Evaluation of the Clinical Efficiency of an Antisickling Polyherbal Formula Drepanoalpha in a Sickle cell disease Patient in Gbado-Lite City (Democratic Republic of the Congo) by Quantum Magnetic Resonance Analyzer

Benjamin Gbolo Zoawe1,2, Koto-te-Nyiwa Ngbolua1,2,*, Pius T. Mpiana1,3, Ndanga Bikibo Appolinaire1, Pangodi Aundagba Jean-Marie1, Masengo Ashande Colette1, Mudogo Virima1,3

1 Research Group in "Ethnopharmacology and Unconventional Medicine", University of Gbado-Lite, Gbado-Lite, Democratic Republic of the Congo
2 Department of Biology, Faculty of Science, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
3 Department of Chemistry, Faculty of Science, University of Kinshasa, Kinshasa, Democratic Republic of the Congo

* Corresponding author: Prof. Koto-te-Nyiwa Ngbolua (PhD); jpngbolua@unikin.ac.cd

Abstract: Sickle cell disease is a genetic disease linked to the presence of hemoglobin S in the blood and is a major public health problem in Africa. The drugs available are expensive in view of the purchasing power of the majority of the population. The aim of this study was to assess the clinical efficacy of an improved traditional medicine called Drepanoalpha (an anti-sickle cell polyherbal formula) in a homozygous sickle patient using the quantum magnetic resonance analyzer. The results show the relevance of the use of this unconventional technical approach in the sickle cell disease patient treatment evaluation. Indeed, this study showed that Drepanoalpha is effective in vivo and restored homeostatic balance by optimizing some vital functions in the treated patient. The quantum magnetic resonance analyzer is therefore an important way which allows understanding the disorders of the body due to sickle cell disease and their correction post-treatment. It is desirable that the use of this device be validated in the evaluation of the effectiveness of anti-sickling drugs in large-scale clinical trials in rural areas like Nord-Ubangi province. Indeed, this instrument is not only fast, practical, economical, accessible, non-invasive but also easy to use and suitable for this category of research in underprivileged areas. The results obtained are in perfect agreement with the facts observed (recovery of some vital parameters and disappearance of seizures in the patient).

Keywords: Unconventional medicine; quantum magnetic resonance analyzer; sickle cell disease; nutraceuticals; therapeutic efficacy

I. Introduction

Sickle cell disease or SS anemia is a hereditary hemoglobinopathy linked to the presence of hemoglobin S in the blood and is a major public health problem in endemic areas. The available medicines are imported, making them expensive in view of the purchasing power of the majority of the population. For more than a decade, our team has been conducting rigorous scientific research on plants used in Traditional Medicine to treat this pathology. These studies led to the formulation of a polyherbal based medicinal plants food in the Democratic Republic of the Congo (DRC) called Drepanoalpha [1-4]. It is a drug whose efficacy has already been scientifically validated in vitro and in vivo and its toxicity limits are well known. Recent reports of total disappearance of seizures among homozygous sickle cell patients who have been treated with Drepanoalpha have been reported by patients or their families across the DRC (Abumombazi, Bukavu, Gbado-Lite, Gemena, Goma, Kinshasa, Lubumbashi, etc.). It has been observed that in more than 100 treated patients, the phenotypic profile is the same as that of normal individuals,
suggesting that this would be an epigenetic modulation of the gene. This medication is given after prior infusion of one to two teaspoons of the powder in boiling water and should be administered within hours of its preparation. The volume of administration is 20 mL with remarkable pharmacological effects in sickle cell patients [5-11]. However, conventional methods of assessing the therapeutic efficacy and safety of improved traditional drugs are expensive because of laboratory consumables (chemical reagents) and equipment, and which, in besides, do not exist in the universities of the hinterland; however, they must train community managers and conduct high-level scientific research in the absence of state and laboratory grants. For this purpose, quantum magnetic resonance (RMQ) is a technique of choice for monitoring treatment in order to disprove or confirm the therapeutic efficacy and safety of a phytodrug in patients. It is a fast, non-invasive and painless technique that does not use chemical reagents but simply exploits the body’s electromagnetic properties using an electronic sensor coupled with the RMQ analyzer and a computer [12-14]. This study was initiated with the aim of validating and promoting the use of RMQ in the monitoring of phytotherapeutic management of sickle cell disease in African rural zones and also as a simple, robust, alternative and/or follow-up of clinical trials in sickle cell patients. Given the limitations of the use of conventional methods in assessing the clinical effectiveness of plant derived medicines in rural areas, RMQ can provide a unique opportunity. This study is a major contribution to clinical trials using an unconventional method. To the best of our knowledge, the evaluation of the therapeutic efficacy of Drepanoalpha by this unconventional methodological approach in a homozygous sickle cell disease (SCD) patient is an original strategy of clinical studies never carried for such screening in the DRC.

