## Understanding effect of lifestyle decisions on health and wellness



Multi-scale physiology model: Cell to whole body framework

Modern lifestyle is associated with high risk towards several diseases such as obesity, diabetes, cardiovascular heart disease, PCOS and liver / kidney malfunction which are associated with metabolic syndrome arising due to sedentary life style and rich diet. Early diagnosis and lifestyle management is essential in preventing metabolic syndrome in the population. Several studies have enumerated the physiological details of metabolism and its regulation relating to diet and lifestyle such as food composition and exercise. Quantitative relationship linking human metabolism to lifestyle decisions is crucial in predicting future consequences on health of individuals. To address this serious epidemic of metabolic syndrome including obesity, diabetes and heart disease, we have developed a mathematical model quantifying the human metabolism based on the lifestyle of an individual.

The developed multi-scale dynamic model accounts for different levels of physiological organisation, namely, cellular, tissue and whole body. At cellular level, the model accounts for metabolic, signaling and transcriptional networks. At the tissue level, the mechanistic model for active cells in the tissue of liver, muscle, adipose, brain, GI track, heart and kidney are accounted for. At the whole body level, the model accounts for overall energy and macronutrient balance to predict body weight and fat mass



Integration of lifestyle, organ functioning and cellular physiology to capture homeostatic dynamics in health and disease states

dynamics. The input to the model considers lifestyle details such as diet, day-to-day activity, exercise, body composition, genetic predisposition (if known) and lifestyle details (sleeping hours, habits, etc.). The effects of perturbations can be analysed at various levels from molecules to pathways leading to the whole body. The capabilities of the model are:

- Reliable disease diagnosis and therapeutic strategies for holistic disease management
- Hypothesis generation for various lifestyle and environmental perturbations
- Determining rational drug targets
- Effective drug delivery with minimal side effects
- Individual specific analysis accounting for their lifestyle and disposition
- Toxicology and drug safety assessment
- Whole body dynamics including body weight, fat mass, plasma metabolite dynamics
- Strategies for adaptive weight loss and muscle mass gain for individuals
- Lifestyle intervention (optimal diet and physical activity chart) for reduced disease risk and managing overall health

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