

A Work Project presented as part of the requirements for the Award of a Master's degree in Economics / Finance / Management from the Nova School of Business and Economics.

Building Companies Based on Science – A Business Plan for an Hydrogen Peroxide  
Decontamination Innovation

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Individual Submission

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## **Abstract**

Breakthrough Innovation in healthcare has been extremely impactful over the last few decades, thanks to its active role in saving lives. Our thesis has been developed having in mind the creation of a vision for a new venture, BioProof, tackling the dreadful problem of healthcare-acquired infections (HAIs), through an already well-known compound, Hydrogen Peroxide in an innovative form, vaporization.

Therefore, BioProof is directly addressing the fast-growing prevention care rather than medical treatments. During the entire project, our vision for BioProof has been shaped considering a business venture based on a technological breakthrough.

Keywords: Entrepreneurship, Innovation, Bio-decontamination, Strategy, Prevention

## **Acknowledgement**

All the intellectual property rights of the technology mentioned, dry VHP, are property of Delox. The breakthrough achieved by Fadhil Musa and his team were the basis for the work presented in this document. As such, we would like to thank them for their cooperation in explaining to us their innovation and in facilitating all relevant documents to help our understanding. Despite this, the vision of BioProof created in this document is of the entire responsibility of the defendants.

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## 0. Disclaimer

According to Nova School of Business and Economics regulations, each member of the same group of Work Project – Field Lab, has to submit separately the part in which he has been more involved. The purpose is to divide the entire company’s vision of the content in individual and common parts, to facilitate evaluation.

In our project division has been actuated as follows:

Division	Pages & sections
<b>João Ribeiro</b>	<ul style="list-style-type: none"><li>• PP 20-21, 23-25 Potential Customers</li><li>• PP 31-35 Competitive Landscape</li><li>• PP 46-50 Financial Forecast</li><li>• PP 50-51 Exit Strategy</li><li>• PP 54-55 Feedback survey</li></ul>
<b>Michele Sottana</b>	<ul style="list-style-type: none"><li>• PP 15 Business Model</li><li>• PP 15-19 Markets with the Highest Potential</li><li>• PP 19-20 Go-to Market Strategy</li><li>• PP 27-29 Feedback from experts &amp; professionals</li><li>• PP 29 Field tests</li><li>• PP 35-40 Logistic &amp; Supply</li><li>• PP 51-54 Key performance indicators</li><li>• PP 58-59 RoadMap</li></ul>
<b>Sebastian Cranston</b>	<ul style="list-style-type: none"><li>• PP 7-8 Executive Summary</li><li>• PP 8-11 Problem and Solution</li><li>• PP 12-13 Initial Applications</li><li>• PP 25-26 Pilot Phase</li><li>• PP 26-27 Market Indicators</li><li>• PP 30 Traditional Methods</li><li>• PP 33 Other Technologies under development</li><li>• PP 39-41 Marketing</li></ul>

	- PP 55-59 Team & Shareholders
<b>Common Work</b>	<ul style="list-style-type: none"><li>• PP 13-14 Intellectual Property &amp; Agreement</li><li>• PP 31-32 Innovative Approaches to HAI</li><li>• PP 41-43 Pricing</li><li>• PP 43-44 Insurance plan</li><li>• PP 44 Payment Plan</li><li>• PP 45-46 Investment Requirements</li></ul>

### **7.1.1 Potential Customers & Partners**

BioProof has targeted some specific potential customers in Canada. Our criteria considers a mix of network size, number of beds and standards/rating of the hospital. The network size will facilitate expansion, the number of beds will ease our arguments as there is more to win with our product and lastly the standards/rating will help us understand whether this is a hospital/network willing to pay for our product, ergo their customers' care.

