Obesity-2013

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Obesity & Weight Management

December 02-04, 2013 Hampton Inn Tropicana, Las Vegas, USA

New mouse models for the study of brown fat dysfunction, energy imbalance and obesity prone

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Abstract

Excess of visceral adiposity and overweight is associated with the development of metabolic disorders such as type 2 diabetes, hyperlipidemia, and fatty liver and cardiovascular disease. Fat storage results from an imbalance between food intake and energy expenditure. White adipose tissue (WAT) is the main energy storage organ in the body, whereas brown adipose tissue (BAT) is an essential component of non-shivering thermogenesis and energy expenditure. We generated the first brown adipose tissue-specific knockout (BATIRKO), lacking insulin receptor. That mouse model bearing a severe brown fat lipoathropphy showed a spontaneous obesity prone upon ageing displaying visceral adiposity. Thus, we have generated BAT-specific double knockout mice of IR and IGF1R (BATIGF1IRdKO) to eliminate insulin and IGF1R expression and signaling. Analysis of remnant BAT showed a deteriorated morphology in dKO as compared to wild-type mice, which is correlated with a lower basal core temperature. IR/IGF-1R dKO at three months show a significant increase in the percentage of body fat as estimated by NMR. dKO mice at six months show glucose intolerance as estimated by GTT versus controls. In addition, those mice also show a manifest fasting hyperglycemia as compared with their controls. Finally, dKO mice at 12 months under standard diet show severe interscapular brown adipose tissue atrophy and also an abundant visceral adiposity and fatty liver in the abdominal cavity. Overall, our data identify IGF1R/IR as important regulators of brown fat activity, a key factor to maintain the energy balance, which may have important therapeutic implications for the treatment of obesity and associated metabolic disorders.

Biography

Manuel Benito completed his Ph.D by Autonomous University of Madrid and also a D.Phil in Biochemistry by Oxford University, UK. He is currently Head of the Diabetes and Cardiovascular laboratory and Full Professor of Biochemistry and Molecular Biology, School of Pharmacy, Complutense University of Madrid. He is the member of the National Academy of Pharmacy of Spain and member of the Stirring committee of Spanish Network of Diabetes and Associated metabolic diseases. He has published more than 200 papers in reputed journals and serving as an editorial board member of journals of his field of expertise.