

Q&A with Dr. Carl Schwartz, President, CEO and Director of Precision Therapeutics Inc. using Artificial Intelligence to Guide Therapy and provide True Personalized Oncology



Dr. Carl Schwartz
President, CEO and Director

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Interview conducted by:
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CEOCFO: *Dr. Schwartz, when we last spoke you highlighted that Precision Therapeutics Inc. was focused on AI for use in tumor testing to bring precision medicine to cancer therapy? Why is that important today?*

Dr. Schwartz: When we receive the patient tumor for testing in our Precision Oncology Insights platform, we know the patient has cancer. Our approach is about using AI, artificial intelligence, to guide therapy to improve the prognosis of the patient, i.e. to achieve a better outcome. The AI approach is important today because we can build systems that learn from the huge amount of data we have about patients and use that to guide decisions about treatment options for each individual patient - true personalized oncology. The interest in using AI for precision medicine has been fueled in part by the digitization of healthcare records, as well as the surge in genomics (sequencing) – so we have access to an unprecedented amount of data with the potential to improve healthcare outcomes. We believe AI can extract useful knowledge from these data to achieve improved, patient specific outcomes.

CEOCFO: *How is artificial intelligence actually used in cancer therapy?*

Dr. Schwartz: Our AI platform, which we call D-CHIP, learns the relationships between the genomic profile of the patient's own tumor and the drug response of that tumor. The ability to grow the patient's own tumor in the lab from the genetic profile and test drugs on them is unique to our subsidiary Helomics, and it has amassed data on more than 150,000 cancer cases. D-CHIP learns what genomic profiles relate to what drug the tumor best responds to and then we deliver that information back the patient's oncologist to individualize that patient's therapy. Of course, the knowledge we extract from that patient's tumor, not only helps that patient but new patients as well. In addition, the knowledge in D-CHIP is of significant value to our pharma customers for the development of new drugs

CEOCFO: *Is AI more applicable to solid tumors or blood tumors, or could it perhaps be used in both?*

Dr. Schwartz: AI doesn't really care where the data comes from. However, we specialize in solid tumors as these are generally harder to treat because they are so diverse compared to blood cancers. In fact, blood cancers were among the first cancers where we were able to use genomic "biomarkers" to precisely target drugs. The complexity of solid tumors and the wealth of data we have means that AI is will be more instrumental in understanding how to utilize that data.

CEOCFO: *What does AI allow us to do that is not being done with current treatment approaches? Does it for example allow the oncologists to for example design a cancer cocktail faster and with drugs that have shown success in a particular type of tumor?*

Dr. Schwartz: The power of AI allows us to really address the complexity of cancer and provide a personalized and precise approach to targeting cancer therapy of that individual patient's cancer. Every cancer is different and the AI we have built into the Helomics D-CHIP platform allows us to utilize the knowledge from 100,000's of patient tumors from different cancer types and stages that Helomics has tested. We combine this knowledge with the genomic and drug response profiling of a patient's own tumor to determine the most appropriate drug or drug combination. The oncologist

has access to this rich information in order to individualize the patient's treatment to improve the outcome for that patient based on their unique tumor profile and how it compares to the AI knowledgebase of all the tumors we have tested.

CEOCFO: *There have been some other companies that have entered the field of AI in use for tumor diagnostics? What is different about what you are developing? When you say AI, is there also machine learning and deep learning involved?*

Dr. Schwartz: Remember, we use AI and genomic and drug response profiling of the patient's own tumor to help guide therapy and this brings a couple of key differentiators to bear. First, we functionally test the tumor from the patient by exposing it to different drugs. This is unique in the industry, as most companies simply look at the genomics of the tumor and compare that to other data. Secondly, we have a huge database of these drug response profiles together with genomic data that already exists from the testing activities and investment (\$180M+) put into Helomics over the last 15+ years. These data are driving our AI platform today, whereas many of the other companies out there are investing \$100M's to generate data to feed their AI platforms. Those assets, ability to grow live tumors and the huge database already available, means we feel we can compete with these larger companies. On the AI side, AI and machine learning are synonymous in my mind. We make use of a wide variety of machine learning algorithms, including deep learning networks.

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CEOCFO: *What is needed in the way of hardware and software to accomplish this? Are there special chemicals needed in the processing of the sample tissue?*

Dr. Schwartz: We use cloud-based platforms so no special hardware is required. Today, the software tools we need to build AI systems are open source and well understood and can be easily deployed at our cloud-based platform. The key to AI is data and we have a proprietary approach to presenting that data to the software tools. In terms of the “wet lab”, it is the growing of tumors that uses a proprietary process and special nutrient solutions to grow the tumor outside the patient's body.

