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Cardiovascular Disease Prevention: New Nutrigenetics Tests

AV Nagay*, GA Khamidullaeva and RD Kurbanov

Department of Arterial Hypertension and Molecular Genetics Research, Republican Specialized Scientific-practical Medical Center of Cardiology, Tashkent, Uzbekistan

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***Corresponding author:** Aleksandr Nagay, Department of Arterial Hypertension and Molecular Genetics Research, Republican Specialized Scientific-practical Medical Center of Cardiology 4, Osiyo Str Mirzo-Ulugbek 100052, Tashkent Uzbekistan

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Introduction

Nutrigenetics testing undoubtedly is an important part in clinical practice. Each patient has a combination of the genes bound to cardiovascular illnesses. We represent step-by-step the projection of Nutrigenetics tests for cardiologists. We represent the multiplex DNA system with technology of the effective analysis of genes. The technology of the effective genes analysis is the combined method of the sequential analysis, ROC-curve and relative risk of RR (Altman's theorem) with use of basic mathematical algorithms (Bayes' theorem) in diagnostics of in vitro. For the first time we applied this technology for identification of genes mutations which enlarge a susceptibility to rising of weight, and also sensitivities to some ions. Thus, using DNA identification, the developed algorithm can recommend an individual diet. The algorithm is capable to transform pathogenic genetic data to the diagnostic tool which in a combination with clinical observation and biometric data can create the clinical decision.

Genotypes

The analysis showed a tendency to a violation of water-salt metabolism in patients with TT- genotype of CYP11B2 gene and DD- genotype of the gene ACE gene via multivariate analysis. This displacement may be observed due to renal dysfunction caused by CYP11B2 and ACE genes regulation, the mechanism of Na+ - exchange through diuresis. The detected connection of 4a/4b-genotype (eNOS gene) and 9+/+9 (B2BKR gene) with the development of endothelial dysfunction in 24% and 8% cases respectively, is most likely due to coupling of the polymorphic marker and site mutation leading to a change of NO production by endothelial cells. The identified association of T/T-genotype of ADRB3 gene and Glu/Glu-genotype of β2-AR gene with the developing insulin resistance risk in 50% and 8% cases respectively confirmed that these genes mediate the physiologic effects of adrenaline. Genotyping of the SNP was performed by Real-Time polymerase chain reaction and multiplex PCR analysis (DT PRIME Real-Time PCR Systems).

Nutrigenetics Panel/ Prognostic Model

We selected clinical signs for creation of the prognostic table by means of the method of the consecutive diagnostic procedure based on a technique of the sequential analysis offered by A. Wald. For each informative sign gradation of this or that indicator were selected to equal the diagnostic value of each of indicators. Thus, by means of point system the personal diet (KETOGENIC, DASH or balanced diet) for a period of 10 days is prescribed. As it is low - saline diet is a low-calorie diet with small amount of fat and edible salt the value of the "a" sum and the "b" sum are united in one low - a saline diet. These approaches are providing more robust and clinically relevant gene-diet interactions. The final form of the prognostic table is presented in Table 1 and Figure 1 [1-3]. The main characteristics of the offered diets are consolidated in Table 2.

Integration into Working Processes

The first time we applied for technology of residual risk on the SNP platform to 3 systems: ENDOTHEL, SNS and RAAS. Depending on the genetic status, this technology allows to correct a food or to apply alternative therapy. The presented method is effective only for the Uzbek population. Results of 5 years of researches (500 Hypertensive patient /400 control group), within scientific grants on studying of nutrigenetics in a clinical cardiology were accepted to basic parameters.

Table 1: Nutrigenetics panel/Cardiovascular risk factors.

Systems	Genes	Negative Geno-types	Salt «a»	Fats «b»	Carbo-hydrates «c»	Sports «d»
ENDOTHEL High risk Endothelial Dysfunction	B2BKR +9/-9	+9/+9	0	3	0	3
		-9/-9	0	0	0	0
		+9/-9	0	1	0	1
	eNOS 4a/4b	4a/4a	0	0	0	0
		4b/4b	0	0	0	0
		4a/4b	0	0	0	2
SNS Risk of the Increased Body Weight Development	ADRB3 Trp64Arg	T/T	0	5	5	0
		A/A	0	0	0	0
		T/A	0	1	1	0
	B2-AR Gln27Glu	Glu/Glu	0	5	5	0
		Gln/Gln	0	0	0	0
		Gln/Glu	0	1		0
RAAS Risk of Water-Salt Exchange Disturbance	ACE I/D	I/ I	0	0	0	0
		D/D	4	0	0	4
		I/D	2	0	0	2
	CYP11B2 C344T	C/C	0	0	0	0
		T/T	4	0	0	0
		C/T	2	0	0	0
If a total sum (a+b) ≥ 14, sum (c) ≥ 10 = low- saline diet with the control of carbohydrates.						
If a total sum (a+b) ≥14, sum (c) ≤ 10 = low- saline diet.						
If a total sum (a+b) ≤ 14, sum (c) <10 = The balanced diet.						
If a total sum (a+b) ≤ 14, sum (c) ≥ 10 = low-carbohydrate diet.						
*Sport: If a total sum d < 8= low physical activity.						
If a total sum d ≥ 8 and BMI≥ 25 = The high physical activity.						

Table 2: Characteristics of 3 basic diets.

Patient	Types of Diet	Characteristics
The hypertensive patient with a diabetic disease	KETOGENIC Low - carbohydrate diet	KETOGENIC low - carbohydrate diet is the ration rich with saturated fats at very limited amount of carbohydrates. After several days of such alimentary regimen – there is an augmentation of ketonic bodies which can be used by body tissues for energy as an alternative to glucose. It is known that this diet can cause retrogress of a diabetic nephropathy in mice. Reduces effect of subjective increase of appetite [1].
The hypertensive patient with the increased body weight.	DASH Low - saline diet	DASH low - saline diet includes: vegetables, fish, bread, low-calorie soups, cottage cheese, not sweet fruit. It is a low-calorie diet with small amount of saturated fat and edible salt [2].
The hypertensive patient with normal body weight.	The balanced diet	Menu of the patient keeping to the balanced diet includes ingredients with a large amount of potassium and a magnesium such as vegetables, buckwheat, milk, meat, fish and fruit [3].

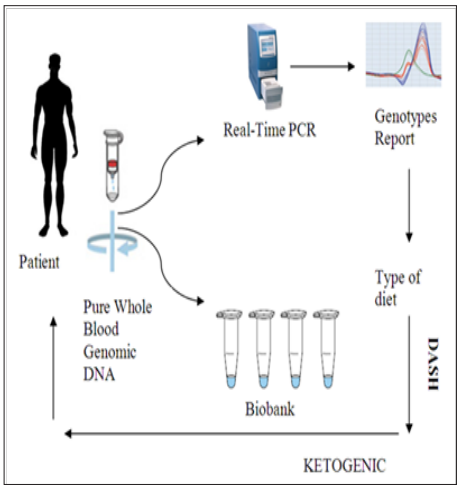

Figure 1: The phenotype/genotype-specific therapy: new therapeutic concept.

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