Symposiums Lectures

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SI-001 **Symposiums**

Nutrition and infertility: Fertile field of research and intervention with preventive value

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The growing scale of infertility has prompted the World Health Organization to recognize this phenomenon as a social disease, which affects about 13-17% of couples of reproductive age [1]. Definitely, success in treatment of infertility requires a professional teamwork of various specialists who consider wide range of multiple underlying causes[2].
Large body of evidences reinforces direct and indirect impact of specific dietary factors upon fertility status in female and male [3, 4]. In fact, hormonal and neuroendocrine controls of energy balance, appetite control, insulin sensitivity and reproduction are closely intertwined[5]. Proper nutritional modification based on comprehensive nutrition assessment, adjuvant to invasive treatments can influence both ovulation induction and improve sperm profile via hormonal and metabolic axis, antioxidant capacity and fatty acids flux in the body [6, 7].
At present, many artificial reproductive treatment (ART) centers do not integrate nutrition counseling in their treatment protocols, or nutrition counseling is only limited to obese or very underweight amenorrhoeic cases, whereas, there are many infertile subjects with normal body weight, who suffer from degrees of dietary imbalances [8, 9]. Also, at hypothalamic level the effects of dietary composition override the effects of body weight which directly and indirectly impact fertility and optimum responsiveness to infertility treatments. Type of protein intake, quality and quantity of carbohydrates are proven to have important impact on ovulation[10, 11]. According to the latest reports, nutrient deficiencies (vitamin D, Fe, Zn,B vitamins), low antioxidant intake, inappropriate dietary patterns and mal dietary habits such as meal skipping and false dieting, are not uncommon among infertile couple[11-16]. The wide array of dietary influences on ovulatory dysfunction suggests a complex balance of nutrition for optimal fertility and confirms the dictum that there is no "one size fits all" dietary intervention to boost fertility. Thereby, specialized nutrition counseling is highly necessary to be considered for infertile female as they attend for treatment.
Additionally, the deleterious effects of dietary factors can impair spermatogenesis, sperm concentration, motility, and increase sperm DNA damage. Especially, infertile obese male with diabetes, dyslipidemia or metabolic syndrome are at increased risk of oxidative stress in the testicular microenvironment or excurrent ductal system [17, 18]. Although, number of nutritional therapies and antioxidants as, zinc, selenium, vitamin B12 , Vitamin C, Vitamin E, Glutathione and Coenzyme Q10 , carnitine and arginine have been shown to improve sperm count and motility [19], none of these interventions can provide optimum support without complete assessment of food intake and appropriate dietary modifications. Therefore, providing timely optimal paternal diet therapy can promote sperm and embryo quality and eventually the rate of live birth success.
Finally, succession in infertility treatment is not finalized only in pregnancy, but the ultimate aim has to be producing a child with optimum neurodevelopment and lowest susceptibility to chronic diseases during its life span [20, 21]. Hence, improving metabolic condition and nutrient demands of infertile couple, at least three months prior initiation of reproduction treatment cycle is definitely crucial opportunity for developing healthy generation. Conclusively, scientific based approaches on setting standards of nutrition care during ART program need to receive more attention in infertility treatment package worldwide.

SI-002 **Symposiums**

Obesity induced effects of male infertility: suggested mechanisms

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Obesity and infertility have been increasing coincidentally. So their interrelationships are under investigation. Studies regarding to sperm parameters and weight status are inconclusive. But nearly all of the studies showed hormonal changes in obese men. Some mechanisms related to the effects of obesity on hormonal parameters are reviewed in this paper. Some unfavourable hormonal changes are decreased levels of testosterone, ghrelin, inhibin B and increased levels of estrogen and leptin. Physical change such as erectile dysfunction due to increase of heat stress is reported in obese men. Weight loss may have beneficial effects on reversing hormonal irregularities in obese men with infertility problem.
Obesity, as a condition of excess body fat, is increasing all over the world. This is coincident with a worldwide reduction in sperm quality tending to male infertility. So it is necessary to broaden our knowledge regarding the significant role of weight status of male partner in cases of infertility. The aim of this review is to evaluate the evidence on the effects of paternal weight status on his reproductive potential. We review studies in Pubmed, Embase and CINAHL data banks using these keywords: BMI, body weight, male, semen parameters, sperm, and infertility.
Many studies investigated the effect of obesity on sperm parameters. These parameters included sperm motility, morphology, viability, concentration, and DNA integrity. The results of the studies are inconsistent. Fejes et al found that waist and hip circumferences negatively correlated with sperm concentration (1). But he didn't find such correlation with BMI. Jensen et al. Showed lower sperm count, sperm concentration, and percentage of normal spermatozoa in overweight men (2). Also, Hammoud et al. Found negative association between BMI and sperm motility and concentration (3), when Martini et al. have not find any association between BMI and sperm motility (4). There are some other studies showed no significant association between BMI and semen parameters (5-9). It seems that BMI and semen parameters are not correlated linearly. Chavarro et al. Found lower sperm count and higher DNA damage only among men with BMI greater than 35 (9). mechanisms of this relationship were under study. One of suggested mechanisms is increase in aromatase activity, which converts androgens to estrogens (10). A study conducted by Hammoud et al. Showed increase in aromatase activity and estrogen concentration only among men with increased number of tetranucleotide repeats in intro4 of the CYP19 gene (10). So, we can conclude that genetic may be the chief responsible of abnormal levels of testosterone in obese men. Another mechanism is related to leptin. Animal studies showed that leptin crosses the blood-testis barrier and can affect on Leydig cells o decrease steroidogenic factor, steroidogenic mRNA and inhibits secretion of testosterone (11). In addition to leptin, ghrelin levels are abnormal values in obesity. It influences the male reproductive system via its effects on steroidogenesis and testosterone secretion. Ghrelin decreases testosterone secretion by inhibiting enzymes involving in sterodogenesis such as

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3β hydroxysteroid dehydrogenase and 17-β- hydroxysteroid dehydrogenase type 3 enzymes. Inhibin B deficit is another hormonal irregularity in obese men. The exact pathological mechanism is unclear. But, decreased inhibin B has been associated with abnormal spermatogenesis and infertility in obese men (12). Moreover, obesity is responsiblefor accumulated fat around the suprapubic region, so it can produce a high amount of heat stress that adversely affects reproductive potential due to low sperm parameters (13). Obesity is also related to erectile dysfunction.
Overall, obesity not only has unfavourable hormonal effects but also it has effects on physical determinants of sperm parameters and it may impair male reproductive potential. The cut off points for weight and BMI are not well-defined. But weight loss is the first line in cases of male and also female infertility and it may reverse hormonal irregularities. Investigations regarding to underlying mechanisms and well-designed RCTs may have important clinical implications.
Keywords: obesity, male infertility, leptin, ghrelin, inhibinB

SI-003 **Symposiums**

Dietary fatty acids and male fertility

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This review focuses on the effects of dietary omega-3 fatty acids, comprehensive fatty acid profiles analysis, and trans-fatty acids on male fertility. Mammalian spermatozoa are characterized by a high proportion of polyunsaturated fatty acids (PUFA) and the membrane structure of spermatozoa plays a crucial role in fertilization. Docosahexaenoic acid (DHA, C22:6n-3) and palmitic acid (C16:0) are the predominant PUFA and saturated FA, respectively, in human's sperm cells. Whether the higher level of DHA is concentrated in the sperm head or tail is variable among different species, human sperm head contains higher concentration of DHA. Dietary FA influence sperm FA profiles and it appears that it is most sensitive to dietary omega-3 PUFA. Although improvements in sperm parameters are a response to omega-3 sources after more than four weeks of supplementation in men diet, time-dependent and dose-dependent responses may explain the failure in some experiments. In human sperm, elevated saturated or tarns-fatty acid concentration alongside DHA low level is a concern. So, Sperm Fat Depression (SFD) may be suggested as a main explanation for men infertility and regulation of sperm FA mean melting point (MMP) is the key factor causing responses by inclusion of omega-3 PUFA.
Keywords: Sperm Fatty Acids, Dietary Fatty Acids

SI-004 **Symposiums**

Prenatal Nutrition and Fetal Development: Focusing on the critical role and requirements of essential fatty acids during pregnancy, lactation and childhood

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Early nutrition is crucial for the development of the growing fetus and for the child's future health. The needs for energy and most nutrients generally increase during pregnancy, lactation and growth. Because they play special roles additional requirements are justified for certain nutrients such as the essential fatty acids (EFAs).
Linoleic acid (LA) and -linolenic acid (ALA) act as precursors for the long chain polyunsaturated fatty acids (LC-PUFAs) arachidonic acid (AA) of the n-6 and eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) of n-3 series that are phospholipid components of all cell membranes influencing membrane structure and functions. Also derived from AA, EPA and DHA are the various eicosanoids with effects on immune responses, vascular dilation, blood pressure and coagulation and neural signaling. Intake of preformed n-3 LC-PUFAs or fish oil during pregnancy, lactation and infancy showed a potential to prevent the development of atopic diseases in children.
DHA is increasingly accumulated in the fetal body during late gestation, with the brain and retina as important target tissues. The role of DHA in nervous function and vision is mirrored in the reported positive effects of DHA, n-3 LC PUFAs or fish oil supplementation during pregnancy on cognitive and visual development of infants. Supplementation of n-3 LC PUFAs during lactation improves their content in breast milk as does high fish intake in pregnant and lactating women. DHA can be biosynthesized from ALA, albeit inefficiently in adults. Although the capacity for DHA biosynthesis appears higher in young infants, it can probably not fully compensate for an insufficient supply through breast milk. Conversion rates also show a high genetic variability influencing DHA status.
To ascertain a sufficient supply, a range of 2.5-9% of energy (%E) from LA and of 0.5-2%E from ALA is recommended for adults including pregnant and lactating women. A consultation group of the FAO/WHO recommends an intake of 0.3g/d of EPA and DHA or of 0.2g/d of DHA alone during pregnancy and lactation for adequate status of the child and the mother. In infants, fatty acid requirements are covered by breast milk during the first 6 months and intake recommendations are based on its composition. Of ALA, 0.2-0.3%E are recommended and 0.1-0.18%E of DHA. Adequate intake (AI) of ALA in children aged 6-24 months is 0.4-0.6%E and 10-12 mg/kg DHA, while AI of EPA and DHA ranges from 100 to 250 mg/kg in children aged 2 to 10 y.

