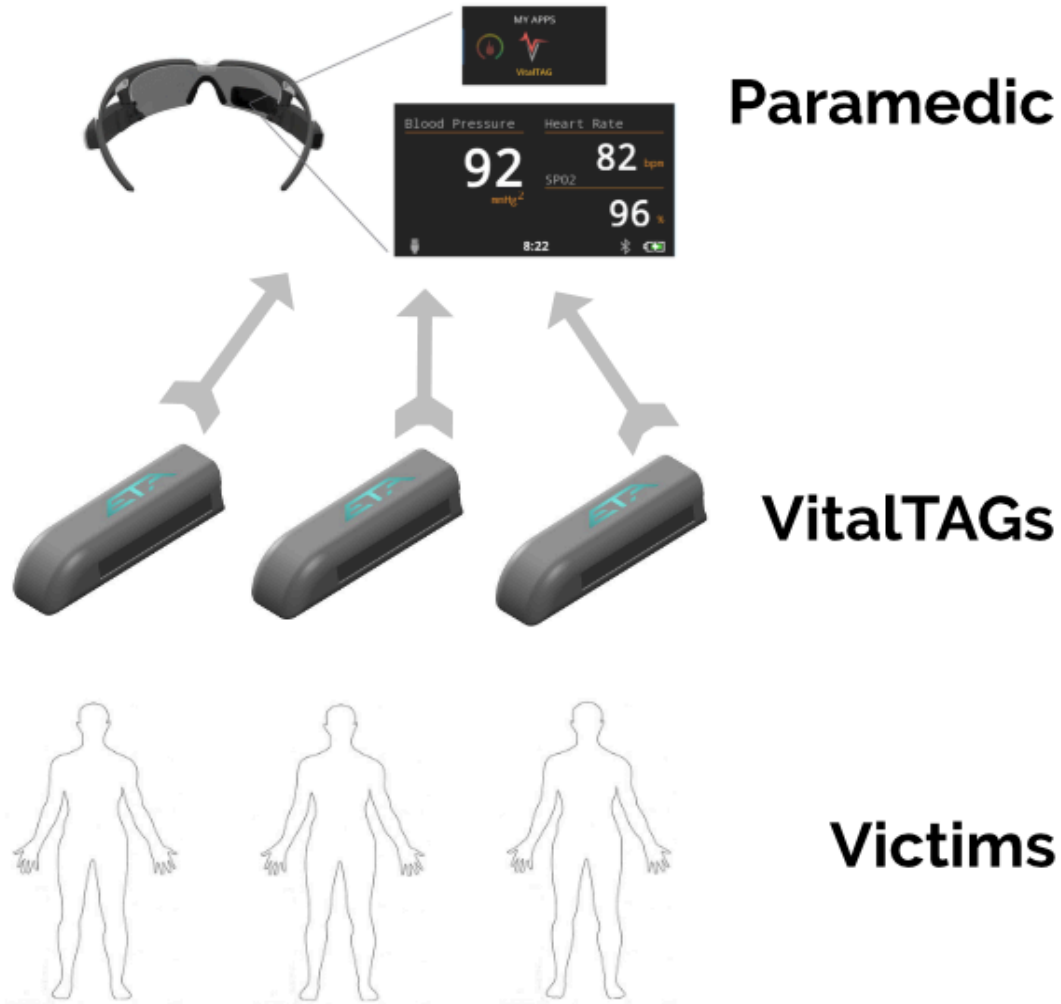
# ETA's Solution: VitalTAG

- Hands-free standalone device that measures and logs:
  - Heart rate
  - Blood Pressure
  - SPO2
- Allows paramedics to focus on other tasks
- Displays on smart eye-wear
  - Can be paired with multiple VitalTAGs
- Can be used by any first aider





