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Unbiased, holistic systems approach to discover how genomic variations in both pathogen and host modulate sepsis susceptibility and outcomes

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Most diseases, and in particular infectious diseases, are a manifestation of complex interactions between several polymorphic genes and pathways of both the pathogen and the infected host. Environmental factors further modulate host-pathogen interactions and accordingly affect disease susceptibility and outcomes.

Unbiased, holistic systems approaches, coupled with advanced genomic and bioinformatics tools helped us analyze variations in disease phenotypes in the context of genomic differences in both host and pathogen, and exposed complex disease mechanisms and road map to focus the design of prevention and targeted interventions.

The streptococcal sepsis model has provided a good example of how the composition of the bacterial community changes within various host niches, to where mutant bacteria able to adapt to certain niches flourish, while those that can't perish. As well, we learned how host genetic variationscan profoundly influence infection manifestations and outcomes. Indeed, our studies of this complex model have demonstrated the utility of genomics and unbiased,systems genetics approaches in elucidating underlying mechanisms of host-pathogen interactions in sepsis, identifying networks of disease interactive pathways and discovering relevant biomarkers of disease progression and severity. Information gained from these unbiased, holistic systems approaches reveal targetable pathways and focus the design of therapeutic interventions.

Biography

Malak Kotb completed her Ph.D. from The University of Tennessee and St. Jude Hospital in 1982, and her postdoctoral studies at Duke University in 1985. She returned to Memphis where she became full professor and director of the translational research program and The Midsouth Center for Biodefense and Security. In 2008, she was appointed Chair of the department of Molecular Genetics, Biochemistry and Micobiology, and director of the Midwest Center for Emerging Infectious Diseases at the University of Cincinnati, College of Medicine. He has been a Senior Research Career Scientist at the VA since 1999. She published more than 165 papers in reputed journals and served on editorial boards. He applies genomics and bioinformatics tools and systems approaches to study dynamic host-pathogen interactions in infectious diseases.