SI-005 **Symposiums**

Prenatal nutrition and developmental origins of health and disease

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Epigenetic elements are proposed as the possible etiologic element of the primary-living scheduling of adult-start diseases. Based on the Developmental Origins of Health and Disease (DOHaD) theory, intrauterine or suitability following birth to the surroundings gives rise to the fetal programming of adult diseases, mainly non-communicable diseases (NCDs).1
Maternal dietary pattern, notably during pregnancy, have long- term effects on the health of her offspring. It may be mediated by changes in metabolism and epigenetic regulation of gene expression; it might have trans-generational impacts. Maternal obesity before gestation, as well as her diet and nutrient intake in pregnancy are important factors for intergenerational fetal programming of adult diseases and their risk factors. Experimental studies have documented that an obesogenic diet during pregnancy would have many adverse effects on the fetal growth trajectory and various

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disorders including insulin resistance, endothelial dysfunction, and obesity in their children. A high-salt diet of mothers during pregnancy has long- term impact on the blood pressure of her offspring. This effect may be mediated through the renal renin-angiotensin system of her children.2,3
The DOHaD hypothesis proposes a correlation between low birth weight, which is a complex clinical indicator of unsuitable intrauterine growth, and the risk of and their risk factors in adulthood. The "Economical Phenotype Theory" expressed that once the fetal surroundings is poor of a necessary element or contains a detrimental element, the fetus suits by favoring development of vital organs to survive. This event is recognized as the "Developmental Flexibility" or "Scheduling", because the genetic schedule suits to the obtainable environmental circumstances leading to the diverse phenotypes.4
It is well documented that adverse intrauterine environment and impaired fetal growth contribute to the early development of underlying risk factors of adult diseases, notably NCDs, with a long latency period until symptomatic diseases. In low-birth-weight newborns, poor fetal conditions might have modified the metabolic pathways for adapting to chronic undernutrition. Therefore, to continue their survival, such children would be programmed to store the highest possible amount of energy, and in turn they would face obesity, hypertension, metabolic syndrome, and early onset of chronic diseases.5
It should be acknowledged that in addition to maternal diet, another aspect of environmental influences on the fetal programming of adult diseases can be the impact of environmental pollutants, notably air pollution and endocrine disruptor chemicals on intrauterine growth retardation, low birth weight, and prematurity, which in turn can be associated with higher risk of chronic diseases in later life.6 This growing body of evidence highlights the importance of primordial/primary prevention of adult diseases and the important role of modifiable prenatal conditions in this regard.

SI-006 **Symposiums**

The future of sport and exercise nutrition and Global marketing

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The future of sport and exercise nutrition is bright. There have been tremendous advances in knowledge and its application, particularly in the last 15 years, and more advances are expected. The number of full-time jobs is slowly increasing. Athletes at all levels are looking seriously at the role nutrition plays in training, recovery, and performance. As athletes compete at the professional level for longer periods of time than in the past, nutrition becomes particularly important because of its role in recovery and good health. Although no one can predict the future with accuracy, some likely developments in the field of sport and exercise nutrition are outlined here.
Recent Studies demonstrate that sports supplements moving slowly from the markets to mass markets sales. In this decade, customers shift from body builders and weight trainers to life- style users and, hence, new market and manufactures chances. The billion dollar market for sport supplements estimated in USA as a biggest market around the world is estimated nearby five billion $ (1). These supplements classified in three main groups; (1) functional foods, (2) beverages, and (3) supplements. Most of the users are: weight trainers, athletes, recreational users and the most important consumers in recent year categorized as "lifestyle" users.
They are consumers that need to feel wellness and wellbeing and have a good sense that they are involved in a healthy program through utilization of these products (2). There is an advance interest for sport beverages. Energy bars and high protein content bars can use for dieters that prevent hunger. Ingredients that reduce weight and burning calories are one of the main reasons of interests of customers.
Job Opportunities: The number of full-time jobs in sport nutrition is expected to slowly increase. A major issue is credentialing and the distinction between sport nutritionists and sport dietitians. In the United States, there is no requirement for people who work in the field of sports nutrition to be licensed. Thus, individual employers set the qualifications for the job. At the present time, the strongest credential in terms of education and experience appears to be the board-certified specialist in sports dietetics (CSSD), which requires that the person be a registered dietitian.
Dual Areas of Expertise: Most athletes would benefit from the expertise of a sport dietitian. Unfortunately, budgets at the high school and club levels are usually small and strained, so it is beyond the budget to hire such a person. Being certified in two areas, such as sport dietetics and strength and conditioning, could be beneficial because there may be enough money in the budget for a full-time person who is qualified to work in both areas.
Entrepreneurial Skills: An entrepreneur is someone who sets up and finds financing for new commercial enterprises. The field of sport and exercise nutrition is ripe for entrepreneurs. New forms of communication such as video conferencing, text messaging, and social networking Web sites may provide the platform for some creative ways to counsel athletes about nutrition.

SI-007 **Symposiums**

Effect of medicinal Plants on delayed onset muscle soreness (DOMS)

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It is well documented that physical exercise, particularly, intense and unaccustomed eccentric exercise is associated with muscle damage. This micro damage can change sarcomere structure and lead to muscle injury, that known delayed onset muscle soreness (DOMS). Responses of inflammatory increased due to microscopy trauma, and damage morphological ultra-structural of muscle fibers can causes pain and reducing muscle strength. These phenomena are more common in subjects that participate in sport program for the first time, or return after a gap. Some exercise that causes more muscle pain including resistance, polymeric training, skiing, downhill running and walking. Therapeutic modalities for the prevention and management of DOMS related symptoms are numerous and include, stretching, massage, compression, warm-up, ice massage, oxygen therapy, ultrasound, and exercise. One of the newest theories that clarify DOMS is inflammation theory. Based on this theory, some researcher has used anti-inflammatory storied drug such as dexamethasone, or non-storied drug such

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as ibuprofen, aspirin, and acetaminophen for attenuating DOMS symptoms. If anti-inflammatory drug could attenuate DOMS symptoms, therefore, theoretically, we can use plant with anti-inflammation characteristic for decreasing and attenuating of DOMS symptoms. In generally, much of plant section has anti-inflammatory property. In this regard, Chamomile plant is considered as an effective and important plant with anti-inflammation property. Chamomile plant has antioxidant and anti-inflammation compounds such as Apigenin Quercetin , terpenoid, alpha bisabolol, Coumarin, patuletin, that can attenuate pain and inflammation by reducing prostaglandin E2, interleukin 6 and factor necrosis tumor alpha concentration. Therefore, it may be used for attenuate pain and inflammation following eccentric exercise. Azarbayajani et al. reported that taking Chamomile plant for 14 day can attenuate pain and muscle inflammation during recovery phase (unpublished data). One of other plant that was used of attenuate inflammation is Cinnamon plant. In traditional medicine, Cinnamon has been used as drug for attenuate pain. Cinnamon is dried skin trunk of tree at scientific name Cinnamomum Zeylanicum. Cinnamon has compounds such as eugenol, felandren, and Safrole. Also, it has other compound such as limonene and linalool, trans Cynthia aldehyde, coumarin, resin, and phenyl propanone compound (Hydroxy cinnamaldehyde) (Maridass). Cinnamaldehyde gives property anti spasm to cinnamon plant. Eugenol can attenuate pain by decreasing inflammation via inhibiting of prostaglandins synthesis. It has been reported that taking cinnamon for two days can attenuate symptoms DOMS. In the investigation, author reported that taking Purslane for six days can decrease symptom DOMS. Regarding studies data; it seems that taking and using plant with anti-inflammation property with an appropriate method to control DOMS. However, to clarify effect of mentioned plant we need to have more studies in these filed.

Keywords: Herb, Medicine, Exercise, Health, Treat

SI-008 **Symposiums**

Creatine Supplementation and Athletic performance: A literature review

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Estimate effectiveness of Creatine supplementation on Athletic Performance. A literature search was conducted from January 2001 through August 2014 that included a Current Contents: Medline, PubMed, thesis, searching internet databases, manually reviewing the archives of the Sultan Abdul Samad Library University Putra Malaysia (SASLUPM), searching the Journal of Nutrition Education and Behavior, a reference list search and directly contacting researchers who works in the field for the following **Keywords:** Creatine, supplementation, Athletic performance, and Improvement . Our goal was to identify randomized clinical trials and observational case-control and cohort investigating the effect of creatine supplementation on athletic performance. Dietary supplementation on performance, Supplementation as an ergogenic aids, improvement of athletic performance, and effectiveness of nutritional intervention on performance promotion. A total of115 studies were identified of which 40 met inclusion criteria for being published in a peer reviewed journal and using goal setting in an intervention of creatine supplementation and athletic performance improvement. Excluded from this review were those studies that used goal setting for nutritional creatine supplementation, to improve athletic performance. The focus of this search was to distinguish the miscellaneous between participants supplementing with creatine and those supplementing with placebo with regard to the athletic performance as the dependent variable. Interpretation of analyzed data strongly indicated that an improvement in athletic performance affiliated with the increase of Phosphocreatine availability in muscle fibers for the synthesis of ATP. When intensity goes beyond the capability of the aerobic system, the muscle commences to rely on the anaerobic system, which includes the use of phosphocreatine and muscle glycogen as fuels. Hence, during the most intense periods of exercise, the muscle will utilize the phosphocreatine store most highly.
This review debates some of the effects and actions of creatine supplementation on athletic performance. The available researches demonstrated creatine supplementation increase muscle phosphocreatine reserves which may cause performance improvement. Miscellaneous indicators in different researches as an indicators of athletic performance improvement were mean power, block jump, 1_RM leg extension and bench press, muscle strength and power, anaerobic running capacity, high-intensity, short-duration activities, enhances the dynamic strength, increase anaerobic metabolism , critical power, anaerobic working capacity, VO2PEAK and VO2PEAK time-to-exhaustion, peak strength, improved ATP synthesis, power output, sprint performance, high intensity, intermittent exercise performance and eventually benefit to exercise lasting 30 s or less. Nevertheless, not all researches have reported improvement due to miscellaneous in participant's readiness, exercise protocol, age and sex, duration of oral supplementation, interaction with other supplements, body composition, time of ingestion, purify of supplement, and environmental obstructive factors that must appraise in future studies.

Keywords: Athletic, Creatine, Exercise Improvement Performance Supplementation.