# Body: High Level System Overview

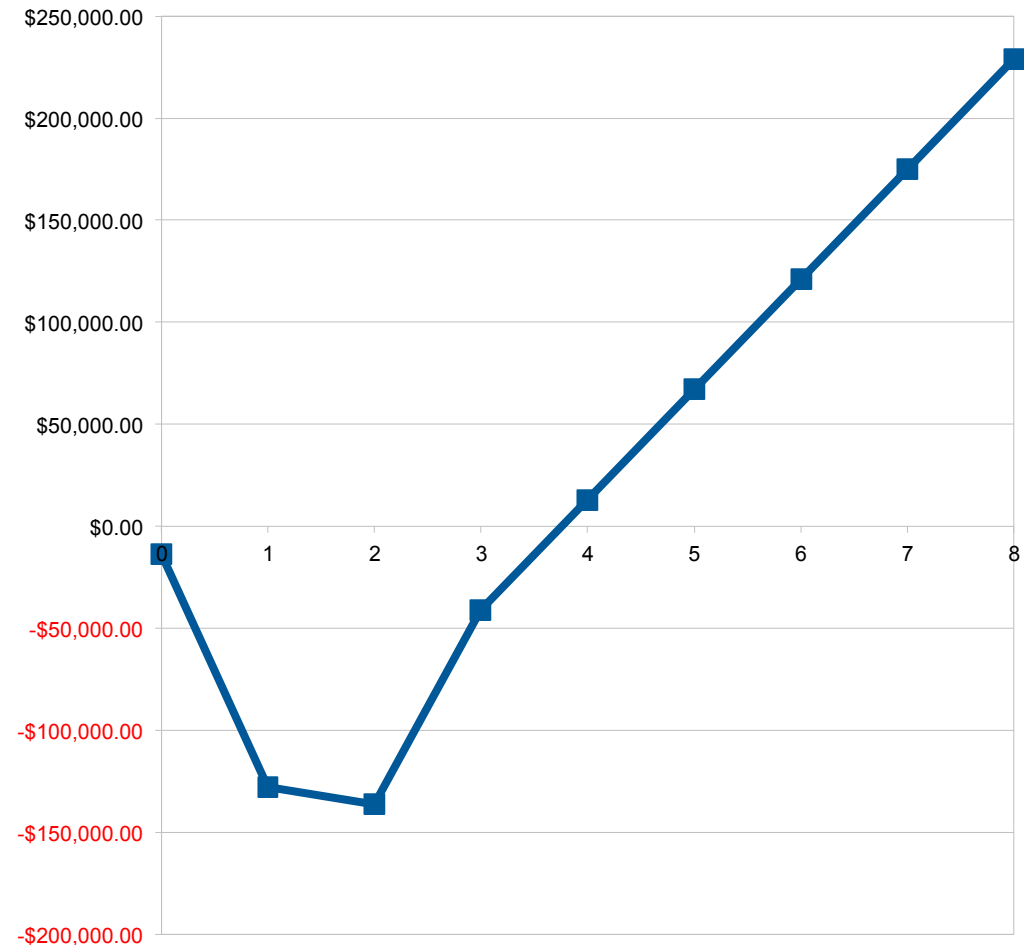


- VitalTAG design chosen over glove design
- Allows multiple to one
- Frees first responders hands






# Body: Business Case

- Estimated Manufacturing Cost: \$24.35/ unit
- Estimated Selling Cost: \$140/unit sold in cases of 5
- Estimated Investment Required: \$350,000
- Financing sources considered: Venture Capitalist or other open funding platforms (e.g kick starter)
- Target sales over 8 years: ~ 50,000 units





# Body: Business Case

Device	Cost (CAD + Tax)	Picture	Features
Tycon Net - The Nonin 8500 Digital Hand-Held Pulse Oximeter	\$1,038.27	 [2]	Displays SPO2 and heart rate Currently used by some first responders
Withings - Wireless Blood Pressure Monitor	\$183.57	 [3]	Measures blood pressure and heart rate Collects data using cellphone app Transfers collection of data to doctor
Athena GTX Wireless Vital Signs Monitor	\$4250.00	 [4]	Measures blood pressure, heart rate, SPO2 and ECG Utilizes app on cellphones Can collect data from up to 20 different devices





