

# Targeting the Obesity and MDR Infections-Science at the Interface of Chemistry and Biology

M. Iqbal Choudhary\* and Atta-ur-Rahman

*H.E.J. Research Institute of Chemistry, International Center for Chemical and Biological Sciences, University of Karachi, Karachi-75270, Pakistan; E-mail: iqbal.choudhary@iccs.edu*

A rapid decline in research and development on new antibiotics coincides with increasing frequency of infections caused by multi-drug-resistant pathogens. The key reason of bacterial resistance is the indiscriminate or suboptimal use of antibiotics. The outbreak of methicillin-resistant *Staphylococcus aureus* (MRSA) occurred over fifty years ago, is now widespread throughout the world. *S. aureus* is the most common bacterial pathogen, which cause skin, soft-tissue, and endovascular infections, pneumonia, septic arthritis, endocarditis, osteomyelitis, and sepsis. As the efficacy of currently available antibiotics is declining due to MDR, and there is an urgent need to develop new approaches to meet this challenge. In the present study, we discovered several novel and potent inhibitors of MDR *S. aureus* (EMRSA-17, EMRSA-16, MRSA-252 and Pak clinical isolates) from natural and synthetic sources. Resistance-reversal studies at molecular level were carried out by employing flow cytometric and microscopic techniques. Synergistic and partial synergistic effect of these compounds along with antibiotics was investigated. This work has so far resulted in the identification of novel “helper molecules”, which can increase the efficacy of existing antibiotics to over 1000 fold. Obesity is an emerging challenge to human well-being. Molecular cascade involve in obesity and associated disorders is not fully understood. Proliferation of adipocytes plays in important role in the on-set and progression of obesity. Understanding the phenomena of adipogenesis is of major importance as adipocyte dysfunction makes an important contribution to metabolic diseases due to obesity. Differentiation of preadipocytes to adipocytes not only results in increasing number of adipocytes but also provide a large pool of fat depots in adipose tissues. Thus one strategy to treat obesity is to reduce the adipocyte numbers and fat content through targeting the mature adipocytes by diverse molecular activities. Among different therapeutic interventions, the discovery of effective antiadipogenic compounds from various sources is considered to be a promising approach. Our recent research is focused on the study of the inhibitory effects of natural and synthetic compounds such as steroids, flavonoids, terpenes alkaloids and sulfonamides, on the proliferation of adipocytes, in a dose dependent manner, as well as to check their effects on to the mature adipocytes. This study has resulted in the identification of several new inhibition of adipogenesis process.

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