SI-009 **Symposiums**

Sport Nutrition Marketing: Shift from Athletes to Lifestyle Users

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Recent Studies demonstrate that sport supplements are moving slowly from the markets to mass markets sales. During the last decade, customers shift from body builders and weight trainers to life- style users and, hence, new market and manufactures chances. The billion dollar market for sport supplements is estimated in the USA as the biggest market around the world. These supplements are classified into three main groups; 1) functional foods, 2) beverages, and 3) supplements. Most of the users are weight trainers, athletes, recreational users and the most important consumers in recent year are "lifestyle" users.They are consumers who need to feel fit and healthy and believe that they are involved in a healthy program through utilization of these products. There is anhigher interest for sport beverages. Energy bars and high-protein content bars can be used for dieters to prevent hunger. Ingredients that claim to reduce weight and burn calories are more in demand due to the in-

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terests of customers.
Keywords: Marketing, Nutrition, Sport, Lifestyle

SI-010 **Symposiums**

Nutritional epigenetic reviewed at length in experimental and observational studies: Diet-induced epigenetic changes and cancer chemoprevention

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MicroRNAs (miRNAs), a class of endogenous, single-stranded, non-coding small RNA with 18–22 nucleotides in length, play a critical role in initiation, progression, metastasis and invasion of cancers. It is widely recognized that deregulation of miRNAs is a hallmark of cancer. The expression of miRNAs can be regulated by several mechanisms, including epigenetic changes. Although epigenetic changes can be inherited in the somatic cells, unlike genetic alterations, these modifications are potentially reversible.
Environmental and dietary components are believed to contribute to differences in cancer incidence among populations with different dietary habits. Studies suggest that a large fraction of cancer deaths may be prevented by modifying dietary composition e.g. the content of fiber, fat, cereals, spices, etc.
Dietary components not only potentially influence fundamental cellular processes involved in carcinogenesis, but also directly influence epigenetic mechanisms. It has been proposed that dietary modulation of miRNA expression may contribute to the cancer protective effects of dietary agents. Recent data suggest that bioactive dietary components play a role directly or indirectly in the modulation of miRNA expression to regulate carcinogenesis and thereby have chemopreventive potential.
Since miRNAs have emerged as critical regulators of genes and proteins, this review discusses the impact of dietary components including micronutrients and non-nutrients on epigenetic alterations especially miRNAs in cancer. Also it emphasizes on promising agents for prevention and perhaps therapy of cancer.
Keywords: Diet, Epigenetics, Cancer, MicroRNAs

SI-011 **Symposiums**

Modern Epigenetic Detection Techniques: current trend and future direction

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As a broad definition, epigenetics is the combined heritable changes in phenotype caused by processes that take place independent of primary DNA sequence. DNA methylation and histone modifications are two broad areas of epigenetics. DNA methylation profiling is important in understanding genetic evolution of embryonic and adult cells and provide insight into the complex circuit of genetic and epigenetic regulations. Methods: In this review, a summary of several modern technologies is given whose scope is at sub-genome and genome levels: IlluminaBeadChip as an example of microarray technology, and Nanopore technology as an instance of next-generation sequencing platforms are detailed. Conclusion: A comparison of some modern technologies are made and the issues of "different methods for different questions" and "future direction" are further discussed in the lecture.
Keywords: Epigenetics, Detection, Techniques

SI-012 **Symposiums**

The underlying mechanisms of nutritional epigenetics in carcinogenesis

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Intermittent and variations of exposure to nutrients during individual's life-time remains obscure about making epigenetic changes over years to rich a critical chaotic point to develop dysregulated biological pathways or metabolism, with impressive healthy consequences. Despite of mutation with irreversible changes in DNA sequences, epigenetic changes are promisingly modifiable perhaps in tune with nutritional characteristics. Experimental evidence supported the role of one-carbon metabolism which globally provides S-adenosyl methionine (SAM) to global methylation of DNA and histones (heterochromatin formation) as an underlying mechanism in disease-associated aberrant methylation. Despite the laboratory experimental studies, the dynamic of epigenetic events often impinges the interpretation of results in nutritional epigenetic studies due to mostly inter-individual variations concerned in epidemiological researches. This meeting bring attendants together to revisit the interaction of nutrients, epigenetic, human disease in the area inborn errors of metabolism, SAM metabolism, dysregulation of biologic pathways in disease pathogenesis, transcription, and biologic development.
Keywords: Epigenetics; Cancer; Adenosyl methionine; Genomics

SI-013 **Symposiums**

Epigenetic and colorectal cancer

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SI-014 **Symposiums**

Genistein, epigenetic & colorectal cancer

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The Incidence of colorectal cancer (CRC) is high in most of nations. Despite the progress in therapeutic modalities, it is one of the most cancer- related death. CRC is result from multiple genetic and epigenetic alternations that are reasons for initiation of neoplastic lesions formation on normal colonic epithelium. Insufficient epigenetic modifications, activates oncogenes and deactivate tumor suppressor, that can leading to various cancers. Dietary intake and epigenetic have closely interaction with each other that proper relation result in normal development. Soy bean contains various bioactive components that are so attractive for their anticancer abilities. One of the most abundant isoflavone found in soy bean is genistein that can block uncontrolled cell growth in colorectal cancer by different mechanisms. As an example, genistein can induction of apoptosis, cell cycle arrest and inhibition of angiogenesis on cancer cells. Effects of genistein are through estrogenic or anti-estrogenic manners. This isoflavone at low doses acts as estrogen agonist so promote cell growth but at higher concentration show inhibitory effect on cell proliferation maybe by suppress tyrosine kinase activity.

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This isoflavone can regulate gene transcription in cancer cell by epigenetic regulation, such as, DNA methylation and histone acetylation. Phosphorylation, methylation and acetylation on specific residuals of histone or DNA can induce some alternation that can prevent or initiate gene transcription. In this study we aimed to review epigenetic effects of genistein on prevention and prognosis of colorectal cancer.

Keywords: Colorectal cancer; Epigenetic; Diet; Isoflavonoid

SI-015 **Symposiums**

Epigenetic role of micronutrients in neutralizing Carcinogen effects of asbestos

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Occupational exposure to chemicals like asbestos is the second cause of lung cancer in Iran. Studies show that 28% of workers in factories producing Asbestos-cement pipe and sheet in Ahvaz suffer from respiratory disorders. On the other hand, some nutrients have been shown to be able to neutralize the effects of epigenetic effects of asbestos in cancer. This study was done through review of the latest studies. Increasing the concentration of asbestos in the environment caused by the body macrophages's inability to remove these particles. Asbestos fibers creating conditions of oxidative stress and disruption of cell division that May underlie susceptibility to several of cancers. Studies showed that the hypermethylation of tumor suppressor genes such as CDKN2A and RASSF1A associated with reduced expression of these genes and will facilitate the conditions to develop cancer. However, studies have shown that simultaneous administration of coenzyme q10, riboflavin and niacin makes hypomethylation and increased expression of RASSF1A gene. In addition, hypomethylation RASSF1A gene was reported in patients with colorectal cancer by folate supplementation. It seems, other micronutrients also play a similar role, although there is need to further studies in this field. The results of numerous studies emphasizes the importance role of micronutrients in adjustment and neutralization of carcinogenic effects of asbestos.

Keywords: Micronutrients, Asbestos, Cancer

SI-016 **Symposiums**

Epigenetic effects of dietary factors

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Many studies suggest that dietary factors can affect gene expression through epigenetic mechanisms. Epigenetic modifications are heritable and potentially reversible changes in gene expression that do not require changes in the DNA sequence. The main mechanisms of epigenetic changes are DNA methylation, histone modifications, and RNA silencing. The reversibility of these changes suggests that we can modulate these alterations by nutrition and bioactive food compounds. Thus, epigenetic modifications could provide a link between dietary factors and diseases like cancer.

A selection was done in articles that were related to diet and epigenetic. All of these articles were in the electronic databases such as PubMed with emphasis from 2000 onwards articles. No restriction about language or study design was made.

One of the most widespread approaches to the epigenetic alterations is dietary control. This could be achieved through the quality and type of the diet. In all the studies that reviewed here many phytochemicals such as dietary polyphones, tea polyphones, resveratrol, curcumin, isoflavones (genistein), and isothiocyanates have modulating effects on epigenetic changes and are also efficacious for preventing or treating the epigenetic aberrations in diseases like cancer. A wide range of nutritional interventions can lead to range of disorders, which are mediated in part by epigenetic processes.Recent advances indicate that epigenetic changes are an important cause of diseases and dietary factors and bioactive nutrients components can prevent or modify epigenetic changes. Epigenome is a good target for nutritional factors and we need more studies for demonstration this relationship.

Keywords: Dietary factors; Epigenetic; DNA methylation; Histone modifications

SI-017 **Symposiums**

A Systematic Review on Strategies and Challenges for Prevention and Control of Childhood Obesity

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Childhood obesity is a global health problem at public and individual levels. It has been of great interest in recent years because of its short- and long-term health consequences. This systematic review presents a summary of the experiences on different family-, school-, and clinic- based interventions, as well as their main strengths and limitations. Articles were obtained from Web of Science, PubMed, and SCOPUS using specified search criteria. All trials have been conducted on children up to 18 were included. Most studies (30/105) were carried on in the United States and were clinical trial (n=70). As children spend a considerable part of their time in school, and adopt some parts of lifestyle there, school-based programs can have long-term effects in a large target group. The most common limitation of these studies is presenting self-reported data, non-randomized selection of schools, short duration of study, and not masking the interventional groups. Because of the crucial role of parents in development of children's behaviors, family-based interventions are reported to have successful effects. The main limitation of these studies is the small sample size, high dropout rate, no follow up data, and selection bias in participation of motivated families. Clinic-based interventions revealed favorable effects; however the main limitation of some of these studies is lack of comparison with control group, and short-term follow up of participants, and the uncertain sustainability of such kinds of interventions. These findings suggest that among different types of interventional programs, a multidisciplinary approach in schools in which children's family are involved, can be the best and most sustainable approach for management of childhood obesity.

SI-018 **Symposiums**

Rationale for designing a school-based intervention to prevent or control childhood obesity

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Background & Objectives: High rate of childhood obesity in Iran is alarming and urges implementation of policies to combat it. To prevent or control childhood obesity we designed an evidence-based, multi-component intervention that was implemented in primary school students in Tehran.

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Methods: Initially, to find an appropriate pattern for our intervention we started a systematic review and searched among all eligible documents during 2001-2011. Meanwhile to seek stakeholders' views about an ideal intervention we implemented a qualitative study with male and female5th graders. After exploring the key elements of the intervention, we hold a session with experts on childhood obesity to explore their idea about our suggested intervention. Finally we proposed an intervention to prevent or control obesity among primary school students. The intervention was implemented as a cluster randomized controlled trial in 4th, 5th and 6th graders in district 9 of Tehran.
The proposed intervention was a multi-component intervention including education of nutrition and physical activity for the students, and education of life style modification for parents and also changing and/or modifying the content of schools' cafeterias. Nutrition and physical activity was educated by the students' teachers. The parents were educated by the researchers. The intervention lasted about 5 months. Final assessment showed an improvement in BMI-Z and hip circumference.
Results:
Conclusion: The current study, for the first time provides an intervention model for preventing childhood obesity in a systematic manner. The methodology can be applied in other settings for other childhood obesity prevention interventions throughout the country.