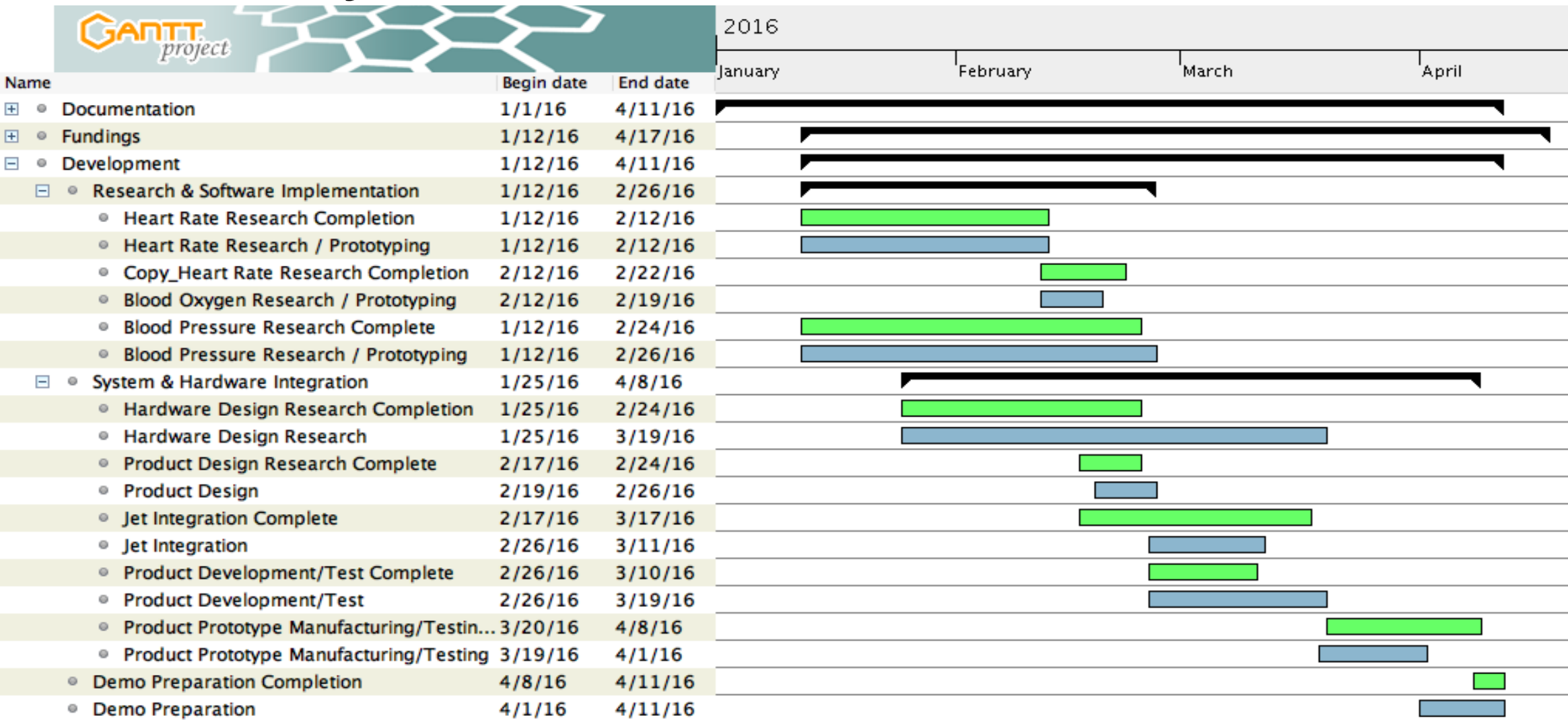
# Body: Budget/Funding

	Amount
Proposed Budget	\$1295.50
Total Expenditures	\$1,501.23
Total Funding*	\$693.00
Balance	-\$808.23

