**Flavor Enhancers: Nucleotides and Nucleosides**

Various nucleotides and nucleosides are known to improve the natural taste and flavor of food efficiently. By moderating basic flavors such as sweetness, sourness, saltiness and bitterness, these are used in various food, beverages and therapeutic industries (poultry, fish, vegetables, antibiotics, medicines etc). These are typically used to mask the canned and processed smells of preserved and frozen foods.

The production of these compounds is achieved by the fermentation process of sugar (eg. Molasses, cornsteep liquor etc.) involves various micro organisms such as members of the bacterial genera **Escherichia, Bacillus, Corynebacterium, Streptococcus,** and of the **yeast** and fungal genera **Saccharomyces, Neurospora,** and **Coprinus**.

Nucleotides such as **inosine 5’-monophosphate (IMP), guanosine 5’-monophosphate (GMP) and xanthine 5’-monophosphate (XMP)** are of utmost importance. It has been observed that **nucleotide accumulation is correlated to the cell cycle** where direct or indirect inhibition of the organism’s cell cycle leads to the overproduction of nucleotides. Arrest of cell cycle in bacteria/other microorganism (for nucleotide production) can be achieved **directly** by inhibiting single steps of the cell division process, such as septum formation, association of the Z-ring, and septation or an **indirect inhibition** of cell cycle can be achieved via the SOS response when the DNA replication is blocked by addition of drugs or due to mutations. These inhibitions have proven to accumulate NAD+; moreover addition of **penicillin** and **cycloserine** is effective for IMP accumulation. The other nucleotide related compounds such as CDP-choline, UDP galactose are also produced through the combination of recombinant *E. coli* and *C. ammoniagnes*.

Further, production of nucleosides involves two main phases where **first phase** is the **fermentation** in which the organisms exploited for the purpose must **lack regulation of nucleotide biosynthesis** and **nucleoside decomposing activities**. For eg. *Bacillus subtilis* and *Corynebacterium ammoniagenes* are used in industrial production of inosine. The micro-organisms here act as cost-effective bioconverters for production of bulk quantities of nucleosides by fermentation. The second phase involves **enzymatic phosphorylation of nucleosides**. Recombinant DNA technology and the hybrid system may allow higher productivity in case of biphasic bioprocesses.