#### **Hamilton Health Sciences**

Hamilton Health Sciences is a Canadian Corporation that comprises seven major hospitals in Ontario, as well as a few other Cancer and Children clinics and rehabilitation institutions. This corporation ranked 3<sup>rd</sup> in Canada's top 40 research hospitals in 2018 (Research Infosource Inc. 2018), showing the desire and willingness to improve and innovate. Its main hospital, Hamilton General Hospital, is Canada's biggest hospital by bed count with a total of 1251 beds. (Definitive Healthcare 2020).

The 2019-2020 community report mentions a partnership with Siemens and further investment in diagnosis equipment, as well as strategic objectives that point to equipment and service improvement. As such, our product is a perfect fit to help the corporation reach its goals. The president and CEO since February 2014 is Rob Maclsaac, who's office can be contacted via the number: 905-521-2100 ext. 76421.

#### **Lakeridge Health**

This is a health network that consists of 5 hospitals in the eastern part of the Greater Toronto Area, as well as a few other offsite locations. It includes the Oshawa Hospital, which is one of the biggest in Canada in terms of bed count, with 850 beds (Definitive Healthcare 2020).

One of the pillars of the corporation's Vision is innovation, something that is recurrently brought up in the 2019-2024 Strategic Plan (Lakeridge Health 2019), especially in the sense of improving the population's health. As such, we believe that our product is aligned with the group's objectives and our product will thus help the goals be reached.

### **7.2.1 Potential Customers & Partners**

In Brazil, BioProof is going to put in place an ambitious strategy to attract the highest-impact clients, starting with the reference group Rede d'Or and then expanding to at least two other important companies in the sector.

#### **Rede d'Or**

The Brazilian-owned Rede d'Or is a privately held, for-profit group of hospitals, which has become the largest independent operator of its type in Brazil, owning nearly 50 units. We believe it is the most suitable target for BioProof to partner with and penetrate the Brazilian market.

Since 2010, when it controlled only 20 hospitals, Rede d'Or has started a multi-billion expansion plan based on mergers and restructuring, which is still ongoing with the plan to add up to five hospitals each year. The company has shown constant growth in the last decade, surpassing \$3.3 billion in turnover in 2019 (World Bank 2020).

All the Rede d'Or hospitals have more than 200 beds, with around 1,000 surgeries per month and 30% of their capacity allocated to I.C.U., which is aligned with our strategy (Rede D'Or Annual Report 2019). To ensure quality of treatment, hospitals are equipped with high-end, medical devices imported from Germany and the United States. This focus on quality treatment is the key pillar of Rede d'Or and we believe we can match their mission and business requirements.

Lastly, one additional reason why we are targeting Rede d'Or as our first customer in Brazil is its social impact. Together with insurance companies, Rede d'Or has actively put in place measures to expand quality treatments to a broader segment of Brazilian society, including lower-income workers who previously had no health coverage.

### **Amil**

Amil is one of the largest private healthcare operators in Brazil. It owns 29 hospitals, 41 advanced healthcare units, a medical complex and many more clinics and healthcare centres. Apart from this, Amil also uses a large, accredited network in the country, including over 31.000 service providers, 1,900 hospitals and over 22,000 clinics (Amil 2016).

Its headquarters are in Rio de Janeiro and it has subsidiaries in nearly all Brazilian states, including São Paulo. Amil is also part of the UnitedHealth Group, a Fortune 500 company, and a global health provider. Amil can be a very interesting target for BioProof due to this global network, which can then allow us to expand further. On top of this, UnitedHealthcare Group has its own arm just for insurance, meaning that they are the ones who deal directly with HAI costs.

### **NotreDame Intermédica**

NotreDame Intermédica is another large Brazilian healthcare operator, founded in 1968. It controls a large network of 24 hospitals, 23 emergency units, and 87 clinics, as well as other healthcare units. It was successful in its IPO in 2018, and since then there have been further investments in human capital, infrastructure, and technology (Notredame Intermédica 2019)

NDI is a strong potential customer for BioProof due to their recent shift. On a path to becoming the number 1 operator, NDI has been eager to invest and improve, seeking new and

innovative technologies as differentiating factors – a role that BioProof could play. The company’s headquarters are in São Paulo and it had a \$2.1bn turnover in 2019.

