



PHYSIC VENTURES

investing in keeping people healthy

Physic Ventures Sees Wider Adoption of Personalized Health Solutions

Physic Ventures Highlights Recent Investments in On-Q-ity and T2 Biosystems, Leading Companies Developing Novel Solutions For Personalized Health

An important issue facing patients and physicians in our current healthcare system is the mutual challenge to identify treatments that are efficacious, cost-effective and without risky or disruptive side effects. The anti-coagulant warfarin prescribed to prevent thrombotic events has wide variation in its effect and risk profile in different patients. When treating depression, patient responses to Prozac (a drug in a class called selective serotonin reuptake inhibitors, or SSRIs) may differ from responses to Zoloft (also an SSRI). The risks to the patient and the increased costs to the healthcare system from “trial and error” medicine necessitate a more precise and effective approach. Drug developers, traditionally focused on developing treatments for conditions affecting an overall population, increasingly recognize the importance of disease mechanism and heterogeneity in individual response in assessing therapeutic efficacy. Increasing pressures on health providers to make treatment decisions with precise information about a patient’s disease stage and inherited variants that affect response to therapy is driving the desire for new, more advanced diagnostic methods and devices.

Physic forecasts a personalized and precise approach to care. This approach will integrate disease biology, individual genetic variation, and decision support systems; it will enable physicians to make more informed treatment and dosing recommendations, thereby reducing safety risks and increasing the efficacy of prescribed therapies and patient compliance. With the integration of personalized tools, physicians can proactively guide, monitor and adjust patient care, enabling better outcomes in a more cost-effective manner.

Investing in Keeping People Healthy

Physic Ventures is committed to *investing in keeping people healthy* and is building companies dedicated to providing solutions to improving the health of people and our planet. Motivated by the rising incidence of chronic disease, rising costs of healthcare and a philosophical shift to the “Consumer in Charge”, consumers are demanding transformational changes in the consumer-health relationship. Driven by increased access to health-related information, rising consumer responsibility for self-care and increased flexibility and choice over the path they pursue to health, consumers and their physicians are seeking personalized solutions that accommodate individual biological and genetic variation, lifestyle and individual economic and social choices.

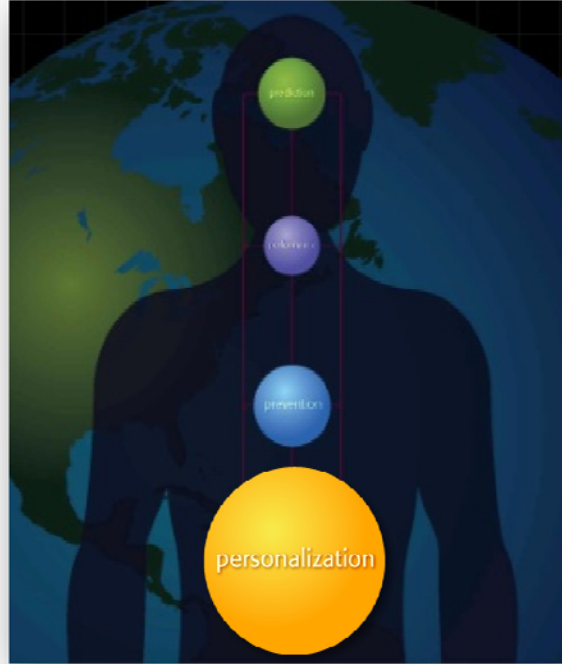
Fitting into this desire for personalization, advances in technology and scientific and clinical knowledge are leading to new approaches to the prediction, detection, diagnosis, prevention and treatment of disease. Physic Ventures sees a growing opportunity to invest in this convergence of technology innovation, scientific insights and consumer education to enable cost-effective solutions that enhance health outcomes.

