SINPE
Società Italiana di Nutrizione Artificiale e Metabolismo

INCREASE MALNUTRITION AWARENESS:
CHALLENGE FOR THE FUTURE

Nutritional support in cancer patients: new challenges in therapeutic setting

Authors
Francesco Cairone , Ludovica Palladino , Loredana Paglia , Elisabetta Umana , Rossella Gentile, Paola Ferraiuolo , Tiziana Magnante

Affiliations
UOC Farmacia Clinica Interaziendale e DPC, ASL Roma 1

ASL ROMA 1

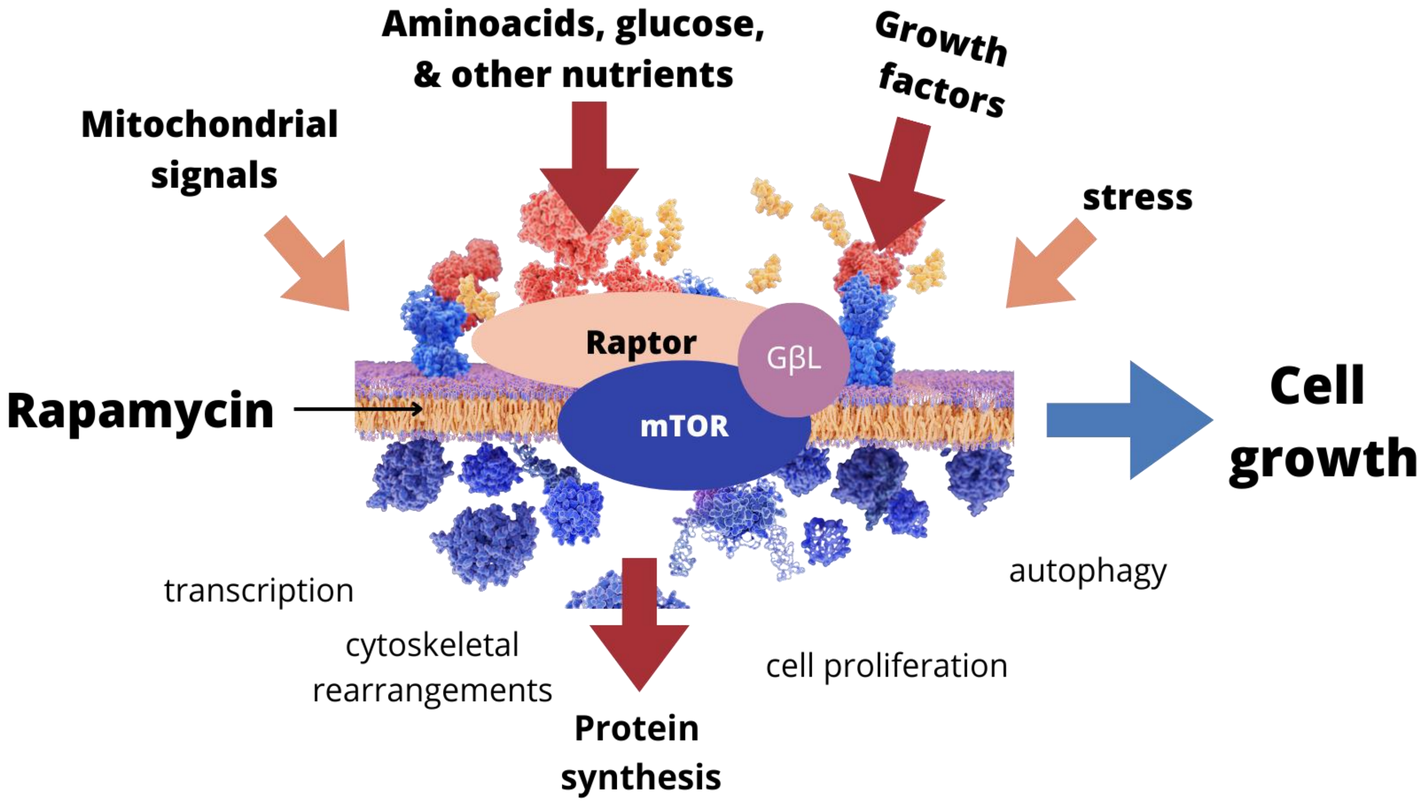


Figure 1. Signal transduction-mediated metabolites in cancers[4].

OBJECTIVE

Some evidence suggests that several nutrients could potentially counter or interfere with cancer therapy. Since there are no clinical studies about this, the aim of this work is to evaluate how the therapeutic response of cancer patients also changes in relation to the dietary supplement.