The table below shows the initial points of contact for BioProof in Brazil:

Company/Group	Name	Position	Contact
Rede D’Or São Luiz	Victor Liporace	Supply Chain Corporate Director	<a href="#">LinkedIn</a>
Amil	Renato Alencar	Purchase Coordinator	<a href="#">LinkedIn</a>
NotreDame Intermédica	Anderson Castro	Purchase Coordinator	<a href="#">LinkedIn</a>

Following the pilot phase, if the results are severely preponderant toward only cleaning rooms in Brazilian hospitals, we will pursue the strategy to set up our office in Brazil instead Toronto. Exactly as in Canada, we will start through a warehouse and a small office hosting the three of us and one or two sales agents. The healthcare groups we will target are in many of the biggest cities in Brazil, allowing us to locate indifferently between Rio de Janeiro, Sao Paulo, or Brasilia.

## **9. State of the Art & Competitive Landscape**

### **9.2 Innovative approaches toward HAI**

Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>) has long been an important pick for fighting nosocomial infections, due to its effectiveness in eliminating bacteria. The two types of technology using Hydrogen Peroxide for this purpose prior to our invention were Nebulization and Vaporization, or VHP. These can be applied in different environments, and in hospitals they are used with the ultimate purpose of reducing the risk of Nosocomial Infections due to environment

contamination. Hydrogen Peroxide has been proved to be better than antibiotics, as it fights the bacteria physically and thus avoids the emergence of bacterial resistance.

**Nebulizing** consists of either iodine or hydrogen peroxide being released as a mist (similar to steam) and its benefit is its easy application and affordability. It is the more inexpensive form of this disinfection procedure. The product comes in liquid form, is easy to transport and compact, but it is not as efficient nor compatible with materials like VHP, the steam generated can harm digital equipment and it requires to be manually operated during the entire process.

**VHP** uses H<sub>2</sub>O<sub>2</sub> and releases it in the form of a vapor which, in a sealed environment, will spread to reach all surfaces and hence have 100% efficacy. VHP, however, is not used across all areas as it is much more costly than nebulization and much less compact and easy to use.

Studies have shown that while VHP inactivates 100% of biological indicators, Nebulization has a big and sometimes very inefficient success range of 10-79% (Doll, M. & Morgan, D. 2015). This has to do with the reach of the machines, as VHP gets on every surface whereas the nebulization mechanism does not (BioQuell 2014).

### 9.3 Dry VHP Superiority

The following table summarises how BioProof compares to VHP, its most direct competitor, attributing scores from 1 to 5 in each of the main selling points:

	VHP	DryVHP (BioProof)
Affordability	2	4
Material Compatibility	5	5

Efficacy	5	5
Compactness	1	4

As the table shows, dry VHP is directly superior to VHP in that it is more affordable and compact and equals the score in efficacy and material compatibility. According to Game Theory, any player will always prefer DryVHP to VHP, as choosing it represents a dominant strategy (Policonomics 2017). For that reason, we strongly believe that eventually all current VHP users will be interested in transiting to dry VHP, at least once the lifetime of the equipment currently in use is over.

Hence, the consumer choice will eventually come down to Dry VHP versus Nebulization, with the latter being the low price but less efficient option, as shown in the following table:

	Nebulization	DryVHP (BioProof)
Affordability	5	4
Material Compatibility	2	5
Efficacy	3	5
Compactness	5	4

Nebulization is slightly more compact and affordable, but considerably less compatible with materials and considerably less efficient, as shown previously.

## 9.5 Main Competitors

The current competitive technologies count on some players such as Bioquell, Amira and Steris and Fedegari in the VHP market.