There are four overarching themes influencing Physic's investment focus on technology-enabled solutions to empower consumers to improve their health:

- **Prevention**
- **Personalization**
- **Prediction**
- **Performance**

Investment Strategy in Personalized Health

Physic Ventures is prioritizing the theme of *Personalization* in its strategy to invest in keeping people healthy and is building companies commercializing science and technology-enabled solutions for personalizing health. Physic defines personalized health as “*the use of precise tools and technologies to measure an individual's unique characteristics for the purpose of enhancing health.*” This definition encompasses a range of solutions across a broad continuum of care (including tools, diagnostics, devices, therapeutics and services), offering a rich source of innovation and investment opportunity. In a strategic review of the landscape, Physic Ventures see the following areas as attractive and ripe for innovation:



- Molecular or biochemical biomarkers to:
 - assess disease status or predisposition
 - determine eligibility for, selection and optimal dosing of therapeutic interventions
 - assess therapeutic efficacy and responsiveness
 - monitor disease and assess risk of recurrence
 - establish the value of pharmacogenetics to reduce adverse events and drug-related toxicities
 - Optimize personal health and wellness
 - Optimize nutrition for individual dietary needs
- Decision support systems to assist the medical and payor community in personalizing treatment decisions and patient management
- New technologies and platforms to enable decentralized (point-of-care/point-of-use) diagnostic testing and monitoring for clinical and non-clinical applications
- Targeted therapeutic approaches based on the understanding of the molecular mechanisms of disease
- Tailored health benefits to meet an individual's specific health conditions

While the landscape will continue to evolve, Physic's current observations and insights are:

- Knowledge of individual and disease heterogeneity is advancing
- Consumer engagement in health is rising
- The current healthcare system is failing to effectively address a diverse set of clinical and non-clinical health needs
- The "one size fits all" system of drug development, health delivery and regulation is lacking predictable and personalized tools to make therapies that take into account heterogeneity and to deliver care that is tailored and more effective
- In a consumer-driven health context, personalization presents a critical, and largely unmet, opportunity to transform the care paradigm by improving health outcomes and reducing costs

Based upon these learnings and insights, Physic Ventures is investing behind a clear set of principles for assessment of personalized health solutions and diagnostics, based on the following four key criteria that enhance likelihood of success and fit with the firm's consumer-directed investment focus:

1. Based on validated science – the underlying science has been validated in well-designed studies and is applicable to multiple conditions providing a range of commercialization opportunities
2. Actionable – the solution should inform a decision around a treatment, procedure, preventive action or behavior
3. Clinically meaningful – the use of the information should provide meaningful changes in health outcomes
4. Cost-effective – the solution should be priced at a point where the patient, provider and payor all benefit from its adoption and use

Physic predicts steady growth in the development and commercialization of novel personalized health solutions driven by the need to improve quality and lower costs of care. Despite the grand achievement of sequencing the human genome, the prior decade fell short of expectations in delivering the promise of personalized medicine. As the understanding between genes and health traits deepens, use increases for precise tools customized to individual genetic variation. The growing adoption of personalized tools is currently concentrated in life threatening, high-cost clinical applications, with the diagnosis, treatment and management of cancer, cardiovascular disease and infectious diseases as key early adopters. Physic Ventures anticipates that the tools being developed to personalize therapies and care will extend to a broader set of health conditions and eventually become an integrated component of drug development, clinical care and health management.

Recent Investments in Personalized Health

Physic's investment in On-Q-ity (<http://www.on-q-ity.com/>) represents its first in the area of predictive diagnostics. On-Q-ity is developing two novel platform technologies with the potential to transform the cancer care paradigm. The first technology is based on proprietary tissue-based DNA repair biomarkers for predicting therapeutic response in individual tumors and the second technology enables the enumeration and characterization of circulating tumor cells in blood, minimizing the need for invasive tumor biopsies. On-Q-ity is a strong fit with Physic's thesis on personalization, for a number of reasons. First, On-Q-ity's intellectual property, covering a broad

range of cancer types, is based on key pathways implicated in cancer cell survival and was developed by leading academic scientists. Secondly, the application of On-Q-ity's platform has the potential to disrupt how cancer is currently diagnosed, monitored and treated. Cancers are being characterized and diagnosed differently, with a shift from the traditional anatomical definition (e.g. breast cancer) to a categorization by the molecular markers or signatures driving the disease. Consequently, Physic Ventures anticipates that the future of cancer care will be based on personalized approaches that are guided by molecular characterizations and thus more targeted to individual needs. The use of molecular signatures will provide important information around susceptibility to treatment and to prognosis for the patient, leading to more cost-effective individualized treatment regimens that increase a patient's likelihood of response.

