

# Relationship Between Some Parameters of the Membrane-Redox Potentials Three-State Line System with the Human Constitutional Types of Traditional Medicine

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**Objectives:** According to Tibetan-Mongolian traditional medicine theory, humans are classified into three main individuals based on the Rlung, Mkhris or Badgan symbolic code (SC). Our objective was to research the relationship between some parameters of membrane-redox potentials three-state line system in relation to the human constitutions of traditional medicine.

**Methods:** The quantities ratio for the SC of Rlung, Mkhris, and Badgan was determined by the Doc-Am-I program. We determined the lipid profile, erythrocyte membrane resistance capacity and body mass index. **Results:** It was shown that the concentration of serum lipids, body mass index and membrane resistance capacity of individuals of the Badgan SC group was increased with statistical significance in comparison to the other two groups. Our study revealed that people of Rlung SC group were characterized by the highest concentration of malondialdehyde and the lowest rate of membrane resistance capacity compared to people of the other two SC groups. **Conclusion:** Our study defined the relevance of the membrane redox potentials three-state line system in connection to the human constitutional types such as the abstractly coded classifications of Rlung, Mkhris, and Badgan of traditional medicine.

**Keywords:** Malondialdehyde, Membranes, Erythrocytes, Medicine, Traditional

## Introduction

The medical tendencies of the last decades have been to explain some unclear issues that cannot be solved through the contemporary medicine by theories such as Chinese Yin-Yang; Korean Sasang constitution types - Tae-eumin, So-eumin, and

So-yangin; Rlung, Mkhris, and Badgan of Tibetan-Mongolian traditional medicine and Vata, Pitta, and Kapha of Ayurveda in India, which are the basis for the diagnosis and treatment in Oriental medicine.

The balance and integration of physiological, metabolic, psychological, and mental functions of living cells and the human body is considered to be essential in preventing disease and

restoring health in traditional approaches of person-centered medicine. According to the Ayurvedic and Tibetan-Mongolian traditional medicine theory, humans are classified into three main categories based on Rlung (mobile, non-oily, light nature – external characteristics of body), Mkhris (hot, sharp and oily – external characteristics of body) or Badgan symbolic code (cold, heavy and cool - oily – external characteristics of body). The Rlung, Mkhris and Badgan symbolic code (SC) is a classification scheme used in traditional Tibetan-Mongolian medicine that is based on more than a thousand years of clinical experience. It co-evolved along with the 5-elements theory and the Vata, Pitta and Kapha of Ayurveda in India [1-3].

The constitution of the human body is believed to be determined at the time of conception and is influenced by the diet and lifestyle of the mother. During a human's lifetime, their constitution is regulated by diet, lifestyle, seasons, age and treatments of traditional medicine. Rlung SC type people are lean, bent, with a bluish, dry and cool skin; they get easily tired and very talkative; and they are very reactive by psychological characteristics. Mkhris SC type individuals have middle body mass, the skin is warm and color is yellowish; they usually feel thirsty and hungry; and they are very intelligent, but become easily angered. The Badgan SC type people have fatty and large bodies; their skin is cold; and they are very patient and slow in physical, physiological and psychological characteristics. Humans exhibit attributes of the predominant Rlung, Mkhris, and Badgan SC in their body, mind, and intellect, which are all linked with each other [2].

In recent years, there has been renewed interest and attention by scientists of Mongolia and many other countries to establish the scientific essence of the theoretical problems of Tibetan-Mongolian traditional medicine in strong connection with theory of contemporary biology and medicine. Ambaga et al. proposed that the main regulating mechanisms of living cells are the three states of membrane-redox potentials (membrane-redox potentials three-state line), which provide a flow (high, moderate, and low rate) of protons and electrons. He also evaluated the correlation between the membrane-redox potentials and traditional medicine theory [1,2,4]. He disclosed an approach to a "new apperception" related to the theories, diagnoses, and therapy of the contemporary medicine, which he named "Newly coded medicine - NCM". This resulted in a combination of the theories and concepts between two medical

sciences that he framed as "NCM-newly coded medicine" or the third new system in the medical science [1,3-5]. Thanks to this new science, coherence between the theoretical and methodological approaches of traditional and contemporary medicines has been elicited. Within this third system or NCM, a new modeling of "human body structure-function" named the "membrane-redox potential three-state line-1, 2, 3, 4 compartment" has been resolved. Therefore, our interest was in finding the relevance of membrane redox potential three-state lines in connection with Rlung, Mkhris and Badgan, the fundamental theory of Tibetan-Mongolian traditional medicine [6] since, no study has been done on three-state line of membrane-potential in connection with the abstract codifications of Rlung, Mkhris and Badgan [1,3-5].

