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Aequor – Developing and Bringing to Market Non-Toxic Natural Marine Chemicals for Dispersing Agents, Water Treatments and Cleaners that Prevents the Formation of Biofilm by a Broad Spectrum of Bacterial Species and Fungal Species

Marilyn Bruno, Ph.D., JD
CEO/Co-Founder

Aequor Inc

Interview conducted by:
Lynn Fosse, Senior Editor
CEOCFO Magazine

CEOCFO: ***Dr. Bruno:, what is the idea behind Aequor?***
Dr. Bruno: - Aequor means "the sea" in Latin and that is because we are inspired by chemicals that are found in the coral reef.

CEOCFO: ***What have you discovered and how are you using this discovery?***
Dr. Bruno: Dr. Cynthia Burzell is our co-founder and CSO (Senior Scientific Officer). She is a marine and medical microbiologist, who is a dive master as well. When she was diving in the coral reef, she saw that some surfaces were covered with barnacles, mussels and algae, and other surfaces were clean. Therefore, she hypothesized that Nature must have developed some mechanism to prevent those foulers (barnacles, mussels and algae) from attaching to the clean surfaces. In fact, researching the clean surfaces, she discovered good bacteria that produce natural chemicals that protect the surface from bacteria and fungi. As on land, these same chemicals inhibit the ability of bacteria and fungi to attach to surfaces, colonize, infect and contaminate. She discovered new antimicrobials that are a natural way to eliminate bacterial and fungal colonization. This is a big breakthrough.

CEOCFO: ***What are the challenges in getting them from the ocean and how are you able to replicate? How long was the process from discovery to having a product?***
Dr. Bruno: Great question, because it was a long slog. Dr. Burzell made this discovery, knowing there were unidentified chemicals and that they were working, but we did not know what they were or whether they were new or not. We also did not know how they worked and their structure. It literally took years to screen these chemicals against hundreds of different bacteria and fungi, and sure enough they killed them all. She also had to find out what they were, and that meant working with chemists to identify the molecular structure of the chemicals. And yes they are novel, which was pretty exciting. I call this the gold mine; natural chemicals never known before.

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Then we worked with chemists to synthesize them chemically. They can also be duplicated by fermentation, but that is a little trickier at scale and costly for us to do without a partner. Therefore, we just went ahead with Phase 1 of our company's product rollout, which was to use bioinspired analog molecules that we are able to obtain in large quantities.

CEOCFO: ***Was there point where you were ready to give up; what gave you the confidence you would get there in the end?***
Dr. Bruno: The small wins and recognition kept us going. When you are in discovery mode everything is difficult but very exciting. Since you cannot sell any chemicals in the USA or overseas without regulatory approval, we had to ensure that our bioinspired analog molecules had U.S. regulatory approval under the EPA Toxic Substances Control Act. We use these as ingredients in our Phase 1 products for water treatments, cleaners and industrial process enhancers.

The next thing to do, once we found that the chemicals worked and how they worked, was to find out who needed them. NASA was actually our first customer. NASA expressed interest when they heard about our product as a possible solution to the problem of resistant bacteria in Space. To protect themselves against radiation, the vacuum, etc., the bacteria had survived by rapidly forming resistance by enveloping themselves under a slimy shield called biofilm. This same biofilm shield can be considered the first and often only antimicrobial resistance response that bacteria and fungi on Earth form to protect themselves against disinfectants, antiseptics and antibiotics.

"Ten years ago when we talked about antimicrobial resistance, the need for decarbonization, and the elimination of toxic chemicals, few people were aware of the scope and impact of these problems. Today, Aequor's data speaks for itself and we hope that this resonates with someone who will contact us to join our team." Marilyn Bruno, Ph.D., JD

CEOCFO: ***Where are you today at Aequor?***
Dr. Bruno: After 3 years working with scientists at the Marshall Space Flight Center, Aequor won a very big NASA prize for solving the problem of biofilm inside the water reuse/recycling systems used on manned spacecraft. Given the important use of our product for the Space Program, we undertook validation testing back on Earth with multinationals and U.S. agencies, which confirmed that Aequor's chemicals worked against many of the antimicrobial-resistant bacteria and fungi. One multinational stated that nothing else known today that could remove biofilm at non-toxic doses, reducing the threat of resistant bacteria and fungi on all surfaces and replacing $350 billion worth of toxic chemicals sold every year. Given our experience cleaning up the NASA water recycling system, we focused on developing water treatments using our product. This led to our eliminating biofilm in water filtration systems under a contract with the Department of Defense, improving industrial processes using water, such as aquaculture, algae cultivation and fermentation, under grants with the Department of Energy, remediating oilfield water under a project with a major oil and gas company; and many other different projects.

CEOCFO: ***Are their different strains? Have you developed different doses? Is it a one size fits all? How do you know what works in each situation?***
Dr. Bruno: That is the genius of Nature, to have developed an overall, non-toxic mechanism that prevents the formation of biofilm by a broad spectrum of bacterial species and fungal species. That is incredibly unusual. Aequor discovered different strains, species, and a new genus of marine bacteria and has shown that different concentrations are needed depending on the type of bacteria and fungi. We have successfully tested against common water borne bacteria, bacteria in the air, in food, on surfaces, including *Salmonella*, *E. coli*, Gram-negative, Gram-positive pathogens, and the resistant super bugs like MRSA and VRSA.