Physic Ventures' investment in T2 Biosystems (<http://www.t2biosystems.com/>) is a further illustration of Physic's focus on personalized health. T2 Biosystems is developing the next generation of clinical diagnostic solutions based on its proprietary platform, which combines nanotechnology and miniaturized magnetic resonance technology. T2 Biosystems has the potential to increase the speed and decrease the cost of diagnostic testing enabled by its platform's ease of use, rapid turn-around time and ability to perform a wide range of tests on a single machine in a decentralized setting. T2's proprietary technology eliminates the need for extensive sample preparation and enables the combination of molecular and immunoassay analysis on a single platform. T2 Biosystems' strategy is to commercialize the platform in decentralized settings, including hospitals, diagnostic laboratories and medical offices, where there is a strong demand for rapid turn-around of lab-quality tests in a cost-effective manner. Physic predicts that expansion of decentralized diagnostic solutions will improve the physician-patient relationship and increase patient engagement in health decisions, thereby strengthening opportunities for prevention, self-care and ultimately improved outcomes. T2 Biosystems' platform has the potential to transform the manner in which diagnostic testing is conducted, the settings in which such tests are performed and ultimately, improve disease diagnosis and guide treatment decisions.

Physic Ventures is pleased to support On-Q-ity and T2 Biosystems in their respective efforts to innovate and drive the adoption of personalized tools to enable more precise treatment decisions. Physic anticipates expanding the Physic portfolio with additional investments in the personalized health sector over the next several years.

Public Policy Challenges to Adoption of Personalized Health

In an effort to gain wider use of personalized health solutions, Physic Ventures sees support from government and regulatory agencies in charting a course for their adoption and establishing standards and criteria that emphasize evidence-based approaches. In the June 15, 2010 publication of the *New England Journal of Medicine*, FDA Commissioner Dr. Margaret Hamburg, and NIH Director Dr. Francis Collins presented their ideas for the future of personalized medicine, in which they envision substantial investments to be made in infrastructure and increased standards to increase the pace of adoption of evidence-based personalized medicine. These recent statements intending to clarify the regulatory review and approval process are promising. Such clarity will encourage investors, innovators, providers and payors to embrace and adopt personalized health solutions. Additionally, increased use of comparative effectiveness will better support individuals in identifying the best approach for his/her own health decisions.

Notwithstanding the growth opportunities in personalized health, significant public policy

challenges remain for successful adoption among multiple stakeholders, including patients, providers and payors. Physic sees the main challenges as:

- Recognition of the economic value of using innovative diagnostic approaches to enable treatment decisions and appropriate sharing of the cost savings with the diagnostic innovator
- Opaque processes for obtaining reimbursement by payors
- Uncertainty in the intellectual property protection afforded to diagnostic innovators

These key economic, regulatory and reimbursement challenges are at the forefront, and critical to the success, of the personalized health agenda. It is essential for key stakeholders, including entrepreneurs, investors, regulatory authorities and policymakers to collaborate in order to frame and influence the debate and contribute to a solution that recognizes the diversity of interests. When these challenges are effectively and thoughtfully addressed, the adoption of personalized tools to improve health outcomes in a cost-effective manner will be accelerated.

Personalization to Expand Beyond Clinical Medicine to Health and Wellness

As the value of personalized tools becomes firmly established in the clinical setting, a broader opportunity will emerge to leverage scientific insights beyond the bounds of the traditional healthcare setting. This opportunity is fueled by increasing consumer engagement in managing their health, large employers' desire to promote employee wellness and minimize healthcare costs, and branded consumer products companies seeking to incorporate new technologies to reach specific target consumer populations. The personalized medicine dialogue is expanding to encompass the use of innovative solutions to improve overall health, wellness and lifestyle. This expansion strengthens Physic's focus on the rising role of the consumer in health decisions and reflects the broader shift from treating disease to a more proactive model of health and prevention.

The adoption of personalized approaches is critical to empowering consumers to manage their health and an essential component of evidence-based clinical care. Innovations in personalized health solutions will be accelerated and implemented with the convergence of a multitude of factors: a rise in consumers' engagement in their health, advances in health information technologies, sharp decreases in the cost, increases in the speed and accuracy, of next-generation sequencing technologies, adoption of educational programs designed to incorporate genomics into the medical practice, and increased engagement of key public policy stakeholders, including the legislative, regulatory and payor communities. On-Q-ity and T2 Biosystems represent examples of companies that are enabling novel personalized approaches, and Physic Ventures anticipates making future investments in companies commercializing innovative solutions for personalized health.

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