

repository to support both clinical research and enhanced clinical decision support for patient management. Creation of an analytical platform to integrate, access and analyze temporal clinical data ranging from the pICU to also incorporate neo-natal ICU and pregnancy history is underway with a prototype already in testing. Analytical methods are being evaluated in collaboration with Dr. Mike Quasney (Medical College of Wisconsin) and the Virtual Pediatric ICU and PALISI (Pediatric Acute Lung Injury and Sepsis Investigators). This effort is exploring expanded international partnerships in both Europe and China to increase the accessible data for analysis and to further participate in the development of better diagnostic standards. We will present the initial state of both the analytics and platform development to encourage extension of this international effort to interested clinicians and clinical researchers. We believe that this unique approach, which focuses first on addressing the critical need to improve patient management through disease stratification will not only benefit pARDS but be extensible to many other pediatric rare disorders.

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## A collaborative approach to encourage research and promote new treatments for orphan diseases

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### Abstract

The last two decades has seen a significant increase in the development of medicinal products to treat rare “orphan” diseases, largely due to the EU Orphan Medicinal Product Regulation (2000), but also because of the consistent advocacy by patient groups prior to this regulation. These groups from across Europe joined forces under the umbrella of EURORDIS, to secure the implementation of the regulation and ensure that there was patient representation on the committee at EMA (the European Medicines Agency) which would be responsible for assessing and giving opinions on applications, namely COMP (The Committee for Orphan Medicinal Products). As its Vice-Chair I have the privilege to ensure the patient perspective is always considered during these assessments. I will discuss how COMP works as part of the EMA Human Medicines Research and Development Support Division to promote the development of research into medicinal products for the treatment of rare diseases and how this is also encouraged by EU funding through Horizon 2020. Since rare diseases are a global issue, I describe how the EU is also collaborating with IRDiRC (the International Rare Disease Research Consortium) to provide the critical mass in terms of patient population and skills needed to meet the urgent need for new therapies as quickly as possible.

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## Disease systems modeling for discovery of mechanistic biomarkers

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### Abstract

The use of biomarkers is becoming increasingly integral to the contemporary practice of medicine and continues to play a central role in preventive, predictive and personalized medicine. However, the limited number of FDA-approved, in use biomarkers, on one hand, and an increasing number of published potential biomarkers, on the other hand,

calls for an accelerated approach to translating biomarker research to clinical application. In this talk, I introduce novel concept of “Biomarker-guided Mechanism Discovery” through an integrative disease modeling approach and present the successful application of this methodology to deciphering the network model of genomic hormone interactions underlying dementia and its translational validation through serendipitous off-target effect. Moreover, the current challenges in biomarker discovery is discussed and results of our proposed Biomarker Ontology in collaboration with pharma industry will be presented.

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## Three-dimensional normal human neural progenitor tissue-like assemblies: A model for persistent Varicella-zoster virus infection and platform to study oxidate stress and damage in multiple hit scenarios

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### Abstract

The environment of space results in a multitude of challenges to the human physiology that present barriers to extended habitation and exploration. Over 40 years of investigation to define countermeasures to address space flight adaptation has left gaps in our knowledge regarding mitigation strategies partly due to the lack of investigative tools, monitoring strategies, and real time diagnostics to understand the central causative agent (s) responsible for physiologic adaptation and maintaining homeostasis. Spaceflight-adaptation syndrome is the combination of space environmental conditions and the synergistic reaction of the human physiology. Our work addresses the role of oxidative stress and damage (OSaD) as a negative and contributing Risk Factor (RF) in the following areas of combined spaceflight related dysregulation: i) radiation induced cellular damage [1,2] ii) immune impacts and the inflammatory response [3,4] and iii) varicella zoster virus (VZV) reactivation [5]. Varicella-zoster (VZV)/Chicken Pox virus is a neuro-tropic human alphaherpesvirus resulting in varicella upon primary infection, suppressed by the immune system becomes latent in ganglionic neurons, and reactivates under stress events to re-express in zoster and possibly shingles. Our laboratory has developed a complex three-dimensional (3D) normal human neural tissue model that emulates several characteristics of the human trigeminal ganglia (TG) and allows the study of combinatorial experimentation which addresses, simultaneously, OSaD associated with Spaceflight adaptation and habitation [6].

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