Taking this into consideration, and given that our technology is strictly superior to that of these competitors, we assume that sales in the first years will follow the same behaviour as VHP's did in the beginning, as follows:

VHP	2013	2014	2015	2016	2017	2018
<b>Bioquell</b>	US\$4.12M	(US\$5.10M)	US\$0.86M	US\$0.54M	US\$3.63M	US\$2.31M
<b>Steris*</b>	-	-	-	US\$111M	US\$110M	US\$291M
<b>Fedegari</b>	US\$1.82M	US\$4.53M	US\$6.11M	US\$7.52M	US\$5.07M	US\$5.22M
<b>AmiraSRL</b>	US\$0.1M	US\$0.25M	US\$0.15M	US\$0.22M	US\$0.14M	US\$0.54M

Sources: (MorningStar 2020), (Investing.com Portugal 2020), (WallStreet Journal 2020).

\*Note that Steris is a wider group with considerable other income sources.

As for the Nebulization competitors, most players have little to no numbers available, as they are either part of major groups where this segment is not very relevant for the total sales or they are split in numerous subsidiaries, these are the numbers available:

Nebulization	2013	2014	2015	2016	2017	2018
<b>OxyPharm</b>	US\$0.28M	US\$0.48M	US\$0.34M	US\$0.42M	US\$1.92M	US\$1.97M

Source:(Orbis 2020)

Given BioProof's geographic expansion strategy, it is worth noting that Bioquell has 21 subsidiaries in Canada and three in Brazil, whereas Steris has seven in Canada and 1 in Brazil. There are no exact figures for performance in each country, but this information

suggests that the two companies have some activity in the two countries. This activity can be limited to compounding pharmacies or laboratories, for example.

## **12. Financial Analysis**

### **12.5 Financial Forecasts**

Assuming that BioProof's operations will begin in February 2022, with the first Boxes and Capsules being sold in the first year, we drew a bottom-up projection with four different scenarios: a negative one, a positive one, and two of partial success and failure, in which we are only able to penetrate the market in one country.

Assumptions:

- The Corporate Tax Rate is set at 20%, a weighted average of the Canadian and Brazilian tax rates, considering that tax rates vary between states and countries (Canada.ca 2020).
- The interest rate taken into account for the Project Valuation was the Federal 10 Year Treasury Rate of 0.97% (as of December 4<sup>th</sup>, 2020) (Board of Governors of the Federal Reserve System 2020)
- The US inflation rate is forecasted to an average of 2.2% over the next 10 years, and so that is the value we assume (Knoema 2020).
- The US\$/BRL exchange-rate was assumed to be of US\$1= 5.1297 BRL, according with the market on December 4<sup>th</sup>, 2020 (Bloomberg 2020).
- The US\$/CAD exchange-rate was assumed to be of US\$1= 1.2779 CAD, as of December 4<sup>th</sup>, 2020 (Bloomberg 2020).
- The average rent per square foot of office space in Toronto's midtown is 23.62 Canadian Dollars (Statista 2020).
- The average office rental price in São Paulo is 165.8 BRL per square meter.

### **Optimal Scenario** (Figure 3.)

- Most positive and desired scenario:
  - Strategy is successful both in Canada and Brazil.
  - Sales gradually increase as we proceed;
    - Slow start in 2021 year due to trial periods;
    - Gradual increase afterwards.

### **Canadian Scenario** (Figure 4.)

- Second most positive and desired scenario:
  - Market penetration only happens in Canada.
  - Sales superior to the next scenario, as we expect greater VHP use

### **Brazilian Scenario** (Figure 5)

- Third most positive and desired scenario:
  - Market Penetration occurs in Brazil only.
  - We expect that this market will seek our product for equipment disinfection only;
    - As such, sales are inferior to the previous scenario.

### **Negative Scenario**

- Worst possible scenario:
  - No sales occur as strategy fails completely.