SI-019 **Symposiums**

Management and control of overweigh and obesity in school age children through a primary health care based program in Iran: A pilot study

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Background & Objectives: In response to the childhood obesity epidemic in Iran, a national guideline for prevention and management of childhood overweight and obesity was developed by MOHME. The aim of this pilot study was to evaluate effectiveness of a primary health care based intervention to control overweigh and obesity in school age children in Iran.
Methods: The study was conducted as a primary health care-based trial on 227 overweight/obese primary school students, aged 6–7 years in the city of Tehran. Participants were assigned to the intervention (n=113) or control (n=114) groups according to the district of their schools. For each child, body weight and height were measured and body mass index (BMI) was calculated. Then Z-scores of BMI for age were calculated by WHO AnthroPlus software. Blood samples were drawn and fasting blood sugar, total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglycerides were measured. Blood pressure was also determined. The intervention was designed based on the chronic care model (CCM). In the first stage, health workers in the designated intervention health centers were trained through a three day workshop. A practical manual was also developed introduced to them as a desk reference. In the first two months, after collecting the baseline information on all the subjects, mothers in the intervention group received five sessions of pre-designed group education by health workers. Dietary intake, physical activity of children, as well as self-efficacy and BMI of mothers were measured in both groups before, one month and three months after the intervention. The outcome measures were compared with the analysis of repeated measurement.
Results: Out of the 226 study participants (75 in the intervention group and 77 in the control group) completed the study. Fifty five percent of the participants were girls. No significant differences were observed between the two groups at the baseline in term of demographic and anthropometric characteristics. As compared to the control values, there were significant decreases in the BMI z-scores in the intervention group ($P<0.001$). Mean changes in the BMI z-scores were 0.16 ± 0.085.There was no significant changes in control group after six months.
Conclusion: The findings show that the intervention designed had significant effect on weight status and physical activity of children, as well as self-efficacy of their mothers. However, to improve the effectiveness and ensure its sustainability, such programs need to take multi-faceted approach and involve other sectors, including schools and community.
This study is fully funded by UNICEF office in Tehran.
Keywords: overweight, obesity, school age children, primary health care

SI-020 **Symposiums**

Nutrient Sensing Mechanisms via a Gut-Brain Axis

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Upon nutrient ingestion, an intestine-brain axis is triggered involving signals from the upper intestine by vagal afferents that communicate with the nucleus of the solitary tract (NTS) in the brain. Satiety signals from the gastrointestinal tract such as small lipids in the upper intestine control food intake by afferent sensory neurons that signal to the NTS to regulate nutrient consumption. Besides this neuronal pathway, many hormones (leptin, insulin, ghrelin, and peptides like cholecystokinin (CCK) and glucagon-like peptide-1 (GLP-1) contribute to the regulation of food intake by modulating the responses of the brain to the intestinal signals. Lipid ingestion can also regulate glucose homeostasis involving a gut-brain-liver axis. As part of the brain-liver axis, the hypothalamus plays a major role in this process as experimental lipid infusion in this area blocks hepatic glucose production, an effect that is reverted after hepatic vagotomy. Moreover, blocking the sensitivity of the hypothalamus to lipids promotes overfeeding resulting in obesity and insulin resistance. During the transition from fasting-to-fed states (immediately following meal ingestion), entroendocrine cells (L- and K-cells) in the proximal and distal small intestine are stimulated, possibly through a combination of neuro-hormonal pathways and direct nutrient stimulation, to secrete incretins, GLP-1 and gastric inhibitory polypeptide (GIP). GLP-1 together with postprandial hyperglycemia stimulates the pancreatic beta-cells to secrete insulin, thereby increasing circulating insulin levels. Postprandial hyperinsulinemia acutely suppresses lipoprotein assembly and secretion in the

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liver, and increased GLP-1 secretion may also have a similar function, reducing hepatic lipid exportpostprandially. There is further evidence in animals that a gut-brain-liver axis is operative and thus the accumulation of certain lipids (such as long-chain fatty acids) in the upper intestine suppresses liver glucose production through action of the gut-peptide hormone CCK.
In this presentation, I will give an overview of the central and intestinal mechanisms that mediate nutrient sensing focusing on the key role of gut peptides, particularly GLP-1 and GLP-2. I will also present some of our own recent studies examining the role of these gut peptides in regulating dietary fat absorption and lipid/lipoprotein metabolism.

SI-021 **Symposiums**

How vitamin A modulate gene expression of immune cells

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Retinoicacid (RA)isinvolvedin manyfunctionsof the immune systemincluding activities of CD4+ T cells including Th1, Th2, Th17 and T-reg, mucosal immunity, myeloid cells development, antibody responses and inflammation. Retinoicacid andits derivativessuch as all-trans RA (ATRA) and 9-cis RA actthroughspecific receptorsinthenucleuscalled retinoic acid receptors (RARs). Different forms of RARs (RAR-α, β, and γ) can dimerize with RXR or some other nuclear receptors and regulate retinoid-mediated gene expression. Although the moleculardetailsandthe signaltransduction pathwaysare notclear so far, in some cases the mechanism ofretinoidactionhas been known. For instance, ATRA increases acetylationofhistonesin thepromoter region of Foxp3 gene and CpGdemethylation in the regionofFoxp3 locus which in turn increase regulatory T cells and subsequently creates tolerance. Therefore RA can prevent the autoimmune diseases by this mechanism. The effects of ATRA on treatment of experimental autoimmune encephalomyelitis (EAE) and collagen-induced arthritis(CIA) mouse model have been shown previously.
Despiteempirical studiesoncelllinesandanimal models, clinical trial studies on the effects of vitamin A and its derivatives are rare. Recently a few clinical trials on the effects of retinylpalmitate on some inflammatory and autoimmune diseases including multiple sclerosis and Atherosclerosis have been done and the results of these investigations partially confirmed the earlier in vitro and animal model studies.

SI-022 **Symposiums**

Whether gene-fat intake interactions are differentially driving the risk of obesity and dislipidemia

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The Prevalence of chronic diseases such as obesity, dyslipidemia, cardiovascular diseases has increased in recent years. These disorders have multifactorial etiology involving environmental and genetic factors. Diet is one of the most important of environmental factors. Changes of diet are so rapid in recent decades.
Industrial progresses have affected food Production and dietary patterns. These changes have led to high intakes of calorie, sugar, fat and refined grains and have increased risk of chronic diseases. World Health Organization (WHO) was predicted that repeatedly 75 and 41 per center of the adult population will be over Wight and obese by 2015.
Interaction studies between gene and food intake for chronic diseases continues and open new windows toward reducing risk of diseases by individualized diet.
The important question is whether gene-fat intake interaction is differently driving the risk of obesity and hyperlipidemia in different population.
In this presentation, I will give an overview of the gene-diet interaction on obesity and hyperlipidemia. I will also present some of our own recent studies examining the role of Apo Polymorphisms and fat intake interaction on obesity and hyperlipidemia in Patients with Type 2 Diabetes Mellitus.

SI-023 **Symposiums**

Potential effect of bioactive food components against cancer stem cells

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A great deal of research has demonstrated the existence of cancer stem cells (CSCs) in several human cancers in recent years. CSCs are minor population of tumorigenic cells that are capable of continuous self-renewal and differentiation which may be regulated by some signaling pathways including Wnt/β-catenin, Hedgehog, and Notch. This cell population undergoes unlimited proliferation, gives rise to differentiated cells and developing new tumors. There are some techniques that has been developed to isolate and characterize CSCs including tumor sphere culture and some surface markers such as CD34+CD38−, CD44+CD24−/low¬¬ Lin−, CD44+CD24+ESA+ and CD133+ in different cancer types.
In addition, recent studies indicate that CSCs may be responsible for tumor relapse and resistance to therapy. Therefore, this CSC population has become a target for cancer prevention and therapy. Understanding the mechanisms that regulate self-renewal is of greatest importance for discovery of anti-cancer drugs targeting CSCs.
Currently available therapeutic approaches, including chemotherapy and radiotherapy, are often used as a main regimen in the treatment of most cancers, but represents a major obstacle in cancer therapy and lack of ability to effectively kill these CSCs.
Natural products have been discovered to be more effective than cancer drugs because of their multi-targeting property, low cost, low toxicity and immediate availability. Since a large number of epidemiological studies have demonstrated an association between consumption of fruits and vegetables and the reduced risk of various cancers, naturally occurring dietary compounds have received increasing attention for their efficacy in cancer chemoprevention. It has been suggested that some dietary constituents including vitamins A and D, curcumin, sulforaphane, soy isoflavone, epigallocatechin-3-gallate, resveratrol, lycopene, piperine, genistein, theanine and choline can directly or indirectly affect CSC self-renewal pathways.
Investigating the efficacy of the dietary compounds against CSCs will provide rationale for preclinical and clinical evaluation of these compounds or potentially their native food extracts for chemoprevention of CSCs. These studies will eventually enable us to discover more effective strategies for cancer treatment to reduce cancer resistance and recurrence and to improve patient survival. The current knowledge about the potential impact of natural dietary compounds on CSC self-renewal signaling pathways will be discussed in this review.

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Keywords: cancer stem cells, dietary compounds

SI-024 **Symposiums**

Combination effect of Apo-B ins/del and Apo A-II T/C polymorphisms influence LDL.c level and its response to polyunsaturated fatty acid intake

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Introduction: There are inter-individual variations in lipid profile response to dietary changes. The polymorphisms which are associated with plasma lipid levels could possibly define part of this variation. Therefore, the interaction effect of two important polymorphism in lipid metabolism (Apolipoprotein B insertion/deletion (Apo-B ins/del) and Apolipoprotein A-II -265 T/C (Apo A-II T/C) was investigated on plasma lipid response in diabetic patients.

Methods: The study sample included 292 (122 men, 170 women) aged 52± 6 y with type 2 diabetics who did not use lipid lowering drugs and were referred to health centers in Tehran. Dietary intake was assessed by a valid food frequency questionnaire. Fasting blood samples were collected to determine lipid profile. DNA was isolated from whole blood by salting- out method. Polymorphism of the Apo-B was determined by electrophoresis in polyacrylamide gels after polymerase chain reaction and Polymorphism of Apo A-II was determined using Tagman real-time PCR. Three combined genotype groups were **defined:** 1) Homozygous for the wild- type alleles for each SNP, n=75; 2) heterozygous for Apo-B ins/del or A-II T/C, n=164; and 3) heterozygous for both SNPs, n=53.

