

Nanoplastics Impair Contractile Performance of Neonatal Cardiomyocytes Subjected to Electrical Synchronization

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Nanoplastics are highly concerned pollutants that are increasingly released to the environment and able to adversely affect various human organs including the heart. Although it is concerned that the immature heart of the newborn offspring is more vulnerable to the nanoplastics compared with the matured heart of adults, the effect of surface charges of nanoplastics on the collective contractility of neonatal cardiomyocytes remains elusive. Here, we distinguished the internalization of polystyrene nanoparticles into the cytosol of neonatal rat ventricular myocytes (NRVMs) from their aggregation on the plasma membrane in the presence of electrical pulses. The microcantilever-based measurement of contraction forces of nanoparticle-exposed cardiomyocytes enabled us to explain their plausible interference on Ca^{2+} ion channels and the collective contractility of NRVMs. The exposure of positively charged nanoplastics in the presence of electrical pulses led to the changes in intracellular calcium levels, and mitochondrial metabolism, finally affecting the contraction force of cardiomyocytes. Our findings provide a better understanding of how surface charges of nanoplastics affect cardiac performance under electrical synchronization, which might offer new insights into the risk assessment of ever-emerging nanoplastics that can be exposed to the immature heart.

Evaluation of Histamine Binding Activity of Surface-modified Yeast Vacuoles by Histamine Binding Protein (HBP)

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Histamine binding protein (HBP) is secreted by blood-sucking mites and inhibits inflammation in the host animals. In this study, recombinant substances that binds with histamine molecules to suppress histamine behavior and helps restore immune system weakened by excessive inflammatory reactions were devised. Protein expression in recombinant yeast was induced, separated by centrifugation, and HBP vacuoles were obtained. The ability to bind histamine of HBP vacuoles was estimated. HBP vacuoles were treated after immune-stimulation in RAW 264.7 cells, and histamine was measured by histamine ELISA. As a result, histamine was dose-dependently reduced by HBP vacuoles. Furthermore, phagocytosis assay was performed to see how HBP vacuoles react to immune cells. And, phagocytosis activity was dose-dependently increased by HBP vacuoles, like pVAM11 vacuoles of the control group. This work was supported by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry (IPET) through Crop Viruses and Pests Response Industry Technology Development Program, funded by Ministry of Agriculture, Food and Rural Affairs (MAFRA) (321108-04)

Inhibitory effect of Yeast vacuoles in vitro on 3T3-L1 preadipocyte development and differentiation

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Vacuoles are known to contain various hydrolases in small lipid sacs and are involved in intracellular signaling. It is suggested that yeast vacuoles can be an important source of preventing adipocyte differentiation. As a result of treatment with 0.02 $\mu\text{g}/\text{ml}$ of vacuole, the accumulation of lipid droplets was reduced by up to 38.8%, and the accumulation of triglyceride was reduced by up to 58.5% compared to the control in a concentration-dependent manner. It was confirmed that the expression of peroxisome proliferators-activated receptor γ and cytidine-cytidine-adenosine-adenosine-thymidine in adipocytes treated with vacuoles was reduced by western blot. In addition, the expression level of adiponectin was increased. By confirming that this effect is the same in the enzyme, it can be seen that the adipogenesis inhibitory effect is a mechanism by lipase activity. Therefore, the inhibition of adipogenesis and the reduction of lipid and triglyceride accumulation of yeast vacuoles could be a key role of inhibition of obesity-related inflammation and prevention and treatment of diabetes. This work was supported by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry (IPET) through Crop Viruses and Pests Response Industry Technology Development Program, funded by Ministry of Agriculture, Food and Rural Affairs (MAFRA) (321108-04)

Sniper Assembly: High-Throughput, Low Cost De Novo Bacteriophage Genome Synthesis Method Utilizing Sequence-Verified Microarray-Synthesized Oligonucleotides

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The ability to engineer and synthesize bacteriophages (phages) can be utilized in fields ranging from drug screening via phage display to direct clinical use in the form of phage therapy. Due to most conventional methods being based on in vivo systems, however, our engineering capacity has been limited by factors such as high virulence of the phage genome and the low transformation efficiency. To circumvent these issues, we present a cell-free low-cost de novo genome synthesis technology called Sniper assembly which is based on massively parallel sequencing of microarray-synthesized oligonucleotides and automated isolation of sequence verified DNA clusters. Through this method, we could also reduce the cost of de novo phage genome synthesis while reaping the benefits of a cell-free process. To demonstrate the performance of Sniper assembly, we synthesized the Acinetobacter phage AP205 genome (4268 bp) using 65 DNA clones with a low synthesis cost of \$0.0137/bp when compared to previous reports. We envision that Sniper assembly can be an economical and robust means of production for engineered phage genomes in the therapeutics industry for applications such as phage therapy.