### **Risk Assessment**

It is our understanding that there may be some risks associated with this business. Considering this, we will briefly mention the ones we consider relevant and solutions in place in case they exist.

**Currency Fluctuation** - With internationalization to countries with different currencies, we expect the business to be exposed to fluctuation risk, especially considering that one of the countries in question is Brazil, with a currency that has a recent history of strong value variations. To fix this, we will make all our transactions in American Dollars, a stable currency.

**Payment Delay** – While the powder is paid upfront, the boxes will be paid for in two instalments, allowing for delays in payment. As our business model is of the Gillette type, the revenue from selling boxes will be minimal, and as so this is a risk that does not represent a great threat.

**Market Risk** – As in all businesses, there is Risk Associated with the market. Being in the healthcare industry, there is a tendency for market risk to have small impacts on the industry, as healthcare is a primary need.

**Competition Risk** – Delox’s Intellectual Property will only be protected for a certain period. After this, there are little barriers preventing other competitors from reverse engineering our product and entering the market with slight modifications. Our way to fight this risk will be to try to be stable and as settled as possible in the market by the time patents are due, but also to continue investing in R&D and ask customers for feedback, to continue improving.

**Political Risk** - While we expect this risk to be fairly low in Canada, the story is different in Brazil. With unstable political options over the last decades, Political Risk is a reality in Brazil, with multiple insurance companies placing Brazil as a medium or high political risk country in 2020 (Aon 2019).

**Faulty Equipment** - Although we get our product from third parties, we will be selling it and so we can be held accountable for accidents or injuries as a result of a malfunction. Our way to protect ourselves from this is via insurance.

## **12.6 Exit Strategy**

There are several potential strategies for both the entrepreneurs and the investors to make a successful financial exit from BioProof. Such strategies can consist of selling the company to another company operating in the medical equipment industry which may be interested primarily in acquire our extensive network of clients (hospitals), collected in several years of operations and spanning at least two nations in the American continent. Those companies are typically big players in the healthcare market. Another potential acquirer are Private Equity companies with investments in the healthcare industry. As previously stated, we have an agreement with Delox that prevents us from selling BioProof to a direct competitor (see “Main Competitors” section) and limits our operations geographically to the American continent.

We perceive a trade sale to a larger company in the same field as the best exit , at least for the moment. We will attempt to reach out to the top firms in the medical device industry. Our targets will be, for example, Medtronic Plc., Johnson & Johnson, General Electric Company, Abbot Laboratories, Becton, Dickinson and Company, Cardinal Health Inc., or Stryker Corporation, as these are all companies considered to be in the top-40 Medical Device Companies (Qmed 2020). We will also attempt to reach out to other companies in this ranking, but the approach to these ones will be leveraged on the fact that we are already operating, and Canada and our product has been approved by the FDA, hence these companies too can leverage on their existing network in said countries to increase sales for BioProof.

As mentioned previously, another exit strategy consists of seeking acquisition from a Private Equity firm interested in the healthcare sector, ideally pursuing a diversification strategy, and looking for new synergies. Private Equity investments in the sector have been increasing and shown considerable performance in recent years (Jain, N. 2019) and some potential customers can be reached out through the Healthcare Private Equity Association

(HCPEA), such as Bain Capital, HealthEdge Investment Partners, Kelso & Company or Novo Holdings (Healthcare Private Equity Association 2020).

As all businesses come with a risk associated, it is wise to also prepare for the possibility of things going wrong. In case they do, or if we come to realize that there is only so much, we can do without a renowned name in the market and a fully developed company behind us, we will consider exiting earlier through one of these channels to either get some of our investment back or to make a safer but lower gain than our projected NPV.

By 2030, in a positive but realistic scenario, we expect our company to be valued at US\$60,000,000.00, or about 3x annual revenues.

### **13.3 Expected Impact – Feedback’s Surveys**

One of the stages of our relationship with the customers will include a feedback survey, both for customer relationship management (CRM) and savings calculation purposes.