Results: the distribution of two genotypes was in Hardy-Weinberg equilibrium. The LDL.c was higher in second and third group (with one or more recessive allele) (p= 0.02). Besides, we observed an interaction between the combined genotype and diet in LDL.c level. Consumption of polyunsaturated fatty acids more than median intake (equal or greater than 0.6% of total energy) caused a significant decrease in LDL-c in the third group (p=0.04).

Conclusion: The study supports the concept that combination of ApoB ins/del and Apo A-II T/C influence LDL.c level and its susceptibility in response to diet.

Keywords: lipid profile, polymorphism, dietary intake

SI-025 **Symposiums**

Diabetes and diet adherence: Determinants, measurement and strategies to improve

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Background: An important part of nutrition-based empirical studies on type 2 diabetes management is measuring diet adherence among patient. Poor diet adherence measurement can over/under estimate the effectiveness of an intervention. Adherence to diet can be measured in a variety of ways. Validity and reliability of the measurement methods is of high concern. The most common method over time has been self-reports via 24-hour recalls, food diaries, and food frequency questionnaires; which have been shown to significantly underestimate the number of poor adherers in a population. Other methods recently developed include examination of biological indicators and electronic event monitors. This paper reviews and discusses the methods of diet adherence measurement in patients with type 2 diabetes.

Methods: Research studies have been obtained from searches of the MEDLINE electronic bibliographic database (January 2009 to July 2014) using certain key terms, supplemented with hand searches of references. Studies were limited to English language articles.

Results: Eight hundred and seven papers were identified through searching the terms. In addition, 18 articles were identified when scanning bibliographies of relevant published articles in the field. After examination of articles 17 intervention studies were finally included in the review. Review showed most of the studies have used self-report questionnaires to measure the diet adherence. Clinical measures were also used for diet adherence including HbA1C, plasma lipids, plasma vitamin C concentration, weight, BMI, and FBS. One study has used personal digital assistant technology to measure diet adherence. Some studies have aimed at improving adherence including tailoring the regimen to patient routines, ongoing telephone contacts and follow-ups, adequate instructions, electronic diaries, social support, short message service, clinic visits, counseling, and telehealth technologies.

Conclusion: Our review showed that recent studies have been limited in use of various diet adherence measures. Using valid and reliable diet adherence measurement methods will provide more accurate data on outcomes of interventional studies.

Keywords: Diabetes Mellitus, adherence, diet, measurement

SI-026 **Symposiums**

Diabetes and cancer: Can resveratrol be a good candidate in this tsunami?

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Background: Resveratrol (RSV) is a naturally occurring product found in grapes, peanut, blueberries, raspberries and mulberries. Many studies have verified anti-cancer properties of RSV in various human cancers. But the precise cellular mechanisms of RSV actions are still elusive. Also, RSV is found to be effective in improving glycemic state, insulin sensitivity and inflammation; and may possibly provide a potential adjuvant for the treatment and management of diabetes. Hepatocellular carcinoma and colorectal cancer are two common malignancies with higher frequency in people with diabetes. Currently available treatment regimens are not able to control these cancers and there is an imperative need

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for improved therapies. Diabetes may influence the neoplastic processes directly through hyperinsulinemia.
Based on the close link between diabetes and hepatic and colon cancers and also anti-diabetic and anti-cancer properties of RSV, this study was designed to investigate the effects of RSV and etoposide (ETO) in p53 wild type liver carcinoma (HepG2) and colon cancer (HCT-116) cells in an in vitro model of hyperinsulinemia.
Methods: Cells were treated with different concentrations of insulin (50, 100 and 200 nM), RSV (12.5, 25, 50 and 100 µM) or ETO (0.5, 1, 10 and 50 µM) for different time points (24-72 h). XTT assay was performed for proliferation assessment. Three types of XTT controls including negative control, solvent control and cell growth control were tested. The relative inhibition activity calculated by the following formula: % inhibition = 100 - (corrected mean OD sample × 100 / corrected mean OD solvent controls), where: Corrected sample OD = OD sample – OD negative control and Corrected solvent OD = OD solvent control – OD negative control.
Results: Insulin showed significant proliferative effect on HepG2 and HCT-116 cells in a time- and dose-dependent manner. Kinetic study revealed that RSV and ETO inhibit cell growth in a dose- and time-dependent manner in both cell lines in normal and hyperinsulinemia condition. Cytotoxic effect of combinational treatments of RSV and ETO in hyperinsulinemia was compared with the conditions in which cells were treated with either insulin or each drug alone. Interestingly, statistically significant reduction in HepG2 and HCT-116 cells viability was observed following co-treatment with RSV and ETO.
Conclusion: The findings of the present study demonstrated that RSV could exert a potent growth-inhibitory effect on human HepG2 and HCT-116 cell lines in normal and hyperinsulinemia condition. Effect of RSV and its synergism with ETO seemed to depend upon its concentration and type of target cells. RSV could be a good candidate for antagonizing adverse effects of insulin in hepatic and colon cancers and recommend to be investigated more in detail at in vivo systems prior to recommending clinical trials such regimen.
Keywords: Resveratrol, Etoposide, Insulin, HepG2, HCT-116

SI-027 **Symposiums**

Diabetes and Inflammation: Pomegranate as an ancient medicine and modern functional food

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Background: Type 2 diabetes is one of the main noncommunicable chronic diseases; low-grade inflammation is a common feature in subjects with type 2 diabetes. Diabetes prevention and treatment are high priorities in medical research. Fruit extracts have been used extensively in this context because they are natural, safe, and readily available. Moreover, folk medicine suggests some possible benefits to their use. The present study was designed to investigate the effects of pomegranate juice (as a rich source of polyphenols) consumption on NF-kB in blood mononuclear cells in patients with type2 diabetes.
Methods: In this double-blind randomized clinical trial, 50 patients with type 2 diabetes were the recruited from Charity Foundation for Special Diseases and Eyvanak Health Center and randomly assigned to pomegranate juice or placebo group. Patients consumed either 250 ml pomegranate juice or placebo daily for 12 weeks. A questionnaire of general characteristics and a 3-day dietary recall were completed by face to face interview. Anthropometric measurements, including weight and height, were measured at baseline and at the end of the study. A sample of 20 ml blood was collected from each patient after 12 to 14 hour fasting at baseline and the end of the study. Total NF-kB p65 protein concentrations were measured by ELISA method. Data were analyzed using SPSS software, using Paired T-test, Covariance analysis and Chi Square test.
Results: Sex distribution and the mean age were not different between two groups. The mean body mass index, nutrients and fiber intake, drug intake and physical activity of patients had not changed during the study. NF-kB reduced significantly in blood mononuclear cells in the pomegranate juice consumption group compared to the placebo group (-0.2±0.4 vs 0.2±0.5 Arbitrary unit, $p< 0.01$) at the end of the study.
Conclusion: Pomegranate juice consumption by patients with type 2 diabetes does not affect fasting plasma glucose or the insulin resistance index (HOMA-IR), whereas it does have anti-inflammatory effects.
Keywords: Diabetes, Pomegranate, NF-kB

SI-028 **Symposiums**

Relationship between Serum Levels of Fetuin-A with Apo-A1, Apo-B100, Body Composition and Insulin Resistance in Patients with Type 2 Diabetes

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Background: Some results exist on fetuin-A as marker for vascular disease in type 2 diabetes. We examined the relationship between serum fetuin-A with some factors, in patients with type 2 diabetes mellitus (T2DM).
Methods: In October 2012 to June 2013, a total of 131 T2DM patients were recruited and evaluated for some parameters including HOMA-IR, Apo-A1, Apo-B100, body fat percentage and waist circumference. Serum fetuin-A levels were measured by enzyme-linkedimmunosorbent assay (ELISA), and Serum glucose was measured with a Cobas MIRA analyzer by enzymatic method. Apo-B100 and apo-A1 were measured by immunoturbidimetry with a Cobas MIRA analyzer. HOMA-IR was calculated by the following formula: [fasting insulin (uIU/mL) × fasting blood glucose (mmol/L)]/22.5.
Results: The mean levels of HOMA-IR were significantly increased progressively across fetuin-A tertiles (p for trend = 0.04) in women but not men. Fetuin-A has just a significant positive correlation with Apo- A1($r = 0.22$, $p=0.02$).
Conclusions: This present study showed that levels of serum fetuin-A are significantly associated with insulin resistance in women with T2DM.
Keywords: Fetuin-A; Apo-A1; Apo-B100; Body Fat Percentage; Insulin Resistance; Type 2 Diabetes.

SI-029 **Symposiums**

Speakers' corner: Gabric Diabetes Education Association

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Introduction: GDEA (Gabric Diabetes Education Association) is an Iranian NGO founded in the year 2006 by key endocrinologists, benefactors, and motivated type 1 diabetics. GDEA's mission is to improve the lives of people with diabetes and to promote primary, secondary and tertiary diabetes prevention via education, awareness-raising, and establishing motivations. Most of the staffs are well-controlled diabetic patients who provide peer-to-peer consultation and motivation for others. Providing a comprehensive model of diabetes school for education, it has been selected as the best practice of diabetes education in the Middle East and North Africa in 2010. The name Gabric is borrowed from a river in Southern Iran.

Activitie: All members can receive free diabetes educational advising from well-controlled diabetic staffs; the formation and organization of a Donor Club (a club of donors which supports GDEA based on their financial capabilities and expertise) and ambassadors Club (a club of volunteers who cooperate with the organization to raise diabetes-awareness across the country); regular conferences, seminars and training programs in cooperation with the municipality and MOH in order to raise diabetes awareness in medical communities and public; an innovative series of diabetes educational programs for children (aged 6-12) called Keepo Adventures; Insulin My Friend, a creative educational campaign targeting the different aspects of type 1 diabetes, carried out by professional diabetes educators nationwide; a complete assortment of books, booklets and newsletters covering a variety of diabetes; launching www.gabric.ir as the most comprehensive diabetes website in Persian language.

Key Notes: GDEA has currently more than 60,000 members; covers its costs via donation, corporate sponsorship and membership fees; provides all services free of charge for children younger than 12; gifts special physiological support, motivation, and unique educational program to children and their parents; recruits and trains type 1 diabetics as employees; performs activities which are complementary to physicians' treatment, and in this way helps to promote better diabetes control; follows an organizational value of acting and thinking in Gabric Way.

Diabetes Education Programs: As a comprehensive Diabetes School, a variety of programs for different target groups has been developed which are conducted in simple words by professional diabetes educators through group-learning classes. They are customized according to local needs such as specific nutritional habits in Iran. GDEA currently has 15 different programs based on most updated and trusted references and protocols. These programs are in 5 different levels covering a variety of target groups (patients with different needs and HCPs). Our association also teaches principles of diabetes education to heath care professionals involved in health care system all over the country.