It has been fascinating to do the validation tests on our own and under pilot projects with some sponsors because, every time we do a test, our product works better than anything else on the market.

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CEOCFO: ***With so many possibilities and seemingly endless opportunities, how do you decide where to focus, both in outreach and in research?***
Dr. Bruno: As I mentioned, we are restricted by regulatory approvals. Our ingredients are approved under the Toxic Substances Control Act, so we can sell our chemicals as dispersing agents, water treatments, cleaners. That is why we first focused on the $50 billion specialty chemical market for water, agro-industrial process es using water, some pre-cleaning and similar verticals.

In order to make antibacterial and anti-biofilm claims for our natural molecules, we will need higher level EPA approval, and if used in therapeutics we would need FDA approval. Therefore, we can only address the markets we have approval for.

CEOCFO: ***How do you reach out to companies that might want to do a pilot project or learn about what you are doing? How do you go beyond the pilot project?***
Dr. Bruno: Going from R&D to commercialization is a big step. Dr. Burzell, manages the lab. I am responsible for the business side of the company. We are both supported by expert consultants in every specialization. Raising money has been the hardest thing, because our product is something new. Some investors perceive this as risky if they are unfamiliar with the chemical ingredients industry, even though we have consistently obtained validations that our products measurably eliminate risks. We are interested in offering samples to companies capable of doing pilot projects. Through this we have done projects both with multi-nationals and with government agencies, including USDA, Department of Defense, NASA, and Department of Energy. Through those pilot projects we have also gotten some significant customers. Additionally, Aequor is a certified Woman-Owned Small Business, eligible for U.S. government contracts. Therefore, we have put all pieces in place to ease our way into business-to-business and business-to government commercialization.

With funding to expand our sales and executive teams, we could be doing a great deal more. We have overcome the Phase 1 problems of launching new chemicals into the marketplace, the high cost of regulatory approvals and filing protection on a robust patent portfolio, but it has been well worth it. Our go to market plan includes licensing, so we plan to license our IP (Intellectual Property) to companies with existing customer bases. That is our segue into the marketplace.

Another way we reach out to potential customers is to give interviews and lectures at conferences where Aequor has become well- known as a leader in bio-fuel production using renewable feed stocks like algae and fermented crop and landfill waste, decarbonization and energy and water savings, water treatments, toxic chemical replacement, etc. This has helped to give us the customer base for our Phase 1 products.

However, Aequor's gold mine contains the natural marine chemicals that are still waiting to be developed and exploited properly. We just have to wait to find partners or raise the funding needed to get them synthesized at scale and validated. Before COVID, we showed the validation data to Dr. Anthony Fauci, and he provided Aequor with a contract with the NIH, National Institute for Allergy and Infectious Diseases, to provide us with free pre-clinical trials. This is thrilling, and Dr. Fauci had the vision to know that our chemicals represented a simple and inexpensive cure for antimicrobial resistant infection and disease that kills millions of people every year. Then COVID hit, and we literally lost three years of progress as everybody shut down their operations. Then when we cranked back up, we went into the industrial biotech and the water sectors.

CEOCFO: ***How do you deal with the frustration of knowing you have something that can make a difference, yet there are many constraints in getting into usage?***
Dr. Bruno: Aequor has discovered new antimicrobials that can prevent and cure deadly resistant infections and diseases. We were surprised to find out that this is not economically attractive for potential licensees in the Pharma sector, which have stated that the government should fund this R&D. Market circumstances dictated that Big Pharma companies walked away from R&D for anti-infectives and antibiotics ten year ago. They claim their low ROI (Return on Investment), compared to the blockbuster drugs that patients have to take every day for the rest of their lives.

We continue to apply for grants and looking for partnerships with Big Pharma Companies to enter this market. We also advocate for more funding for understanding the resistance response mechanisms and ensuring that the obstacles are removed to finding effective cures. It us a tragedy for us to see millions of people dying of antimicrobial-resistant

infection and disease every year, including from hospital acquired infections, chronic wounds, contaminated food, water and surfaces that we see as avoidable.

The reason Aequor has been able to go on is because we raised pre-Seed funding from family, patient angel and venture investors and many success stories in agro-industrial use cases. For example, after the NASA work, our product was launched to the international space station for further experiments. Seeing our little product in that capsule shooting up into Space was really exciting and we have had so many more exciting moments. We have won awards and enough grant funding just to keep us afloat while we are out there looking for investors and partners. We are also currently doing a talent search to expand our management team.

We are gratified to see growing unmet market awareness of the demand for unique products like ours. Ten years ago when we talked about antimicrobial resistance, the need for decarbonization, and the elimination of toxic chemicals, few people were aware of the scope and impact of these problems. Today, Aequor's data speaks for itself and we hope that this resonates with someone who will contact us to join our team. We cannot do it alone. We welcome partners!