CEOCFO: *Where are you in development and as a go to market product will it be something housed in a lab somewhere that doctors will have to send tissue sample to you or will you be selling the hardware, software and possible disposables?*

Dr. Schwartz: The Helomics laboratory is already running these tests and has been doing so for 15+ years. Samples tissue from the patient biopsy comes into this lab on a daily basis and the clinical testing is performed in the Helomics lab as an LDT (Lab developed Test) regulated by CLIA. The high complexity of this kind of testing and the regulatory requirements means that it will always be performed in a laboratory with highly trained staff.

CEOCFO: *Would you tell us where your TumorGenesis subsidiary is in its efforts to grow patient tumors in the lab?*

Dr. Schwartz: TumorGenesis has the first kit available for clients; we call it the discovery kit. It allows clients who have access to patient tumor samples, from clinical trials or biobanks, to identify which biomarkers present in all the different cell types within the tumor and surrounding tissues will bind to these cells. This is important because the identification of the biomarker is the first step in isolating all the different cancer from the patient tumor. The next step is the ‘capture’ and this uses a second kit is also supplied by us. In this capture step the biomarkers from the first step are used to bind the cancer cells from the patient tumor to a support. The cells can then be looked at and identified as either growing or not and we can identify what cell type it is, ensuring we have all the cell types present in the original tumor. Once that is done, the cells can then be expanded and screened at Helomics with a wide variety number of approved drugs in combination and in dilution; delivering the best combination treatment for that patient's sample.

CEOCFO: *What has been the medical community response to the use of AI as being a part of cancer treatment and specifically what you are doing at Precision Therapeutics?*

Dr. Schwartz: Most of the oncologists we talk to are looking for all the help they can get to help achieve the best outcome for their patients. We've had a very positive response to what we are doing from both existing and new oncologists we have talked to. The value of our AI platform is that it encapsulates huge amounts of data on patient tumors that no single oncologist could ever hope to get by reading current research papers or talking to colleagues. Think of it like having the

experience of thousands of oncologists at your fingertips to help you choose the right drugs for the right patient. Importantly, the AI doesn't make the decision it merely provides evidence to help the oncologist.

CEOCFO: *What are you doing to get the word out? Are you attending conferences?*

Dr. Schwartz: Our plans are to initiate contact with prospective clients either at conferences or on a one-on-one call. The industry is looking for a faster, cheaper and more reliable means of categorizing and testing patient tumors.

CEOCFO: *Precision Therapeutics recently secured the rights to novel technology designed to develop drugs that target specific cancer by its mutation? Would you tell us about that and where the technology is in its development?*

Dr. Schwartz: The technology already has proof-of-concept and we are now commercializing it in the form of kits for those clients that want to do some of the work in their own labs. In addition, as shipping human samples is cumbersome and fraught with regulations, etc. they can minimize that by either doing it in their own labs or a hospital lab where the patient samples are collected, or they can send them to our lab at Helomics which is CLIA certified. The technology is ours. Our focus right now is the identification of different patient tumor types and what is the most effective treatment for that tumor using drugs already approved by the FDA. Certainly, a novel combination of drugs is something that is highly valuable and deserves our attention, but right now, we want to get this technology helping patients first.

CEOCFO: *You have recently added some members to your scientific advisory board? Would you tell us about them and what they add to the company and your efforts in cancer diagnostics?*

Dr. Schwartz: Our SAB is focused on our mission as a Precision Medicine Company, so is comprised of key opinion leaders from medicine (Dr Paul Kornblith), pharma industry (Dr Amelia Warner, Dr Hector Gomez and Dr Paul Sweetnam), as well as computational biology/artificial intelligence (Dr. Robert Murphy). We also have representation from Dr. Marc Malandro in terms of academic partnerships.

CEOCFO: *How are you with funding today? Are you considering reaching out to investors or partners to continue your growth?*

Dr. Schwartz: We have tapped the public markets a number of times during the past 3 years and will continue to do so opportunistically.

CEOCFO: *In closing, address our readers in the investment and healthcare communities. Why is Precision Therapeutics an important company and how will you make a difference in the way we approach the treatment of cancer?*

Dr. Schwartz: AIPT is our symbol and it stands for applying artificial intelligence to cancer one mutation at a time. We stand at the inflection point in cancer treatment. Historically patients were treated with drugs approved for cancers by the organ in question such as breast cancer, prostate cancer, liver cancer, etc. At Precision Therapeutics we understand that cancer is personal – meaning each organ that has cancer has a specific mutation. For example, there are 24 varieties of ovarian cancer and one drug does not work for all 24 mutations. We use of artificial intelligence system applied to a database that has drug response data to advise oncologist on how to treat patients by the type of mutation they have. This same program is also invaluable to big pharma in the development of new drugs. This will be our major business – working with drug companies on new mutation specific drugs.