SI-030 **Symposiums**

Microalgae as a potential source of healthy edible oil

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Edible oils play an important role in providing daily energy needs and health of human being. Nevertheless most countries including Iran have difficulties in production of edible oil and they import most part of their needs. The World Food summit of 1996 defined food security as "access of all people at all times to sufficient, safe, nutritious food to maintain a healthy and active life". Based on this definition, food security of these countries faces with some risks. By 2050 the world population and thus the food demand will be doubled and world confront more limitation of agriculture land and water. Therefore, sustainable development and production of sufficient amount of food for the growing world population using the limited sources of fresh water and arable lands would be one of the biggest challenges for the 21th century. According to this fact the demand for alternative sources of food including edible oils increases. The growing interest in microalgae, as an alternative and new source of food, is part of this movement. The fact that microalgae cultivation does not compete with cultivation of plants, makes them even more attractive. Micralgae could be cultivated using sea water, even salty water, in non-arable lands which are more available. Biomass and oil production yield per hectare by microlage is much higher compare to the once produced by plants. Also microalgae are rich in valuable nutritional compounds such as healthy fatty acids. Since now production of nutraceuiticals such as carotenoids and other health promoting substances from microalgae have been commercialized. Production of polyunsaturated fatty acids from microalgae has been also commercialized since the last years. Production of algae oil as a row material of low valuable biodiesel has been the subject of studies in past 10 years. However, nowadays attentions are being concentrated on production of edible oil from this source. The most important key factor in this issue is the production economics. Not only the quality of the produced edible oil should compete with the edible oil produced by plants but its price should be compatible as well. For this reason from one hand strains should be selected (or improved) according to the quality and quantity of lipid and from the other hand the cultivation and harvesting technologies should be improved in a way that the overall algae oil production costs decreased. The studies performed by us and others in the world show that although there are some challenges but based on the big genetic diversity among microalgae and their adaptability to different environmental condition there are promises as well. The aim of this paper is to discuss the potentials of algae oil as an alternative source of plant edible oil by comparison of the quality and quantity of the oil produced by plants and microalgae, the production economy, challenges to be solved and possible solutions.

SI-031 **Symposiums**

Functional properties of Thermostable lactic acid-forming bacteria (B. coagulans)

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Probiotics are live microorganisms, which have several beneficial effects including inhibition of diarrhea, prevention of cancer, stimulating the immune system, reducing the absorption of cholesterol, improving lactose intolerance symptoms, decreasing the blood pressure. Microbial flora of the digestive system makes a healthy and rich environment for absorbtion and digestion of food, inhibits binding of bacterial growth, enhances and modifies the immune system. The beneficial effects of the flora on stress and memory improvement have been proven. Many studies have been conducted for appropriate selection of food matrices (as the carrier) and identification of bacteria with functional properties and better performance. Food industry, pharmaceutical and research centers, have particular attention to research in this field to sell the new products in the market more success-

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fully. Although the addition of probiotics in food products was first done in dairy industry but nowadays, huge global market of non-dairy probiotic foods are offered (1).The most important factor in selection of probiotics is safety assessment and survival of cells exposed to acute physical and chemical conditions. Environmental conditions (acidic PH), presence of bile salts in digestive system reduces the viability of these cells before they reach to the consumer, and subsequently reduces the effectiveness of these products. Lactobacilli are the most widely used probiotics that can inhibit the attachment of pathogenic bacteria through colonization and adhesion to epithelial cells or producing inhibitory compounds. Today, there is a special attention to Bacillus coagulans as the 'sporeforming lactic acid bacterium' (Lactobacillus sporogenes). It is known as a resistant probiotic bacterium (2).

The purpose of this study is investigating the role of sporeforming probiotics in health promotion and use of probiotics in food industry as supplementations. Several clinical studies have done about the health effects of supplements containing Bacillus coagulans and food products comprising probiotics. In this paper, we will refer to some of these effects. Due to the special properties of Bacillus coagulans like being resistance to high temperatures and acidic conditions, pentose fermentation ability, there are economic trends to produce this bacterium in bulk. In animal studies, it was reported that the bacteria act as probiotic and there is tendency for mass industrial production for human usage as well (3). Enders and colleagues evaluated the effect of Bacillus coagulans and wall structures of this bacterium in modifying the immune system in 2012. The results showed that not only the bacterial metabolites modify the immune system but also the wall structure of the bacteria is effective in stimulating the production of interleukin-10 and reducing the symptoms of IBD (4). Another study evaluated the effect of this probiotic in pregnant women. The results showed a reduction in plasma triglycerides and VLDL levels in pregnant women. The study found that using Synbiotics for 9 weeks in pregnant women decreased TAG and VLDL and also increased the levels of GSH (an important antioxidant that helps preventing damage of cells) compared to the control group. On the other hand, using those foods had no effect on cholesterol, HDL and LDL of plasma (5). A recent study, which performed on diabetic patients (35-70 years), showed that using Synbiotic foods for 6 weeks caused a significant increase in insulin level of the patients. On the other hand, GSH levels in these patients were significantly increased, which indicated the antioxidant effects of these compounds (6). Besides, using Synbiotic bread for 8 weeks could decrease VLDL and triglyceride levels and unlikely increase the level of HDL in the serum of patients with type II diabetes. In this study, Syniotic bread containing live and resistant to heat bacteria of Bacillus coagulans was used. Patients used the bread three times a day (120 / g day). The results indicated the usefulness of probiotics in controlling blood cholesterol levels (7). Due to the scientifically proven results of the beneficial effects achieved from probiotics consumption in the daily diet, the attitude of producing and using probiotic foods has increased.

SI-032 **Symposiums**

Recent trends in nanoencapsulation as nutrient delivery system for food bioactive compounds

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The growing concern for the promotion of health and prevention of disease through improved nutrition has led to numerous attempts to develop food-grade delivery systems to encapsulate, protect and deliver bioactive components. Bioactive components may be utilized for two main purposes, to protect the sensory and nutritive quality of the food and/or to protect the body against chronic and age-related diseases. The delivery of bioactive compounds to various sites within the body is directly affected by particle size so encapsulation of bioactive compounds such as carotenoid pigments, polyphenols and other antioxidants in polymer-based nanoparticles as nanofoods provide simple way to develop novel functional foods that may have physiological benefits or reduce risks of diseases. Because of unique properties of these compounds, polymeric nanoparticles (nanospheres & nanocapsules) enhance the performance of them by improving their solubility and bioavailability, in vitro and in vivo stability, sustained delivery, preventing their unwanted interactions with other food components and protection from physical and chemical degradation etc. Nanoparticles are composed of either synthetic or naturally occurring biodegradable polymers such as poly lactic acid (PLA), chitosan and alginate. Hydogels chitosan and sodium alginate, by virtue of their physiochemical properties and mild gelation conditions have emerged as potential matrices of various bioactive compounds for controlled food-grade delivery through the oral route. Hence, controlled or sustained delivery system is crucial to obtain maximum benefits of using bioactive components as functional foods or nutraceuticals. This paper reviews nanoparticle encapsulation systems with respect to their potential applications as nutrient delivery system in foods.

Keywords:

SI-033 **Symposiums**

Functional food: National &International Regulation challenges

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In recent years, the idea of the physiological and nutritional effects of food, beyond what was widely accepted, dramatically sweeping the world.

Due to the high cost of health care and increasing incidence of non-communicable diseases, these type of food products that claim to help prevent and treat some of these diseases, have a special significance. So, countries should have legislation and regulations for the safe production and scientific and administrative methods to control health claims for these products development. The purpose of these legislation and regulations, are consumer protection, promote fair trade, creating incentives for research and innovation in the food and supplements industries. Determining the daily amounts of active components in these products which provide their health claim on the one hand and setting the maximum amount of their intake which doesn't put the consumer in the risk of excessive intake in the other hand are among the most important challenges in front of scientists and regulators. Moreover, providing accurate and clear information to consumers about the safety of this product in order to help them to make right decisions and choose appropriate food products, is another issue of importance in the current global regulations.

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This paper discusses the challenges facing the development of laws and regulations relating to these products.
Keywords:

SI-034 **Symposiums**

Intersectionality: A new paradigm to study and promote population health and quality

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Population health is relatively a new conceptual and research framework. It utilizes a holistic approach to study and promote health combining demographic, socioeconomic, cultural, biologic, and environmental factors. In general, population health aims to promote and improve the health of population through managing and reducing health inequalities between and within subpopulations. Understanding and capturing different determinants of population health requires a comprehensive conceptual framework. It seems the concept of intersectionality; the study of intersections between forms or systems of oppression, domination or discrimination; holds the basic requirements of the new framework. Intersectionality, as a new approach to social determinants of health, not only can be used in health research methodology, but also could be utilized in reshaping the primary health care systems. This paper introduces the concept of intersectionality, its theoretical background, and characteristics.
Keywords: Population health & quality, Intersectionality, Health inequalities, Socio-cultural oppressions

SI-035 **Symposiums**

Food Intake Experiences of Iranian Households: An Intersectional Approach

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Good health has been as a long standing ideal for human being, which food quantity and quality have played a key role in providing such an ideal. As a famous statement, to be poor by definition is to have less of the good things that society produces for its members, including good health and proper nutrition. Phenomenon that is called inequality, not only will be present in many areas- having its independent effect on food intake experiences each- overlapping inequalities will produce disadvantages that are more than the sum of their parts.
Without having a mere economic stance for poverty/inequality here, it should be noted that simultaneous dependency of people to various disadvantaged socio-economic statuses will seriously affect their food intake experiences. In other words, multiple disadvantaged people/families will have the poorest food-related experiences. Among these multiple disadvantages, coming from nutritional literature, are lower income, lower education, higher family size, to have female household head, and rural-urban dichotomy.
Present study, exploiting households' food expenditure information of more than 38000 Iranian households, coming from nationally representative samples in year 2012, examines food-related experiences in relation to various dimensions of households/household heads' SES status. A special emphasis is given to intersectionality of various statuses. Preliminary findings indicate that beside of independent effects of any of lower SES related statuses, intersectionality effects are also present, while taking households' food-related experiences (including; per-capita energy intake, per-capita consumption of various food groups, and food variety) into account.
Keywords: Food experiences, multiple inequality, household income-expenditure

SI-036 **Symposiums**

Major Dietary Patterns in Relation with Socioeconomic Status and Food Insecurity: Study of two Iranian Ethnic Group Living in Urmia, Iran.