The purposes of this study were to investigate the correlation between some parameters of membrane-redox potential three-state line system in relation to the human constitutions of traditional medicine. The specific purposes were: (1) to determine "Rlung, Mkhris, Badgan symbolic code" by the Doc-Am-I Program (traditional medical questionnaire, pulse, and urine examination); (2) to define the amounts of serum cholesterol (CH), triglyceride (TG), low-density lipoprotein (LDL), high-density lipoprotein (HDL), the body mass index (BMI, visceral and subcutaneous fat), the erythrocyte's membrane resistance capacity (MRC), and the malondialdehyde (MDA) in the erythrocyte membrane; (3) to compare some parameters (lipid profile, MDA, MRC) with the human constitutional types such as the Rlung, Mkhris and Badgan SC in traditional medicine.

## Materials and Methods

This cross-sectional research study was conducted at the Innovation Center of the New Medicine Institute and Biochemical Laboratory of the Khulj-borjigon Clinic in Ulaanbaatar, Mongolia. 800 healthy subjects (20-25 years old) were involved in the study. The Bio-medical Ethics Committee at the Mongolian National University of Medical Sciences approved this experiment.

### 1. Diagnostic methods

Blood samples of the 800 subjects were collected and serum levels of CH, TG, HDL, and LDL (parameters representing the second compartment) were determined with the automatic "Screen Master". The MRC (parameter representing the fourth

compartment) was determined using a UV spectrophotometer (UV755B) and a peroxidation hemolysis test. The MDA in the erythrocyte membrane was measured by a thiobarbituric acid reactive substances (TBARS) assay and the BMI (parameter representing third compartment) was quantified by the “Karada Scan HBF-361”. The quantitative ratio of Rlung, Mkhris, and Badgan SC of healthy individuals was determined with criteria using a traditional medicine questionnaire, pulse, urine examination, and the Doc-Am-I Program.

## 2. Statistical analysis

We conducted all of the analyses using SPSS 17.0 software (SPSS Inc., Chicago, IL). The quantitative ratio of Rlung, Mkhris, and Badgan SC types were analyzed using descriptive statistics. ANOVA with Tukey post-hoc analysis were used to examine the differences between Rlung, Mkhris, and Badgan SC groups on the serum lipids, MRC, MDA in the erythrocyte membrane, and BMI. Pearson’s correlation was calculated to examine the correlations between BMI and the increase of MRC and between BMI and the CH:LDL ratio. Statistical results were presented as the mean ± standard deviation and results were considered statistically significant with a p-value of <0.05.

## Results

The subjects of our study were 800 individuals between the ages of 20 and 25. The traditional medicine questionnaire of the physiological, psychological, and mental functions for the identification of Rlung, Mkhis, and Badgan SC of healthy individuals are shown in Table 1.

**Table 1.** Some characteristics from the traditional medicine questionnaire for the identification of three SC

Characteristic	Badgan SC	Mkhris SC	Rlung SC
Body size	Large	Middle	Small
Percentage of body fat	Fatty	Moderately-fatty	Lean
Skin	Smooth, whitish	Soft, oily and yellowish	Dry, rough and bluish
Thirst	Normal	Prone to thirst	Sometimes feels thirsty
Appetite	Poor	Good	Normal
Movements and physical activity	Less and slow	Moderate	Excessive and quick
Sleep	Deep	Moderate	Insufficient

Results of the traditional medicine questionnaire and the medical doctor’s examinations (pulse and urine examinations) for the identification of Rlung, Mkhris, and Badgan types showed that 292 persons(36.5%) belong to Rlung, 204 persons(25.5%) to Mkhris and 304 persons(38%) to Badgan. The demographic characteristics of the 800 subjects are presented in Table 2. There were 216 (27%) men and 584 (73%) women.

