Ph.D. Thesis proposal[1]

General Information		
Ph.D. Thesis Title	**Metabolic dysfunctions, nutritional status and eating behavior in Lebanese Autistic patients**	
USEK Doctoral Program	Ph.D. in Life and Earth Sciences	
Research Center		
Research Group	NND USEK	
Research Axis	Neurodevelopmental and Neuropsychiatric Disorders from genetic to pathophysiology Topic: Autism	
PhD Supervisor	Name & Title: Prof. Walid Hleihel Email: walidhleihel@usek.edu.lb	University Address: Holy Spirit University of Kaslik- USEK
Co-supervisor (if applicable)	Name & Title: Dr. Yonna Sacre Email: yonnasacre@usek.edu.lb	University Address: Holy Spirit University of Kaslik- USEK
Co-supervisor (if applicable)	Name & Title: Dr. Tania Bitar Email: taniabitar@usek.edu.lb	University Address: Holy Spirit University of Kaslik- USEK
Location (s)	Location 1: USEK	Work shift calendar /per year (70%)
	Location 2: Tours	Work shift calendar /per year 30(%)

Applicant Profile and/or Special Requirements	Biology or Biochemistry background
Comps Exam Language	☐ Arabic ✓ French or ✓ English

Context of the Topic & Scientific Methods
(Research impact, objectives, design, methods, and outputs)

Autism Spectrum Disorders (ASDs) are heterogeneous neurodevelopmental disorders behaviorally defined by significant deficits in social interaction and communication and by the presence of restricted interests and repetitive behaviors. The etiology of ASD remains largely unknown but is likely multifactorial including genetic and environmental factors.

Several studies suggest that the maternal diet during pregnancy has a fundamental role in the etiopathogenesis. For example, a maternal diet that is high in fat products or deficient in vitamin D or folic acid could increase the risk of ASD. Furthermore, it has been reported that individuals with ASDs are nutritionally vulnerable because they exhibit a selective or picky eating pattern and sensory sensitivity that predisposes them to restricted intakes. In addition, studies have shown that children with ASD frequently use special diets or receive nutritional supplements to treat ASD symptoms. However, to date, supportive evidence on the nutritional diet and ASD are not conclusive. In fact, nutritional status depends not only on food intake, but also on digestion, absorption, metabolic processing, and metabolic demand. More recently the focus has shifted to the relationship between relative metabolic

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[1] Thesis proposal should not exceed two pages.

disturbances and developmental disorders. However, despite the differences in the nutritional habits and the environmental factors between countries the results of a research study conducted by our team has suggested that it might be a common metabolic profile between Lebanese ASD and other studied population which could be related to mutations in enzymes of a specific metabolic pathway. Therefore, a better understanding of these issues has implications both for discovery of the pathophysiologic underpinnings of the disorder and for the development of effective interventions.

Our study will be performed in different steps:

1. Evaluation of the nutritional status and the eating behavior of Lebanese patients suffering from ASD and comparison with USDA recommendations and guidelines.
2. Identification of blood/urine metabolic indicators in ASD Lebanese Patients.
3. Identification of genetic variations related to metabolic pathways' enzymes in ASD Lebanese Patients.
4. Study of the prevalence of protein energy malnutrition (PEM) among ASD patients in Lebanon.

Outcomes (OCs): What do we wish to achieve?	
OC1:	Improve ASD patient's nutritional status trying to prevent the onset of metabolic symptoms
OC2:	Improve the eating behavior and nutritional status of ASD patients through a proper nutritional intervention
OC3:	Identification of metabolic indicators that can serve as early warning signs and be included in routine practice

References (R) (5 most recent peer-reviewed publications in the field)	
R1:	Identification of metabolic pathway disturbances using multimodal metabolomics in autistic disorders in a Middle Eastern population Bitar et al., Journal of Pharmaceutical and Biomedical Analysis (2018)
R2:	Diet: the keystone of autism spectrum disorder? S. Peretti et al. Nutr. Neuroscience (2019)
R3:	Nutritional Status of Individuals with Autism Spectrum Disorders: Do We Know Enough? S. Ranjan et al. Adv. Nutr. (2015)
R4:	How nutritional status, diet and dietary supplements can affect autism. A review A. Kawicka et al. Rocz Panstw Zakl Hig (2013)
R5:	Standardizing the experimental conditions for using urine in NMR-based metabolomic studies with a particular focus on diagnostic studies: a review Emwas, et al., Metabolomics Off. J. Metabolomic Soc. (2015)