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ASIA EDITION

New discovery helps in understanding diseases better

08 February 2013 | News | By BioSpectrum Bureau

Cell nucleus structure discovery helps in understanding diseases

Singapore: Scientists from Singapore and Germany have identified that the proteins lamin A (Lmna) and lamin B receptor (Lbr) are essential for holding silent genes in their correct position at the edge of the nucleus, in the form of heterochromatin. A deviation from their normal position will cause the genes to malfunction, leading to heart failure, vascular disease and muscle wasting.

For hundreds of years before this discovery, scientists were puzzled by why heterochromatin clustered at the edge of the nucleus and how it was relevant to normal cell function. This recent discovery will enable scientists to gain a better understanding of the diseases of the heart and muscles, and find cures for them in the future.

The findings by Ms Audrey Wang and Mr Colin Stewart of A*STAR's Institute of Medical Biology and Ms Irina Solovei, Mr Boris Joffe and Mr Heinrich Leonhardt of the Ludwig Maximillian University in Munich, Germany, were recently published in the prestigious journal Cell.

The nucleus, the brain of the cell, carries all the information, in the form of chromatin necessary to help a cell grow, thrive, and reproduce, in the form of DNA packed into chromatin. Hence, understanding how chromatin is organized in the nucleus is important to understanding disease and normal processes such as aging. The scientists showed that the two proteins lamin A and lamin B receptor are important to the organization of chromatin in the nucleus. Using mouse models, they demonstrated that in the absence of the two proteins, heterochromatin collapsed into the nuclear center. This disrupted gene expression and affected skeletal muscle development, resulting in muscle failure (Annex A).

Prof Stewart, research and assistant director of IMB, said, "These findings will provide new insights into how diseases arise

and may help explain how mutations in lamin proteins result in a variety of different syndromes. In particular, we are extending these findings to explore how changes in chromatin position may contribute to heart failure. Moving forward, we will collaborate with cardiologists and vascular clinicians at SGH and NUHS to translate these findings to benefit patients."

Prof Birgitte Lane, executive director of IMB, said, "I would like to congratulate Colin and the team for this important piece of research. It brings us a step closer to understanding the nucleus and to developing new treatments for common diseases. It could be particularly relevant for Singapore, as we, like other developed nations, are facing an ageing population, and heart failure, vascular disease and muscle wasting all increase with age."