The questionnaire for SC group assignment was based on constitutional assessment of the subjects. The Rlung SC group of people have features of a narrow body frame; weakly-developed body build; irregular appetite, food and bowel habits; difficulty gaining weight; are quick at physical activities; have dry skin and hair; and lower tolerance for cold temperature. The Mkhris SC group of people have features of a moderately-developed body build; high frequency of appetite and thirst; good digestive power; high perspiration tendency; tolerance for cold weather; moderate mobility; and moderate physical strength. The Badgan SC of people have features of a broad body frame; well-developed body build; tendency to gain weight; low appetite and digestion; less mobility; less forgetfulness; good healing power; and cool temperament.

**Table 2.** Division of subjects by Rlung, Mkhris, and Badgan constitutional types and sex

Variables Number (%)	Constitutional groups			Total
	Badgan	Mkhris	Rlung	
Male	82	56	78	216
Female	222	148	214	584

As shown in Table 3, the percent saturated fatty acid in the visceral fat of the Badgan SC group (8.3±0.98%) was increased by 39% and 58.6% (p<0.001) in comparison to the Mkhris SC group (5.06±0.73%) and Rlung SC group(3.43±0.74%)8, respectively (Table 3). The percent unsaturated fatty acid in the subcutaneous fat of Mkhris SC group(27.4±0.54%) was increased by 6.2% and 14.9% compared to the Badgan SC group (25.7±0.28%) and Rlung SC group (23.32±1.92%), respectively.

The BMI of the Badgan SC group (25.74±2.21 kg/m<sup>2</sup>) was increased by 1.11 and 1.12 times (p<0.05) compared to the Mkhris SC group (23.12±2.48 kg/m<sup>2</sup>) and Rlung SC group (22.73±0.34 kg/m<sup>2</sup>), respectively (Table 3). According to the traditional medicine theory, individuals of Badgan SC have the biggest fatty body and people who belong to Rlung SC group

have the smallest or lean body among all groups.

**Table 3.** The comparison between the parameters of third compartment of membrane-redox potentials three-state line system by Rlung, Mkhri, and Badgan groups

Variables	Constitutional groups			p-value
	Badgan	Mkhri	Rlung	
Number (%)	304 (38%)	204 (25.5%)	292 (36.5%)	800
Saturated fatty acid in visceral fat (%) <sup>a</sup>	8.3±0.98	5.06±0.73 <sup>b</sup>	3.43±0.74 <sup>c,d</sup>	<0.001
Unsaturated fatty acid in subcutaneous fat (%) <sup>a</sup>	25.7±0.28	27.4±0.54 <sup>b</sup>	23.32±1.92 <sup>c,d</sup>	<0.001
BMI (kg/m <sup>2</sup> ) <sup>a</sup>	25.74±2.21	23.12±2.48 <sup>b</sup>	22.73±0.34	<0.05

<sup>a</sup>Data shown are the mean±SD <sup>b</sup>Badgan SC group and Mkhri SC group differ significantly <sup>c</sup>Badgan SC group and Rlung SC group differ significantly <sup>d</sup>Mkhri SC group and Rlung SC group differ significantly