- Funding sources include:
- ESSEF (\$513.00),
  - Angel Investor (\$180.00)
  - Personal (\$808.23)



# Body: Timeline





# Body: Problems Encountered

- Technical
  - MAX30100 pads, MAX 30100 voltage supply, Oscillator, Noisy Signal, Biopotential signal, component failure, 3D prints
- Logistical
  - Tight deadlines, shipping delays, 3D printing times
- Team Dynamics
  - Time scheduling between classes, work, and personal lives
- Other Solutions
  - Late nights, and lots of coffee



# Body: Problems Encountered

Task	Andre	Jeetinder	Richard	Tony
Research	P	P	P	P
Heart Rate POC				P
SpO <sub>2</sub> POC			P	P
Blood Pressure POC		S	P	P
Software Development				P
PCB Design	S		P	
PCB Population	S		P	
Smart Eyewear Integration				P
Smart Eyewear GUI	S	S	S	P
Enclosure Design	P		S	
Enclosure 3D Printing	P	S	S	
Final Product Testing	P	P	P	P
Data Collection		P	S	
Part Ordering			P	
Meeting Minutes	P	S	S	
Business Case	P	S		
Finances			P	P
Documentation	P	P	P	P



# Body: Learning

- Circuit design
- PCB manufacturing
- 3D modeling design
- 3D printing with PLA and ABS
- Biopotential signal acquisition and processing
- App based software development
- Product design and development



# Body: Outcomes

- The team of ETA successfully built VitalTAG
- Each VitalTAG
  - Measures Heart Rate, SpO<sub>2</sub>, and Blood Pressure
  - Logs an hour of data onboard
  - Communicates to the smart eyewear via bluetooth
  - Smart eyewear app connects to multiple VitalTAGS



# Acknowledgements

- We gratefully would like to thank:
  - Mr. L. Alberto Chang – Cash flow mentorship
  - Dr. Ash M. Parameswaran – Circuit Advise
  - SimpleHome – Angel Investor/Funder
  - ESSEF - Funding
  - Dan Faedo – Firefighter & First Aid Instructor Interviewee
  - Ryan Haluk – Paramedic Interviewee
  - Adam Godkin – First Aider & Lifeguard Interviewee
  - Lukas-Karim Merhi – Assistance and experience
  - Neovasc Inc – Data collection volunteers
  - Steve Whitmore & Dr. Andrew Rawicz – leading this course
- And most importantly our families, friends, and significant others for tolerating us



# Conclusion & Future Work

- Successfully built VitalTAG system
- VitalTAG will
  - Enhance capabilities of first responders
  - Greatly decrease time needed to collect vitals
  - Increase the efficiency of paramedics
  - Provide logged vital data to physicians
- The ETA team will continue product development and take it to market after these improvements:
  - New enclosure, Intel Curie chip, versatile eyewear app, etc.





# References

[1] C. Skelton, "What's really going on with ambulance response times in B.C.?", Vancouver Sun, 2016.

[2] Pricfalls, "Pulse Oximeter Hand Held W/Memory", 2016. [Online]. Available: [https://www.pricfalls.com/product/pulse-oximeter-hand-held-wmemory/71855384?utm\\_source=Nextag&utm\\_medium=cpa&utm\\_term=&utm\\_content=&utm\\_campaign](https://www.pricfalls.com/product/pulse-oximeter-hand-held-wmemory/71855384?utm_source=Nextag&utm_medium=cpa&utm_term=&utm_content=&utm_campaign). [Accessed: 25- Jan- 2016].

[3] Withings, "Withings Wireless Blood Pressure Monitor", 2016. [Online]. Available: <https://www.withings.com/us/en/products/blood-pressure-monitor>. [Accessed: 25- Jan- 2016].

[4] Athena GTX, "WVSM® - Athena GTX", 2016. [Online]. Available: <http://athenagtx.com/products/wvsm/>. [Accessed: 25- Jan- 2016].