II. Material and Methods

2.1 Place of study

This study was conducted in Gbado-Lite city in the Nord-Ubangi province (Figure 1) in the Democratic Republic of the Congo.

Figure 1. North Ubangi Province

http://biarjournal.com/index.php/bioex
a. Sickle Cell Anemia Patient

The 13-year-old female patient (size: 110 cm; weight: 30 kg) was received in our research unit "Ethnopharmacology and unconventional Medicine" attached to the University Medical Center of University of Gbado-Lite, DRC in May 06, 2019 for painful seizures (vaso-occlusion) and hemolytic anemia. Result of Emmel test revealed SCD status. The SCD patient had received first aid at the Gbado-Lite General Reference Hospital (HGR) where he received symptomatic treatment. When he arrived at the University medical center, accompanied by his father, the hemoglobin level was 6% and the patient had splenomegaly and jaundice and has never been transfused since birth. His father admits to having previously submitted successfully her child to Drepanoalpha treatment in 2016 and that the child had no pain crisis longer known until he was admitted to HGR.

b. Drepanoalpha (An innovative antisickling polyherbal formula)

Drepanoalpha is an anti-sickle cell dietary supplement that supplements SCD patient nutrition with essential proteins and trace elements. His powder contains 17% proteins, 5.70% fat, 6% raw fibre and 55.33% carbon hydrates and presents an energy value of 1482.07 kJ.

In addition, this nutraceutical contains in its composition the iron (9.0 mg/100 g), magnesium (1.4 mg/100 g), calcium (4.8 mg/100 g), zinc, manganese, potassium, phosphorus and vitamin C. Phytochemical Studies showed that anthocyanins and organic acids are the main active principles of Drepanoalpha. In addition, flavonoids are plentiful in Drepanoalpha and can be proposed as phytomarkers for quality control and the standardization of this dietary supplement. In addition to its nutritional properties, Drepanoalpha showed an ability to increase the hemoglobin level in vivo and antisickling activity (normalization rate: 80%), anti-hemolytic and antioxidant properties (DE₅₀: 0.604 ± 0.028 µg/mL). Drepanoalpha reduces the frequency of sickle cell attacks and improves the general state of treated patients. With a lethal dose (DL₅₀) greater than 4,000 mg/kg in the Wistar rat and 16,000 mg/kg in the guinea pigs, the product may be considered non-toxic under the normal conditions of its use. In addition, the product did not show any toxicity on immune cells and blood coagulation factors. For its use, it is necessary to place in a cup about 80 mL boiling water and add the amount of the powder of Drepanoalpha corresponding to the patient’s age, i.e. 1 to 2 teaspoons. After infusion for 30 minutes, the surmegree is collected after filtration using a tea sieve or a very clean cloth. The resulting infuse will be administered three times a day at a rate of 20 mL per intake. This infuse cannot be used beyond 24 hours after its preparation. To be effective, Drepanoalpha should be consumed continuously for at least 6 months; it was only after that will give the maintaining doses [5-11].

Figure 2. 1Drepanoalpha Powder
III. Methodology

The mini-quantum analyzer performs a systematic scan of the human body. Electromagnetic signals emitted by the human body (a reflection of its normal or pathological state) are collected by an electronic sensor, amplified and processed by a microprocessor. The data collected is then compared by the software with the RMQ spectrum based on the principles of Fourier serial decomposition.