How the relationship between the theory of Rlung, Mkhri, Badgan and biochemical parameters such as CH, TG, LDL, HDL and BMI can be explained in the level of the "membrane-redox potentials three-state line system", is connected with the question "do human bodies really consist of Rlung, Mkhri, Badgan or Vata, Pitta, Kapha or yin, yang?". It was shown that the concentration of CH in individuals of the Badgan SC group (4.02±0.52mmol/L) was increased by 9.45% and 15.1% (p<0.001) compared to the Mkhri SC group (3.64±0.5mmol/L) and Rlung SC group (3.41±0.42mmol/L), respectively; the concentration of TG in the Badgan SC group (0.94±0.28mmol/L) was increased by 21.2% and 29.8% (p<0.001) compared to the Mkhri SC group (0.74±0.28mmol/L) and Rlung SC group (0.66±0.01mmol/L), respectively; and the concentration of LDL in the Badgan SC group (2.99±0.54mmol/L) was increased by 22.7% and 24.4% (p<0.001) in comparison to the Mkhri SC group (2.26±0.47mmol/L) and Rlung SC group (2.31±0.51mmol/L), respectively (Table 4). According to the traditional medicine theory, individuals of the Badgan SC have the biggest fatty body and people who belong to Rlung SC group have been the smallest or lean body among all groups. Our results may support that the predominance of the beta state of membrane structures and the prevalence of high-reduction ability of redox chains in Badgan-dominated type of people are accompanied by induction of the Stearoyl-CoA desaturase (SCD) gene enzyme activity and causing a remarkable increase in

plasma lipids and very low density lipoprotein production.

The collected data showed that the average amount of HDL in the Mkhri SC group (1.71±0.24mmol/L) was increased by 8.18% and 19.8% (p<0.001) in comparison to the Badgan SC group (1.37±0.33mmol/L) and Rlung SC group (1.57±0.24mmol/L), respectively (Table 4) and the percent unsaturated fatty acid in the subcutaneous fat of Mkhri SC group was increased with statistical significance, compared to the other two SC groups.

**Table 4.** The comparison between the parameters of serum (second compartment) lipids by Rlung, Mkhri, and Badgan groups as the mean±SD

Variables	Constitutional groups			Total
	Badgan	Mkhri	Rlung	
CH (mmol/L)	4.02±0.52	3.64±0.5 <sup>a</sup>	3.41±0.42 <sup>b,c</sup>	<0.001
TG (mmol/L)	0.94±0.28	0.74±0.28 <sup>a</sup>	0.66±0.01 <sup>b,c</sup>	<0.001
LDL (mmol/L)	2.99±0.54	2.26±0.47 <sup>a</sup>	2.31±0.51 <sup>b,c</sup>	<0.001
HDL (mmol/L)	1.37±0.33	1.71±0.24 <sup>a</sup>	1.57±0.24 <sup>b,c</sup>	<0.001

<sup>a</sup>Badgan SC group and Mkhri SC group differ significantly <sup>b</sup>Badgan SC group and Rlung SC group differ significantly <sup>c</sup>Mkhri SC group and Rlung SC group differ significantly

The MRC of the Badgan SC group was increased by 18% and 39.5% compared to the Mkhri SC group and Rlung SC group, respectively; MDA of erythrocyte membrane of the Badgan SC group was decreased by 47% and 66.3% in comparison to the Mkhri SC group and the Rlung SC group, respectively (Figure 1). Three states of membrane structures and redox potentials reflect the oxidase and reductase activity; the speed of enzymatic reaction conducted in the cells; the oxygen consumption; the production of ATP and NADPH; the thermoregulation; the body weight and serum lipid profile of human body; and even membrane structures.

The Badgan SC group was characterized by their low concentration of lipid peroxidation products (MDA, Figure 1). Also, they had a positive, strong correlation between BMI and the MRC (r=+0.9, Table 3, Figure 1) and between BMI and the CH:LDL ratio (r=+0.9, Table 3,4). For the Mkhri-dominated coded group, the results of our investigation showed that these people were distinguished by high oxidation activity (HDL: 1.71±0.24mmol/L; percent unsaturated fatty acid in subcutaneous fat: 27.4±0.54%) within the whole organism's membrane structures. Further, our study exposed that people