Questions?





# Appendix



Fig. 2 PPG waveform and its important parameters

- For ages 18-50
  - Diastolic BP  $\pm$  2.625 mmHg
- For ages 26-50
  - Systolic BP  $\pm$  3.521 mmHg

R. Samria, R. Jain, A. Jha, S. Saini and S. Chowdhury, "Noninvasive Cuffless Estimation of Blood Pressure using Photoplethysmography without Electrocardiograph Measurement", 2014.

Source	Date	Spent		Reimbursed	Balance
		CAD	USD		
Amazon	01-15-16	\$60.06			
Mouser	01-15-16	\$40.73			
Sparkfun	01-15-16	\$208.56			
ESSEF	01-22-16			\$513.00	
Angel Investor	02-13-16			\$180.00	
DigiKey	02-13-16	\$42.34	\$29.58		
DigiKey	02-13-16	\$146.18	\$102.13		
eBay	02-13-16	\$24.00			
DigiKey Customs	02-16-16	\$28.07			
Mikroe	02-24-16	\$69.04	\$47.00		
OSH Park	02-24-16	\$180.75	\$130.80		
Mikroe Customs	02-29-16	\$21.77			
DigiKey	03-01-16	\$67.74	\$49.86		
Lee's Electronics	03-02-16	\$232.40			
Lee's Electronics	03-12-16	\$17.23			
Main's Electronics	03-12-16	\$22.20			
DigiKey Customs	03-14-16	\$15.32			
DigiKey	03-18-16	\$75.63	\$56.37		
Omni Circuit Boards	03-18-16	\$86.24			
PCBWay	03-21-16	\$96.87	\$72.00		
Lee's Electronics	03-23-16	\$9.74			
		<b>Total</b>		<b>Reimbursed</b>	<b>Balance</b>
		\$1,444.87		\$693.00	-\$751.87





	Price 1 current (unit)	Price past 5k (unit)	Year 0 (TEST)	Year 1	Year 2	Year 8	Cost of Pack
<b>Revenue</b>							
Units sold	1	1	25	2000	4000	8000	5
unit revenue	\$80.00	\$140.00	\$0.00	\$280,000.00	\$560,000.00	\$1,120,000.00	\$700.00
** for now use use phone, or sell recon, or screen							
<b>Cost</b>							
<b>Variable Cost</b>							
<b>Total for Design Atmega328P</b>	\$38.54	\$24.35	\$610.95	\$65,167.72	\$130,335.45	\$195,503.17	
<b>Total for Design Currie</b>	\$50.18	\$28.84	\$680.45	\$70,447.72	\$140,895.45	\$211,343.17	
Headroom (7%)			\$0.00	\$19,800.00	\$39,200.00	\$78,400.00	
RnD (13%)			\$0.00	\$36,400.00	\$72,800.00	\$145,600.00	
Marketing and sales (12%)			\$0.00	\$33,600.00	\$67,200.00	\$134,400.00	
Individual Voluntary Arrangement- IVA (5%)			\$0.00	\$14,000.00	\$28,000.00	\$56,000.00	
<b>Fixed cost (year)</b>							
<b>One time cost</b>							
Wages			\$0.00	\$220,000.00	\$220,000.00	\$440,000.00	
General Expense			\$10,000.00				
Regulation (FDA, CSA)			\$2,897.00	\$283.00	\$284.00	\$283.00	
<b>Subtotal Cost with Currie</b>			\$13,557.45	\$394,330.72	\$568,379.45	\$1,066,026.17	
<b>Profit</b>							
Subtotal Profit			-\$13,557.45	-\$114,330.72	-\$8,379.45	\$53,973.83	
Cum CF			-\$13,557.45	-\$127,888.17	-\$136,267.62	\$229,001.15	
NPV for 5 year	\$23,648.09						
IRR for 5 years	15.39%						
NPV 8 years	\$111,298.12						
IRR 8 years	28.88%						



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