Folate biosynthesis, \textit{E. coli} mutants and pregnant women – An approach in favour of conservation of biodiversity

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Abstract
The human microflora comprises a complex ecological system maintaining an executive homeostasis that plays important role in human health, such as, by stimulating the immune response, aiding digestion of food materials and helping to prevent pathogens from colonizing on epithelial surfaces. Folic acid, also called folate or folacin, is a vital raw material for production of Red Blood Cells (RBC), as well as norepinephrine and serotonin (important components of nervous systems). In human, non-pathogenic strains of intestinal flora bacteria- \textit{Escherichia Coli} (\textit{E. Coli}), impart vital role in favour of synthesizing folate from simpler compounds and focuses a significant insight paying regards to conservation of biodiversity especially in case of pregnant women. We have analyzed the consequences and the capability of synthesizing folate by \textit{E. Coli}, present in human intestine as a beneficial microbial flora, by utilizing different software, widely used in Bioinformatics and our review suggest that, conservation of different features of \textit{E. Coli} appears to be very important in case of pregnant women to prevent the offspring from several vulnerable stages.

Keywords: Folate biosynthesis, pregnant women, homeostasis, \textit{E. Coli} mutants

1. Introduction
Folates are required in a variety of reactions (known as one-carbon metabolism) in both bacterial and mammalian tissues, where they act as carriers of one-carbon units in various oxidation states. Folic acid also helps to synthesize genetic material in every cell of the body and normalize brain function. In humans, folate deficiency contributes to problems \cite{1,2,3} in neural tube development in the fetus resulting in spinal cord defects in newborns, and is implicated in cardiovascular disease. Folates are required for the normal growth and proliferation of all cells and when they are not available cells ultimately die. A better understanding of the biosynthesis of folates and the consequences of disturbing folate biosynthesis in microorganisms will contribute to our understanding of this important biochemical pathway as well as assist us to devise appropriate drug that are not subject to jeopardize any event associated with various defects in newborns. Non-pathogenic laboratory strains of the human intestinal bacteria \textit{Escherichia coli} (which are beneficial for humans) may be an excellent model system for the study of biosynthesis of folates. First, like many other pathogens, \textit{E. coli} synthesizes folates from simpler compounds \cite{4} and thereby permitted us to study the entire biosynthetic pathway. Secondly, there is a wealth of genetic, biochemical and molecular data available for \textit{E. coli}, helped us in favour of rapid dissection of novel phenotypes. Many of folate’s healthful properties help women specifically. It’s particularly important for pregnant women to get enough folate to keep the fetus healthy. It also seems to prevent cancer of the cervix.

Methods of Analysis
It has already been reported that, \textit{E. coli} mutants that lack dihydrofolate reductase (DHFR) grow on minimal media containing combinations of the folate end products but do not grow on media supplemented with other combinations. We have analyzed the enzyme dihydrofolate reductase present in \textit{E. Coli} utilizing different software widely used in Bioinformatics study like BLAST2.0, Pfam search tools and KEGG (Kyoto Encyclopedia of Genes and Genomes).
Results
We found that Dihydrofolate reductase (DHFR) catalyses the NADPH-dependent reduction of dihydrofolate to tetrahydrofolate, an essential step in de novo synthesis both of glycine and of purines and deoxythymidin phosphatase (the precursors of DNA synthesis) PUBMED: 2830673, and important also in the conversion of deoxyuridine monophosphate to deoxythymidine monophosphate. Although DHFR is found ubiquitously in prokaryotes and eukaryotes, and is found in all dividing cells, maintaining levels of fully reduced folate coenzymes, the catabolic steps are still not well understood (PUBMED: 3383852).

Discussion
Since the 1960s, folate has been linked to neural tube defects. But it wasn't until 1992 that the U.S. Public Health Service acknowledged the link and recommended that women of childbearing age consume 400 micrograms (mcg) of the vitamin per day. This simple measure has significantly reduced the number of babies born with neural tube defects. But it wasn't until the early 1940s that folate was finally isolated and identified.

Folate functions as a coenzyme during many reactions in the body. It has an important role in making new cells, because it helps form the genetic material DNA (deoxyribonucleic acid) and RNA (ribonucleic acid). DNA carries and RNA transmits the genetic information that acts as the blueprint for cell production [12-15].

Conclusion
When there is any sort of mutation takes place in the enzyme dihydrofolate reductase resulting loss of proper catalytic activity, it appears not only non-functional paying regards to folate metabolism, but also appears as a harmful event as antibodies against human placental folate receptors are found to be blocked for binding of folic acid to folate receptors on placental membranes [16]. This reflects the importance of taking care in order to maintain homeostasis in pregnant women from maladministration of any resource, even antibiotics [1, 4] from any sort vulnerable effects in offsprings.

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Author’s Contribution
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