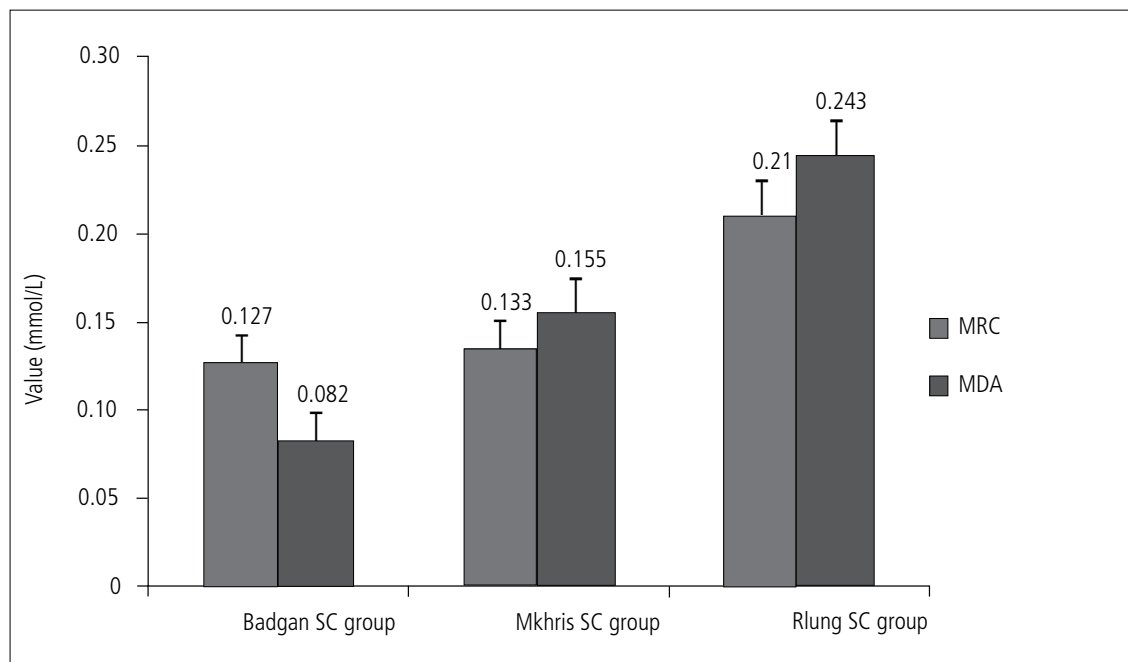


Figure 1. The rates of MRC, MDA in Rlung, Mkhris, and Badgan SC groups

of the Rlung SC group were characterized by the highest concentration of lipid peroxidation products (MDA:  $0.243 \pm 0.062$  mmol/L), the lowest rate of the MRC ( $0.21 \pm 0.013$  mmol/L) compared to people of the other two SC groups (Figure 1). Also, data obtained by our research revealed that the amounts of CH ( $3.41 \pm 0.42$  mmol/L) and TG ( $0.66 \pm 0.01$  mmol/L) were diminished, the BMI ( $22.73 \pm 0.34$  kg/m<sup>2</sup>) was decreased, and the percent saturated fatty acid in visceral fat ( $3.43 \pm 0.74\%$ ) and the percent unsaturated fatty acid in subcutaneous fat ( $23.32 \pm 1.92\%$ ) were reduced in comparison to the other two SC groups. Those results demonstrate that the membrane resistance and the BMI were decreased in the Rlung SC group, paralleled with low antioxidant capacity and less accumulation of serum cholesterol and lipids.

## Discussion

Many foreign researchers are conducting research on the close collaboration of traditional medicine and modern medicine and their ideas have been described in the literature [7-9]. Aggarwall et al. discussed a "golden triangle", that modern technology is able to treat many severe diseases on the bridges of traditional medicine and modern medicine. New ideas raised by researchers have been proved by this hypothesis [10]. There have been several research studies by South Korean, Chinese and Indian

researchers on the collaboration of key concepts of traditional medicine and modern medicine [7-9].

South Korean dietitians paid attention to the type of gene MDR1 and its genetic polymorphism, which is responsible for p-glycoprotein synthesis and participates in the absorption of nutrients in small intestine with adenosine triphosphate (ATP) support. Their research revealed that in 1236C-2677G-3435C and 1236M-2677G-3435T haplotypes, MDR1 was high in the individuals of So-eumin type (Introversion and Judging). Differences between So-yangin and So-eumin were revealed on the MDR1 C 1236T genotypes. Tae-eumin type of individuals was predominate with the MDR1 G2677/A genotype [7].