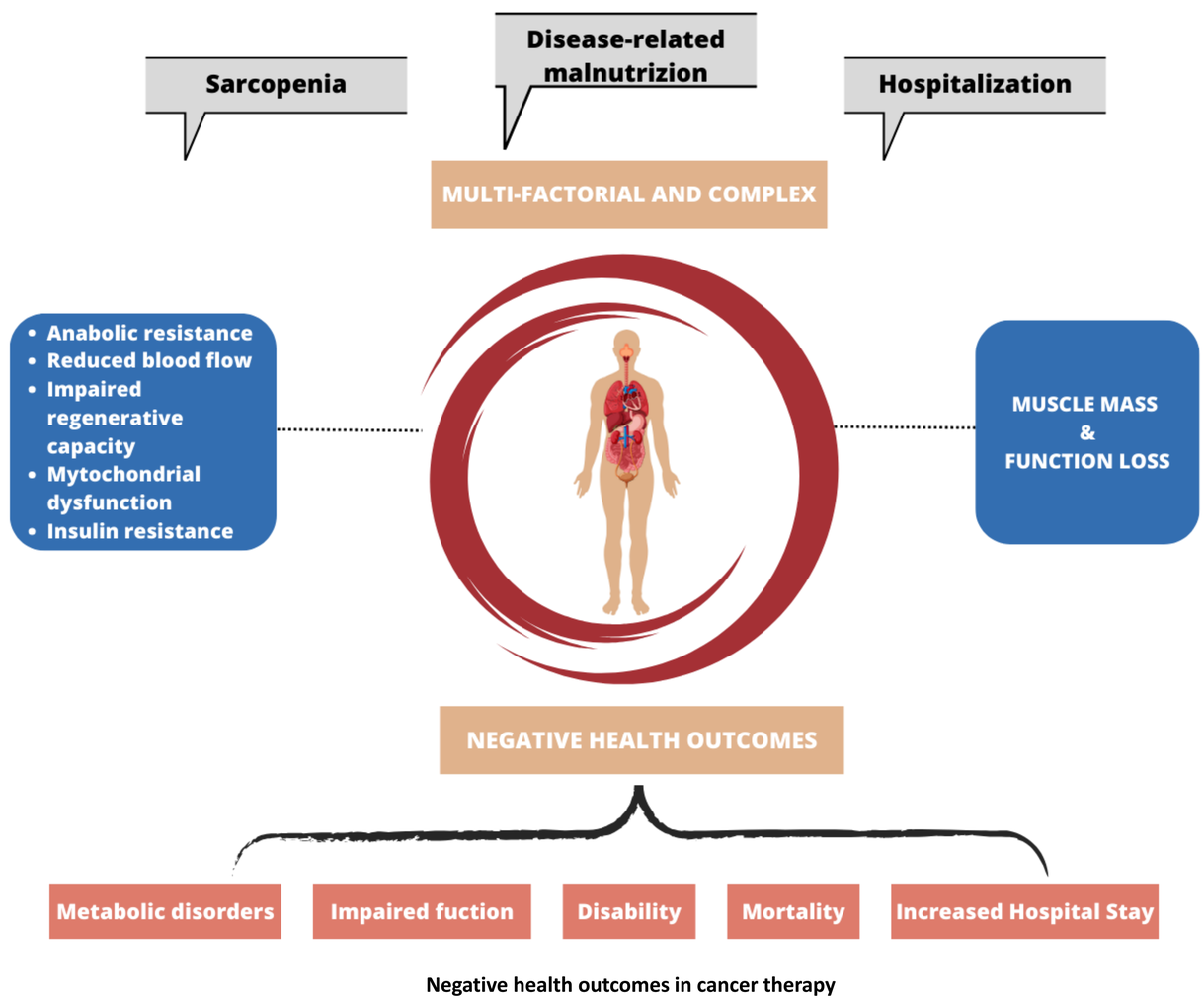
METHODOLOGY

Several cancer patients were selected on the basis of responsiveness or not to cancer therapy following dietary supplementation. Nutritional screening was performed using validated instruments (NRS 2002, MUST, MST, MNA, PG-SGA) and repeated systematically.

