Dear editor:

Gastric cancer (GC) has been consistently ranked among the top malignancies affecting humans after lung, breast, colon/rectum, prostate and skin cancers. It represents the world’s fifth-most frequent malignancy and the third leading cause of cancer death. This type of cancer arises from malignant cells in the stomach lining and can thus be categorized into two topographic subsites: cardia gastric cancers, which arise closest to the esophagus, and non-cardia cancers, which arise in the distal portions of the stomach. Chronic inflammation caused by Helicobacter pylori infection and autoimmune gastritis complicates the development of these two major types of gastric cancer, though adenocarcinomas, which arise from epithelial cells in the chronically inflamed gastric mucosa, account for more than 90% of stomach cancers. Even though Helicobacter pylori has been identified as a carcinogen and a major cause of GC, many gastric illnesses have been implicated in the disease, including chronic gastritis, stomach and duodenum ulcers, and lymphomas of the mucosa-associated lymphoid tissue system. Gastric cancer is caused by several risk factors, including infections, diet, genetics, lifestyle, and the environment, all of which can be avoided by making adjustments to avoid the risk factors.

Chronic inflammation is a term used to describe the inflammatory response marked by continuing immune cell activation and the presence of inflammatory mediators. In the context of GC, chronic inflammation plays a pivotal role in the development and progression of the disease. It is believed that chronic inflammation provides a microenvironment that supports the growth and survival of neoplastic cells. Therefore, targeting chronic inflammation may be a promising strategy for the prevention and treatment of GC.

recruitment and tissue damage as a result of the persistent inflammatory responses. Inflammation represents an old evolutionary process that involves the activation, recruitment, and action of innate and adaptive immune cells as well as tissue repair, regeneration, remodeling, and tissue homeostasis management. While pro-inflammatory cytokines such as IL8, TNF, IL10, IL1B, and IL1RN are implicated in higher risk of gastric cancer, others such as IL35, IL27, IL23, and IL12 are elevated in gastric cancer cell lines and tissue from H. pylori-infected subjects. Cytokines such as IL33, IL32, and IL10 have also been identified to be expressed in the inflamed stomach mucosa and elevated level of IL-1 and IL-6 have been linked to non-scirrhous type gastric cancer, human gastric carcinoma growth and progression. Among nutraceuticals targeting inflammatory cytokines include allicin, the active ingredient in fresh crushed garlic, which lowered the expression of IL-8 and IL-1beta levels and inhibited secretion of IL-1beta, IL-8, IP-10, and MIG from the two cell lines in a dose-dependent manner. Apigenin, kaempferol and resveratrol also exert inhibitory effects on the TNF-alpha, whereas the capsaicin derived from green and red pepper also inhibited the interleukin-6-induced STAT3 activation. Flavonoids such as morin, rutin, quercetin, Fisetin, Luteolin, Naringenin were reviewed to have modulatory effects on cytokines and inflammatory pathways.

Nutraceuticals encompasses pharmaceutical alternatives possessing physiological benefits including vitamins, amino acids, minerals, and other dietary ingredients, extracts, or derivatives that have potential health advantages beyond their nutritive benefits. Several foods, nutrients, and non-nutrient food components appear to play a role in chronic inflammation management. These substances can target inflammatory mediators while also reducing macromolecular oxidation. Vitamin E, for example has been demonstrated to have antitumor, anti-metastasis and chemo preventive effects in gastric cancer, presumably by suppression of the NF-kb pathway, inhibition of HMG-CoA reductase, DNA polymerases, and specific protein tyrosine kinases and protein kinase C. Low dosages of vitamins, particularly vitamin A, vitamin C, and vitamin E, can considerably reduce the incidence of GC. Several phytochemicals such as resveratrol, quercetin, curcumin, and anthocyanins, may inhibit inflammation via suppressing prostaglandin production and the NF-kB pathway via enhancing/inhibiting cytokine production as the case may be. In order to reduce the current trends on gastric cancer, it is recommended that

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**Figure 1.** Nutraceuticals modulating cytokines implicated in gastric cancer via pathways and enzymes.
we should keep away from the various risk factors, abstain from alcohol, tobacco usage, smoked and pickled meals, as well as salted meats and fish. Therefore, we should consume a lot of fresh fruits and vegetables as well as whole grains including whole grain pasta, bread, cereal, and rice. One approach is to use experimentally proven supplements containing nutraceuticals to reduce our risk of developing this malignancy.

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