Yang-deficiency, Yin-deficiency, and Phlegm-wetness with 23 single nucleotide polymorphisms in the three genes were genotyped in China. The results of this research showed biased distribution of PPARD rs2267669 and rs2076167, APM1 rs7627128 and rs1063539 in Yang-deficiency, PPARG Pro12Ala in Yin-deficiency and PPARD rs2076167, APM1 rs266729 and rs7627128 in Phlegm-wetness [8].

The study from India about the collaboration of key concepts of Ayurvedic medicine and modern medicine showed that the components of the lipid profiles like TG, CH, VLDL, LDL, and the LDL/HDL ratio were higher in Kapha when compared to Pitta and Vata males. Additionally, Kapha also had lower levels of HDL when compared to Vata. On the other hand, hematological



parameters like hemoglobin, and red blood cell count of Pitta males showed high values in comparison to Vata and/or Kapha people. Indian researchers observed significant differences in biochemical and genome-wide expression levels in individuals from three contrasting constitution types selected on the basis of phenotyping principles of Ayurveda. A number of differences in biochemical parameters also correlated to gene expression differences. Lipid profiles differed significantly amongst all the three groups [9].

Mongolian researchers conducted a study about the lipid profile (CH, TG, HDL, and LDL), the MRC, MDA, levels of erythrocyte-conjugated dienes, Schiff base (the product of peroxidation), body weight, and body temperature in relation to pulse and the constitutions (Rlung, Mkhri, and Badgan SC) of a person. The subjects of this study were the young healthy males [2].

In our study, the Badgan SC group had increased concentrations of serum CH, TG and LDL, representing the second compartment; increased BMI and saturated fatty acid in visceral fat, representing the third compartment; and a high rate of MRC, representing the fourth compartment. All these conditions indicate dominance of the beta state in the membrane, a high reduction potential with medium levels of proton and electron conductance, and a low level of proton leakage in the membrane-redox potentials three-state line system, which is equivalent to the Badgan SC in traditional medicine: a heavy, firm, cold-oily external pattern of the body. Our results showed that the clinical characteristics of the individuals with the Badgan SC have similarities to Tae-eumin Sasang type who often have high TG, CH [11] and body fat mass [11,12].

The Mkhri SC group had increased concentrations of serum HDL, representing the second compartment; had medium BMI and increased unsaturated fatty acid in subcutaneous fat, representing the third compartment; and medium rate of the MRC, representing the fourth compartment. All these results indicate a predominance of the alpha state in the membrane, a high oxidation potential with high levels of proton and electron conductance, and a medium level of proton leakage on the membrane-redox potentials three-state line systems, which is equivalent to the Mkhri SC in traditional medicine: a hot, sharp, hot-oily external pattern of the body.

The Rlung SC group had decreased concentrations of serum lipids (CH, TG, LDL and HDL), representing the second

compartment; reduced BMI and saturated fatty acid in visceral and unsaturated fatty acid in subcutaneous fat, representing the third compartment; and a low rate of the MRC, representing the fourth compartment. All these conditions indicate prevalence of the gamma state in the membrane, a reduction of redox potential with low levels of proton and electron conductance, and proton leakage on the membrane-redox potentials three-state line systems, which corresponds to the abstract Rlung terminology in traditional medicine: a mobile, non-oily, light nature.

Despite the small sample size, our results indicate a reasonable correlation between some physiological, biochemical parameters of the membrane-redox potentials three-state line system and the human constitutional types of the traditional medicine. The main limitation of our study is that it only included 20-25 year-old (limited age) subjects and too few men to analyze the differences between genders for each group.

In the future, to determine an association between membrane-redox potentials three-state line system and the human constitutional types of traditional medicine will require a large population-based study, including representative samplings of gender and different age groups. We observed significant differences in biochemical parameters and BMI, which correlate to constitutional Badgan, Mkhri, and Rlung types. The lipid profile recently considered to be an independent predictor of cardiovascular mortality was also found to be significantly high in Badgan group, compared to other groups. Additionally, Badgan-dominant people had high levels of LDL, a feature that is reported to increase risk for atherosclerotic conditions.

## Conflict of Interest

The authors state no conflict of interest.

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