EDITORIAL

Metabolomics in Cancer

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Oncologic emergencies are classified as either metabolic or structural symptoms which are sub classified into metabolic, neurologic, cardiovascular, hematologic, and infectious complications. Metabolic changes caused by cancer or its treatment sometimes require immediate medical intervention. Hypercalcemia of malignancies is associated with bone metastasis, such as breast and lung cancer, multiple myeloma, and hematologic malignancies with a very poor prognosis and dead of nearly fifty percent of the patients within 30 days[1]. Tumor lysis syndrome is another metabolic emergency course, which is a severe complication in cancer patients before or after starting antineoplastic therapy. Acute lymphoblastic and myelogenous leukemia, and Burkitt lymphoma has been reported as most commonly expressing tumor lysis syndrome[1].

During the disease progression in advanced cancer patients' energy metabolism is severely compromised by the event of some symptoms, including anorexia, nausea and vomiting, which cause irregular uptake of different nutritional elements[2].

A collection of molecular events characterizes cancer formation and progression. Extension of the knowledge of the molecular networks that distinguish the organlimited disease from the metastatic disease may lead to the identification of critical biomarkers for cancer invasion and aggressiveness. Despite the progression in the identification of biomarkers in the levels of the genomic, transcriptomic and proteomic, little is known about the global specific metabolomics alterations incancer progression.Metabolomics is the scientific and systematic-study of the chemical processes involving metabolites and specifically unique chemical fingerprints, mainly on thesmallmoleculemetabolite profiles[3].

Sarcosine, the N-methyl derivative of the amino acid glycine is revealed as a potentially crucial metabolic intermediary of cancer cell invasion and aggressiveness. In prostate cancer,metabolomics profile was able to distinguish benign prostate, clinically localized prostate cancer and metastatic disease.Sarcosine was identified as a differential metabolite that was highly increased during prostate cancer progression to metastasis and can be detected in a noninvasive manner in patients' urine. In invasive prostate cancer, cell lines sarcosine were also increased in comparison to benign prostate epithelial cells[4] while1-SG was lower in the serum of patients

with prostate cancer[3].

In patients with colorectal cancer metabolites involved with redox status, energymetabolism and intermediates of amino acids, choline and nucleotides metabolism were the most affected molecules from early to late stages of the disease. Glutathione, isoleucine and leucine were upregulated in all stages of colorectal cancer but could not be differentiated between the stages[5].In comparison with the serum of colorectal polyp and colorectal cancer, the pyruvate and glycerolipid metabolisms were activated in colorectal polyps, while the glycolysis and glycine, serine, and threonine metabolismwere activated in colorectal cancer6. Changed metabolism may elevate cellular proliferation. It was found that the rates ofacetate/glycerol and lactate/citrate could be the potential biomarkers in colorectal polyp and colorectal cancer[6]. Serum and tumor analysis in colorectal patients showed that aspartic acid, glutamic acid, proline, threonine, lysine, arginine, uracil, xanthine, hypoxanthine, S-adenosylhomocysteine , S-adenosylmethionine, carnitine, symmetric dimethylarginine , asymmetric dimethyl arginine, dimethylglycine, and betaine was significantly elevated while L-glutamine, L-alanine, and glucuronoic lactone was increased[3].

In the serum of invasive ductal carcinoma breast cancer patients, lysophosphatidylethanolamine was decreased and ceramide was increased[3]. Serum analysis of gastric cancer patients show increased 3-HP and dropped pyruvic acid. Plasma analysis of pancreatic cancer revealed that N-acetyl glycoprotein, dimethylamine, very low density lipoprotein and acetone was elevated and 3-hydroxybutyrate, High-density and low-density lipoproteins, lactate, citrate, glutamate, and the amino acids; lysine, alanine, valine, isoleucine, glutamine and histidine were reduced. In patients' urine with ovarian cancerPseudo-uridine, N4-acetylcytidine, imidazol-5-yl-pyruvate, urate-3-ribonucleoside, 3-indolelactic acid, 3'-sialyllactose and 3-sialyl-N-acetyllactosamine was increased and L-histidine, N-acetylglutamine was decreased. Finally, in the serum of the esophageal cancerMalonic acid and L-serine was increased[3].

Implications of novel targeted therapeuticsin cancer metabolism is increasingly developing toward personalized therapeutics. Cancer at first is a metabolicdisease involving in energy production in process ofmetabolism. Each individual has a unique metabolicentity, so personalization of metabolic therapies as a broadbased cancer treatment will require finetuning to match the therapy to an individual's specific physiological characteristics.

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