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Background & Objectives: Urmia, the capital city of west Azerbaijan provenance, is a multiethnic city that Azeri Turks as the major and Kurds as the main minor ethnic group live in this city. Since, major dietary patterns of these two Iranian ethnics and their relation with the various socioeconomic factors and food insecurity(FI) status has not been studied yet, the aim of this study was to assess the relationship between major dietary patterns in relation with socioeconomic status and food insecurity in two Iranian ethnic group living in Urmia, Iran.
Material and methods: In this cross-sectional study, 723 participants (427 women and 296 men) aged 20–64 year old, from two ethnic groups (445 Azeri and 278 Kurd) were selected through a combination of cluster, random and systematic sampling methods. Dietary information was collected by a valid semi-quantitative F.F.Q. Demographic and socioeconomic characteristics were obtained by a questionnaire and household food security status were measured using adapted household food insecurity access scale through face-to-face interviews at homes. Dietary patterns were defined by factor analysis method and the relationship between dietary patterns, SES and FIS was assessed by ANCOVA test.
Conclusion: Findings suggest that SES and food security status of the households has detrimental effect on shaping dietary pattern and this effect may be stronger than cultural background.
Keywords: major dietary patterns, socioeconomic status, food insecurity, two Iranian ethnic
group, Urmia.

SI-037 **Symposiums**

Evaluation of Subsidy Targeting Program through Cash Transfer on Food Security and Expenditure of Urban Population in Tehran: a Mixed Method

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Background & Objectives: Cash transfer is one of the strategies used by many developing countries to improve food

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security and nutritional status of lower socio-economic groups. The aim of the present study was to compare food security and food expenditures of urban households before and after targeted subsidy cash transfer program in the city of Tehran.

Methods: The study population included households from six districts with different socio-economic status in the city of Tehran. Food security and food expenditures data on each household were collected in 2009 (before) and 2012 (after) implementation of the policy, through interviews at the subject's home. Data gathered in both period included: a) demographics and household expenditure; b)food security by previously validated Household Food Insecurity Access Scale (HFIAS); c)Dietary intake by three consecutive 24 hours recalls. In addition, data on household coping strategies were collected through 7 focus group discussions with women from different districts. The discussions were audio taped and transcribed. Chi-squared test was used for analyzing differences in qualitative variables and differences in quantitative variables were analyzed using paired t-test and one way analysis of variance (ANOVA) before and after the targeted subsidy policy implementation.

Results: Based on the results, the frequency of food secure households has declined from 56.4% to 43.5%, mild food insecurity has increased from 19.3% to 28.4%, moderate food insecurity has risen from 13.3% to 15.5% and severe food insecurity has grown from 11% to 12.5% in the second measurement. Furthermore, the total expenditure has been risen significantly from 6100±431 in 2009 to 8692±869 thousands rials in 2012 ($p<0.001$). Consumption survey showed significant decrease in consumption of meat and dairy groups after changing commodity subsidy program to cash transfer in household's residents in Tehran. Most of the women studied reported strategies like loaning or borrowing from family and friends and expense the savings to compare the increased food and other prices such as transporting and fuel. Qualitative study confirmed the reduction of milk and dairy products, red meat, fish and nut groups purchasing.

Conclusion: The findings suggest that the replacement of staple food subsidies by cash transfer has increased household food insecurity (especially marginal or mild food insecurity). Moreover, the total expenditure of the household has significantly increased which is an indicator of decreasing welfare index.

Keywords: Subsidy Targeting, Cash Transfer, Food Security, Food Expenditure, Mixed Method

SI-038 **Symposiums**

Role of ecology and environment on food availability and dietary pattern of a traditional-nomadic community: the study of LAK nomad in Lorestan

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Background & Objectives: Indigenous food system refers to indigenous knowledge and understanding regarding characteristics, gathering, processing and/or preparation of local foods. In the life of nomads, environment, climate and seasonal change has a great effect on dietary intake and food acquisition. The purpose of this study is to introduce food system of Laks, a nomad in Lorestan, as an example of impact of the local cultural environment on food intake.

Methods: This qualitative research was undertaken through ethnographic methods, including application of techniques such as participatory observation and ethnographic interviews. Nomad's life and food intake throughout a year was studied in two phases of warm and cold season (pasture). The study population included members of "Zeyali" tribe who are a sub-tribe of Beyranvand clan of Lak ethnic in the Lorestan province, west of Iran. For additional validity of data, Food system was studied comparably in two subgroup of this tribe named as "Safer" and "Bur ". The researcher lived and moved with the nomads in both warm and cold season and took note of all related observations and interviews. Data were then coded and categorized for final interpretation.

Results: Findings show that local foods are still the main sources of nutrition in the Lak diet. A great variety of species of wildlife plants and animals are included in their food pattern through hunting, fishing and gathering that provide rich cultural and nutritional benefits. Various food items from the main food group: fruits, vegetables, dairies, Meats and cereals are included in their diet. However, they have learned to make appropriate changes in food choice, processing and storage based on the season and climate. For instance, preparation and consumption of local cheese within the studied nomads varied based on the climate of their living environment. "Beiranvands" who live in the lower altitudes that is warmer, produce and consume less cheese as compared to "Hassanvands" who are mainly in the higher altitudes and are known for the cheese they produce. It was also shown that nomad's food access and intake is influences by socio-demographic factors, including gender, age and other social status.

Conclusion: Nomadic indigenous food system is linked with indigenous environment. The results indicates the importance of identification and protection of Indigenous Peoples' food systems because of their potential to provide many economic and nutritional benefits and ensure food security for Indigenous Peoples in their home regions. The many benefits they offer to physical health and the continuity of indigenous cultures.

Keywords: environment, seasonal changes, indigenous food system, Food Wisdom, LAK ethnic nomads

SI-039 **Symposiums**

Surface display of proteins in microorganisms – potential applications in food control and processing

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Studies of microbial cell envelopes and particularly cell surface proteins and mechanisms of their localization brought about new biotechnological applications of gained knowledge in surface display of homologous and heterologous proteins. By fusing surface proteins, or their anchoring domains with different proteins of interest their so called genetic immobilization is achieved. Hybrid proteins are engineered in a way that they are expressed in the host cells, secreted to the cell surface and incorporated into the wall/envelope moiety. In this way laborious and often detrimental procedure of chemical immobilization of the protein is avoided by letting the cells do the whole procedure. Both bacterial and yeast cells have been used for this purpose and a number of potential biotechnological applications of surface displayed proteins have been reported. Examples range from microbial whole cell biocatalysts, biosorbents,

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biosensors and biostimulants development to design and screening of protein and peptide libraries. When surface immobilized enzymes are used, substrates do not need to cross membrane barriers, i.e. enzymes are free to access any externally added substrate. Thus, often complex and expensive purification of the enzymes used on an industrial scale is bypassed. In addition, the multi-step transformation can be performed using microbial cells displaying different enzymes that catalyze cascade reactions. In recent years particular attention has been paid to yeast systems for surface display of proteins since most yeasts are generally regarded as safe (GRAS) microorganisms, yeast cell walls are capable of binding more proteins, and the cells are bigger. Besides, yeasts are generally more suitable for expression of proteins originating from higher eukaryotes. In this talk our current knowledge on mechanisms and molecular systems for surface display of proteins on bacterial and yeast cell surfaces will be discussed. Particularly, potential applications of surface displayed proteins in food processing, as well as for creation of sensors suitable for food control will be summarized.
Keywords: surface display, genetic immobilization, bacterial envelope, yeast cell wall, food processing enzymes

SI-040 **Symposiums**

Impact of Listeria monocytogen on global food safety

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Listeria monocytogenes is a Gram-positive facultative intracellular food-borne pathogen, which can survive in multiple habitats like soil, vegetation, food processing plants, food, domestic and wild animals as well as humans [1]. L. monocytogenes has a remarkable ability to resist environmental stresses such as heavy metal ions, high salt concentration, low pH-values, low temperature, as well as low water activity. Listeria monocytogenes is transmitted predominantly through contaminated food Listeriosis includes a spectrum of clinical illnesses ranging from febrile gastroenteritis to potentially fatal bacteremia and meningitis in groups at higher risk for invasive disease, including older adults and persons with certain medical conditions.It is estimated that 1,662 invasive infections with L. monocytogenes occur annually in the United States, causing 1,520 hospitalizations and 266 related deaths. L. monocytogenesis classified into 13 serotypes, the majority of sporadic cases and listeriosis outbreaks were caused by strains of 4b, 1/2a and 1/2b.
Food-borne listeriosis outbreaks have been reported since1975, in industrialized countries in Europe, North America and Oceania with a few or no reports from Africa, Asia and Latin America. Because of the multifaceted properties, L. monocytogenes can grow and multiply in various food matrices even under adverse conditions like high pH, low temperature. The vast majority of listeriosis cases and outbreaks have been associated with the consumption of contaminated food, mainly sea food and dairy products, ready-to-eat deli meats and produce. In recent years, a number of listeriosis outbreaks have been linked to contaminated cheese, including those made from pasteurized milk: e.g. hard cheese in Belgium 2011 (12 cases, 4 deaths), Ricotta salata cheese in the USA in 2012 (22 cases, 4 deaths), and Les Frères Cheese also in the USA in 2013 (6 cases, 1 death).
The prevalence of Listeria spp. in ready to eat meats varies from 1.8% to 48.0%.The highest prevalence was reported in fish products followed by graved and cold smoked fish in Sweden in 2012. In Iran prevalence of Listeria spp. have examined in different foods, results shown it has remarkable impact on food safety in Iran.
Keywords: Listeria monocytogenes, outbreaks, prevalence, food safety

SI-041 **Symposiums**

Microbial risk assessment and food safety planning

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Diseases caused by foodborne microbial hazards constitute a global-wide public health concern. During the past several decades, the incidence of foodborne diseases has increased in many parts of the world. The incidences of Salmonella Enteritidis in eggs and egg products, Listeria monocytogenes in ready-to-eat foods, Enterohemorrhagic Escherichia coli in ground beef, Campylobacter in broilers in many countries in the world are examples of microbiological incidences with significant adverse impact on public health. The list is non-exhaustive and can be prolonged to many other microbiological incidences around the globe. It is important to note that risks from microbiological hazards are of immediate and serious concern to human health. Risk Assessment is a main element in assuring that sound science to be used to establish proper policies and guidelines to promote food safety for consumer protection. The Microbiological Risk Assessment process should include quantitative information to the highest extent possible in the evaluation of potential risk. Since Microbiological Risk Assessment is an emerging science, implementation of proper guidelines may require a period of time and in advance demands specialized training in the countries that consider it necessary.
The fundamental principal of Microbiological Risk Assessment should be predominately based upon science and it should be performed according to a structured approach, which includes Hazard Identification, Hazard Characterization, Exposure Assessment, and Risk Characterization. A quantitative test should be prioritized to qualitative test whenever necessary, and the matter of uncertainty must be stated during risk assessment process.
The complexity of any specific risk assessment will change with the complexity of hazard being evaluated, the availability of the reliable data and scientific knowledge and most importantly the complexity of the risk management questions being proposed to the risk assessors. As a result there is increasing interest in developing principles for both determining how microbial risk assessments should be conducted and how the results of those evaluations are used to both manage and implement effective food safety planning.
Keywords: microbial hazards, microbiological risk assessment, food hazard identification, food safety planning