Regarding CRM, to ensure that we are providing the best possible service to our customers, we will draw a customer satisfaction section on the survey, that will address matters as easiness of use of our product, overall satisfaction with the usage, satisfaction about the supply chain (to ensure that the timings and status of delivery are running smoothly), satisfaction with the team and support and, lastly, leave room for improvement suggestions or comments. This will be particularly important to keep our customers satisfied and to retain their usage of BioProof.

Although we know that our product is effective in eliminating pathogens and, just as Nebulization and VHP, it brings value added to hospitals, not only as it saves lives but as it saves money, we would like to draw conclusions on average savings due to the use of your technology and be able to provide average expected savings to hospitals. To do this, we will ask some of our clients for existing information on annual HAI numbers before and after they

acquired our product and, to prevent from the case in which they do not keep track, we will attempt to make a select few hospitals keep track of such KPI. In this latter situation, data on 2-3 hospitals will suffice and, as such, we have margin to offer a special discount in order to incentivize cooperation on this topic. We will also ask for information on expenses with cleaning staff before and after the acquisition of our product. This might represent only slight savings, but as our technology solely requires a staff member to place the cartridge and press a button, we expect that this can bring some savings to the hospitals and medical facilities as well.

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## 16.1 Appendix

Figure 1.  
Stakeholders Contacted

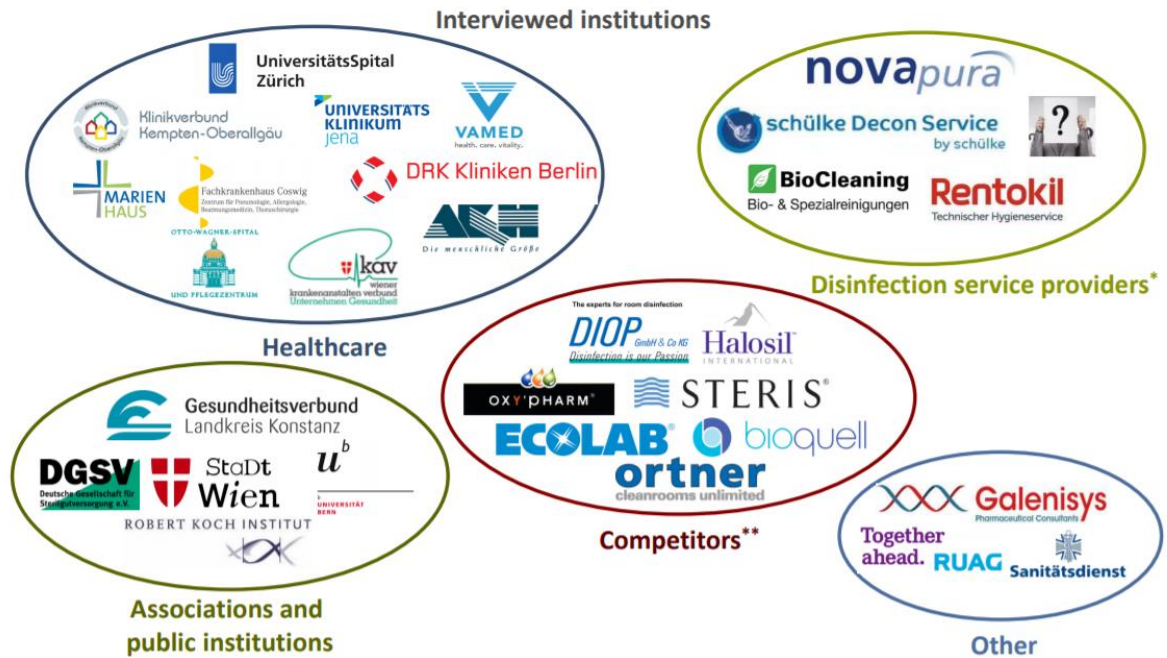


Figure 2. Division of equity

