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The identification of nitrile-metabolizing microorganisms and enzymes towards the production of pharmaceutical intermediates using biotransformations

Caio Roberto Soares Braganca
Waterford Institute of Technology, Ireland

Nitrile compounds are versatile and can be converted into amides, amines, imines, oximes, carboxylic acids, esters and alcohols, encompassing a large group of economically important synthetic intermediates. The pharmaceutical industry particularly requires amides and acids for use as intermediates in the manufacture of many drugs and chemicals. The biotransformation of nitriles mediated by microorganisms has therefore attracted considerable attention in academia and industry as a sustainable alternative to the conventional chemical reactions that require drastic conditions of pH, temperature and pressure, use of metal catalysts, high-energy consumption and low selectivity in the process. As a result, the search for microorganisms which contain the enzymes responsible for these biotransformations (nitrilases, nitrile hydratases and amidases) is crucial. Work to date in this study has involved the isolation and analysis of pharmaceutically relevant nitrile-metabolizing microorganisms from the environment in the expansion of the PMBRC isolate library by using soil samples from various parts of the globe and construction of metagenomic libraries by direct cloning of environmental DNA using soil samples collected in Ireland. A range of bacteria, yeast and filamentous fungi were isolated for further study. High-throughput colorimetric activity assays were used to identify those that demonstrate the most promising activity. Gene screening of isolates demonstrating desired activity for the presence of nitrilase, nitrile hydratase and amidase was performed by conventional PCR and partial gene sequence was identified. Further study to identify complete gene sequence for cloning and expression is underway towards realizing commercial potential.

caiosoaresdt@yahoo.com.br

Vitamin-D deficiency in Asian Indians

Surya Prakash
All India Institute of Medical Sciences, India

Vitamin-D is a lipophilic molecule essential to calcium and phosphate balance and osteo-metabolic system regulation. Vitamin-D metabolites also have physiological functions in non-skeletal tissues, where local synthesis influences regulatory pathways via paracrine and autocrine mechanisms. Vitamin-D deficiency is now recognized as a pandemic. The major cause of vitamin-D deficiency is the lack of appreciation that sun exposure. Very few foods naturally contain vitamin-D and foods that are fortified with vitamin-D are often inadequate to satisfy either a child's or an adult's vitamin-D requirement. Previous studies have suggested that low vitamin-D status was contributed to the development of insulin resistance, the metabolic syndrome, hypertension, fatty liver disease, sleep apnea and cardiovascular disease. Over the past two decades, serum vitamin-D concentrations have markedly decreased in the population of USA. Indeed, only 23% of children and adults in USA were considered to be serum vitamin-D sufficient (serum 25(OH) D≥30 mg per L). Decreased vitamin-D and elevated parathyroid hormone (PTH) levels are believed to play a role in the etiology of the metabolic syndrome. Recent reports show a wide presence of vitamin-D deficiency from various parts of north India as well as south India. These reports has been indicated that low levels of serum vitamin-D contribute to high risk for insulin resistance, obesity, non alcoholic fatty liver disease and cardiovascular disease in Asian Indians.

suryabhat@gmail.com