SI-042 **Symposiums**

Situation of milk microbial safety in Iran

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Biopolymer-based antimicrobial packaging to improve food safety
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Microbial growth in food products is still a major causes of foodborne illness. Nowadays, recent food-borne microbial outbreaks and the increasing antibiotic resistance of some

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pathogens associated with foodborne illness are also serious concerns. On the other hand, a rise in consumer demand for safe, fresh and minimally processed foods and also for environmental protectionpose major challenges for food safety and quality. Therefore, there has been increasing interest in developing new preservation techniques such as antimicrobial packaging to provide an increased margin of safety and quality. Antimicrobial packaging is a form of active packagingdesigned primarilyto protect food products from the growth of microorganisms and deterioration which can involve the use of synthetic or natural antimicrobial agents. However natural agents such as essential oil, herbal extracts and biopeptides are more interested due to the increasing awareness of consumers in terms of health matters. Today, the use of polymeric mateials has to be restricted not only because they are not non-totally recyclable and biodegradable so they pose serious ecological problems, but also because they seem to be a potential source of the release of chemicals such as monomers and plastisizres into food that may have a veriaty of effects on human health. As a result, the need for a safe, eco-friendly atmosphere has led to a shift on the use of biodegradable materials.Therefore, biopolymers-based films and coatings that carryingnatural antimicrobial agents as an additional protective barrier are emerging as the preferred preservation method. Consequently it might be very promising system for the future improvement of food safety and quality during processing and storage.

Keywords: Food safety, Antimicrobial packaging, Biopolymers

SI-043 **Symposiums**

Applications of ENMs in the Food Products

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Nanotechnology is an emerging science which can be applied in food industry to develop novel food products and processes. Nanoscience are expected to bring several benefits for food industry and agriculture including enhanced nutrient absorption using nano encapsulation of nutraceuticals, new sensory properties (especially taste and texture), decrease the fat content, enhanced packaging, quick sampling of chemical contaminants, traceability and security of food products. Nanotechnology in food industry can also cause to extend shelf life of food products using nanoparticles in food packaging materials due to high barrier and mechanical properties or antimicrobial activities. Detection of relevant analytes such as gasses, small organic compounds and food-borne microorganisms using nano-sensors is another use of nanotechnology. Innovative intelligent packaging to keep food safe and hygiene during storage and also less food waste is a promising application of nanotechnology for future. However, there are still concerns about safety of nanomaterials which can cause to threat consumer health and also fear of consumer reaction is another restriction of this technology. Therefore, risk assessment of nanoparticles, enhancement of consumer information and establishment of certain regulations should be considered in food industry. Consequently, more researches in this field of study should focus on the potential applications of nanomaterials and safety assessment.

Keywords: Nanotechnology, Food industry, Nanomaterial, Consumer safety

SI-044 **Symposiums**

Applications of nanomaterials in food packaging

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Nanomaterials describe materials of which a single unit is sized usually less than 100nm and have unique optical and reactivity properties. These unique characteristics have been attracted researchers to use them at different industries such as food industry. Food safety, the most important challenge of food industry, is indirect relation to food security, for example food contamination with pathogens can cause discomfort and damage of a big population of consumers, so control of food spoilage from farm to home is one of the most important challenges of food scientists. Development of food packaging and application of novel technologies in this field can improve the quality and safety of foodstuffs and increase their shelf life.

Nano-packaging is one of novel technologies which can help at detection of microbial contaminants. Nanotechnology can change the gas and water vapor permeability of packages, so help to increase fruits, vegetables and other food products shelf life. Giving impermeability characteristics to packaging polymers for moisture control, self-cleaning surfaces which can destroy the microorganisms, smart papers with the ability of displaying internal information of the package, increasing mechanical strength of packaging polymers, giving super hydrophobicity to the surface of food packages, filtering of UV light to prevent the damage of lipidic food products, controlled release of bioactive food components such as antioxidants into the packages via their nanoencapsulation, traceability of food products via Nano sensors applied in the labels, are only some applications of nanotechnology in food packaging industry, so using of nanomaterials in this field is able to improve safety of foods and help to develop healthier food products with longer shelf life.

Keywords: Nanomaterials, packaging, food

SI-045 **Symposiums**

Nanosensors for food safety

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Nanotechnology improvement and selective sensor design and their convergence with the food science have led to a great revolution in the food quality and safety control to detect the mass of bacterium in short time and with high precision. Nowadays selective and smart sensors have revolutionized quality control in food products. These sensors can identify the volume and toxicity of the bacteria in moments with very high precision. In this technique a molecular framework with polymer pattern in nano-size was produced with a monomer and mostly with meta-acrylic acid. This selective pore was then used as a based on the bacterial antibody connection to the nanoparticle. The imprinted polymer particles can be characterized by Fourier transform infrared spectroscopy (FT-IR). Usually there are O-H and C=O stretching vibration in the leached polymers, and these peaks in the unleached polymers are shifted to lower frequencies. The polymeric particles with well-controlled physical forms in different size ranges are highly desirable. For example, the imprinted nanospheres are very suitable for use in developing binding assays. Scanning electron microscopy (SEM) is employed to determine the shape and surface morphology

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of the produced polymer particles. The direct or indirect selective attachment between bacteria and spherical particles can produce a tunable signal which and be detected though potentiomentic or various spectrometric methods in a short time.

Keywords:

SI-046 **Symposiums**

Toxicokinetic and fate of ENMs Following Ingestion

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Engineered Nanomaterials (ENMs) are usually meant those nano components that have deliberately been introduced into the food or feed chain, but not those accidental or naturally occurring minor nano-structured contaminations in food materials. Although this definition might assign some specific area of focus in regulatory issues but, they won't overcome the effects of the presence of accidental nanomaterials in human consumption. ENMs have special properties due to high surface to volume ratios that make them extremely reactive species with biomolecules, gastro-intestinal tract and biological tissues. Nano-scales materials might considerably differ from their corresponding macro-scales materials in toxicity profiles including toxicokinetics due to the unique nano-related physic-chemical characteristics. Very limited information is available on the oral consumption of ENMs with food, except for some insoluble metals or metal oxides. On the other hand ENMs most probably undergo changes and alterations in the GI track which make the study of their fate in the body very difficult. Liver and spleen is the major distribution site for the nano materials although many of smaller sizes ENMs might extensively distribute in other organs. There is limited information on the placental passage of some ENMs but nothing so far on the elimination in the breast milk. Our ability to measure the long term accumulation of ENMs in the body is very much limited and there are only a few data on their accumulation in the body mainly for insoluble ones. There are also problems on the selection of the best animal model that may mimic the kinetics of human body for the investigation of engineered nanomaterials. Limited knowledge and abilities to investigate on the safety of ENMs use and their toxicokinetics have forced many regulatory agencies to recommend that for non-essential and non-medical (including food and feed) purposes, ENMs manufacturing and use should be prohibited until relevant safety and kinetic test are available and in place. A review of problems and controversial limited data on ENMs toxicokinetics will be presented in the conference.

Keywords:

SI-047 **Symposiums**

Food-associated ENMs: Metal (Oxide) NPs and Their Toxicity Profiles

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Engineered nanomaterials (ENM) have emerged as attractive and promising candidates for a wide range of advanced applications including in particular in food industry. Nanotechnology-based food and health food products, and food packaging materials, are available to consumers in some countries already. It is expected that nanotechnology-derived food products will be increasingly available to consumers worldwide in the coming years. Physicochemical characteristics of nano materials have raised some growing concerns about their effects on human health and environment. As applications for metal oxide nanoparticles (NPs) are employed by food industry, the release of nanomaterials into the environment may pose severe threats for ecological systems and human health. Toxic effects of NPs on microorganisms and animals have also been reported, where metal oxide nanoparticles are the most extensively studied. Their toxicities are attributed to three mechanisms: 1. Generation of reactive oxygen species (ROS), which can damage the cell membrane; 2. Penetration of nanoparticles into the cell where they interfere with intracellular metabolism; 3.Release of metal ions that hinder enzyme functions. Also of concern are the effects on the lungs caused by metallic nanoparticles, titanium dioxide nanoparticles in particular, and carbon nanotubes. This presentation aims to increase understanding of both Metal (Oxide) NPs toxicological nature and risk to consumers from nanotechnology-derived food.

Keywords:

SI-048 **Symposiums**

Health Implications of Nanofood, Consumer Safety Issues andRegulatory Aspects

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There are different concerns regarding the safety of engineered materials (ENMs) for the environment and human. Health risks of ENMs should be determined by possible food exposure and hazard potential assessment using sophisticated methods together with toxicokinetic and toxicodynamic data on oral administrations of ENMs. Despite of developing great toxicological models, there are still lack of knowledge for many classes of ENMs to provide realistic health risk assessment, ENMs regulation and standardization. Much of the debate about the safe use of nanotechnology in the food sector has focused on the uncertainties and the lack of toxicological data. Physicochemical properties of ENMs e.g. particle size , morphology , water solubility, chemical composition ,surface charge and coating properties affects the biological interactions of ENMs with different cell types .Moreover their toxicity is frequently masked by biocoatings which may be stripped at different rates by different cell types with undetermined toxicity outcomes. ENMs don't undergo routine biotransformation pathways therefore their biological fate and half-life could not be determined well however they may interfere with biotransformation of pharmaceuticals which may cause drug overdosing or under-dosing, with harmful and even life-threatening consequences for patients. Other parameters, such as surface/volume ratio, phase transfer, chemical stability, and tendency to aggregation can result in reactivity of ENMs with critical genes and proteins in target organs. In particular, there is a lack of knowledge on how to monitor the mentioned effects of ENMs single and complex exposures, and there are limited information on ENMs biomonitoring by realistic biomarkers. Although we are not able, at present, to identify "nanospecific" biomarkers that meet all necessary criteria, it is mandatory to use a battery of available biomarkers of health effects to predict local and systemic effects of ENMs by focusing on their inflammatory, oxidative stress and genotoxic potentials to determine the high risk groups in human population. A panel of suitable biomarkers as indicators of exposure, susceptibility and health risks of ENMs will be discussed in this review and the regulatory activities of Iran Nano Health Committee will be described in this presentation.

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