Category	Receptor	Metabolites	cancers	Effects mediated by receptor
Glucose	GPR31	Lactic acid and pyruvate	Colorectal cancer Prostate cancer	Tumor progression
	SUCNR1	Succinate	Cancers with SDH germline mutation	Cancer metastasis and invasion Angiogenesis Macrophage migration and M2 polarization
Fatty acid	GPR109A	Niacin and butyric acid	Colorectal cancer	Cell apoptosis, against carcinogenesis
		β-Hydroxybutyrate	Colorectal cancer	Tregs and IL-10-producing T cell activation
		Short-chain fatty acid β-Hydroxybutyrate	Breast cancer	Apoptosis and cell cycle stagnation
	GPR109B	3-Hydroxyoctanoate	Breast cancer	Cell proliferation Inhibition of FAO
	GPR43	Short-chain fatty acid	Colorectal cancer	Inhibition of recruitment and migration of neutrophils Failure of CD8(+) T cells Excessive activation Of DCs
	GPR84	Medium-chain fatty acid	Acute myeloid leukemia	Activation of Wnt signaling
			Colorectal cancer	Inhibition of osteoclastogenesis
			B cell lymphoma	Macrophage phagocytosis
	GPR40	Oleic acid	Hepatocellular carcinoma	Cell proliferation, migration and invasion
			Ovarian cancer	Cell proliferation, migration and invasion
			Prostate cancer	Activation of PI3K/Akt signaling Cell invasion
	GPR120	Long-chain fatty acid	Breast cancer	De novo synthesis of fatty acids
			Pancreatic cancer Colorectal carcinoma Bone cancer	Cell migration and invasion
			Prostate cancer	Activation of M2 macrophages
			Melanoma	Inhibition of cell migration and invasion
			Lung cancer	
	GPR78	Unknown	Breast cancer	Mitochondrial transport of fatty acids Inhibition of Macrophage infiltration
Amino acid	mTOR	Leucine	Acute myeloid leukemia Subependymal giant cell Astrocytomas Triple-negative breast cancer Pancreatic tumor	Activating protein synthesis
	GPR109A	Niacin	Colorectal cancer	Inhibit glucose transport and glycolysis
	xCT	Glutamate cysteine	Non-small cell lung cancer	Regulate cancer metastasis
	AKT	NA	Unknown	Stimulates proliferation and anti-apoptotic responses
	Cell cycle regulators	8-Hydroxyquinaldic acid	Colon cancer	Inhibit proliferation and mitochondrial activity
		Cadaverine	Breast cancer	Inhibit cellular movement and invasion

INTRODUCTION

Neoplastic diseases are the most frequent cause of death [1]. The etiopathology involves different pathways such as angiogenesis and/or the dysregulation of protein signaling as mammalian target of rapamycin (mTOR), and/or interfering with protein synthesis [1]. For this reason, cancer therapy is often based on anti-angiogenesis drugs targeting growth factor inhibition (VEGF). Malnutrition is often related to neoplasia, and recently, ESPEN guidelines suggest an increased protein range for the maintenance of muscle mass [2]. However, the intake of nutrients such as β-hydroxy-β-methyl butyrate (HMB), a metabolite of leucine, and/or long-chain amino acids that stimulate the growth factors or mTOR complex, might act "antagonistically" to cancer therapy.



Negative health outcomes in cancer therapy

RESULTS

Data collected provided important information related to dietary protein and/or amino acid supplementation, that might interfere with mTOR and AMPK activation (Fig.1), resulting in increased protein synthesis and fibroblast growth factor with a followed decreased response to cancer therapy. This hypothesis is based on the idea that the stimulation of mTOR or growth factors might promote the growth of cancer cells, which is typically undesirable during cancer treatment [3]. There are several aspects clinically to be considered:

- **Personalization**: The response to dietary supplements is highly individualized. What works well for one cancer patient may not be suitable for another. Personalized nutrition plans that consider the specific needs and conditions of the patient are important.
- **Consultation with Healthcare Professionals**: It is crucial for cancer patients to consult with their oncologists, pharmacists and dietitians before taking any dietary supplements. Healthcare professionals can assess the patient's nutritional status, current treatments, and potential interactions with supplements. They can provide recommendations tailored to the patient's unique situation.
- **Clinical Trials:** Some cancer centers and hospitals conduct clinical trials to study the impact of dietary supplements on cancer treatment outcomes. Participation in these trials can provide valuable insights and guidance for patients.

CONCLUSION

In summary, the therapeutic response of cancer patients can change in relation to dietary supplements, but the effects can be both positive and negative. It's essential for cancer patients to work closely with their healthcare team to determine the most appropriate and safe use of dietary supplements during cancer treatment. This will help ensure that the supplements are used in a way that supports the patient's overall health and doesn't interfere with the effectiveness of cancer therapies.

RELATED LITERATURE

[1] Nature reviews Molecular cell biology, 21(4), 183-203.
[2] Journal of cachexia, sarcopenia and muscle, 4, 55-61
[3] Journal of the International Society of Sports Nutrition, 13(1), 8
[4] *Transduction and Targeted Therapy*, *8*(1), 196..