The main elements of analysis relate to about 40 parameters, of which cardiovascular systems and cerebro-vascular, bone mineral density, trace elements, nerves cranial, the gastrointestinal function, function of the large intestine, liver function, gallbladder function, pancreatic function, kidney function, the pulmonary function, brain, bone growth index, the endocrine system, the immune system, etc. The test is done before the meal or an hour later in an elongated position as showed in figure 3 and by ridding the patient of any metal objects and other electronic devices. The patient takes in his left or right hand the electronic sensor coupled with the RMQ and a personal computer as described by the manufacturer of the RMQ device [12-14]. The data was taken on D-day 0 Base line and J21 post treatment. The duration of treatment was seven days (J1-J7).

After scanning the human body, the results are automatically displayed on the computer screen and can be recorded or printed.

IV. Discussion

The results of the RMQ analyses indicate that for some parameters, the values were not influenced by the taking of Drepanoalpha. While for others, the parameter values have been corrected from abnormally low or high values to normal benchmarks. These observations confirm the safety and therapeutic efficacy of Drepanoalpha in homozygous SCD patient as previously validated by conventional techniques in SS erythrocytes, rats; guinea pigs and homozygous SCD patients’ model systems [6, 8, 10, 11].

The safety results in the absence of alteration of the values of vital organs (unchanged values) indicating that Drepanoalpha does not interfere with the functions of vital organs (kidneys, liver, brain, etc.): Cardiovascular and cerebrovascular systems, gastrointestinal function, liver
function, gallbladder function, pancreatic function, kidney anointing, lung function, bone mineral density, brain, rheumatism, blood sugar, amino acid, skin, eyes, thyroid, etc. While, **efficiency** therapeutic results in the normalization of the values of parameters assessed from the body or organs emitting electromagnetic waves obtained by an electronic sensor coupled with the RMQ.

These values provide information on the state of the body or organ: healthy (normal value) or pathological condition (anomaly: abnormally low or high relative to normal/reference). This study revealed that Drepanoalpha is effective *in vivo* and has restored homeostatic balance by optimizing certain vital functions in the treated SCD patient. Indeed, Drepanoalpha has improved the function of the large intestine by normalizing the coefficient function of peristalsis function of the large intestine, the rate of absorption of the colon and the coefficient of bacteria. For the latter parameter the decrease in its value from 13,797 to 2,611 means that treatment with Drepanoalpha reduces the incidence of bacterial infections in the SCD patient. Taking the infused based nutraceutical improved the functioning of the cranial nerves and the memory index at the level of the patient's brain, bone mineral density. The polyherbal formula also helps to prevent rheumatism by improving the coefficient of hyperostosis and the coefficient of osteoporosis. Bone growth index values include bone alkaline phosphatase, osteocalcin, long bone healing status and epiphysic line; 17 mineral elements (Fe, Zn, Se, Cu, Co, Mn, I, Ni, Fluore, P, K, Mg, Vanadium, Sn, Si, Sr and Bore); 8 vitamins (A, D3, E, K, B1, B2, B12, C); 5 coenzymes (biotin, pantothenic acid, folic acid, nicotinamide) and glutathione were standardized/normalized. It should also be noted that the consumption of Drepanoalpha also improved the endocrine system (thyroid index, adrenal gland index, pituitary secretion index, pineal secretion index, glandular secretion index, thymus) and the immune system (amygdala immune index, bone marrow index, spleen index: from 253,757 to 35,637, index of immune system, index of immune gastrointestinal tract) of the SCD patient.

The reduction in the index value of the spleen is evidence that Drepanoalpha reduced the rate of sickle cell disease *in vivo* and would therefore prevent splenic sequestration of sickle cell cars reported in the literature as a factor responsible for splenomegaly in SCD patients [15]. The results of this study also show that Drepanoalpha improves the physical quality base of sickle cell disease. Indeed, this phytodrug reduced the response capacity index (from 288,094 to 65,419) respectively, the lack of water (from 323,023 to 37,637) and Index of hypoxia (from 1208, 137 to 141,467). This shows that Drepanoalpha improves the state of hydration and oxygenation of sickle cellerytocytes and confirms that the bioactive molecules contained in Drepanoalpha would inhibit on the one hand, falcification by interfering with the polymerization of deoxyhemoglobin S and the Gardos canal reported in the literature as a factor implicated in erythrocytic dehydration [16] on the other hand.

The results of the RMQ analysis also indicate that Drepanoalpha prevents obesity in patients by reducing the lipid metabolism coefficient (from 3,954 to 3,708) and fat tissue colour coefficient (from 11,555 to 4,197). Based on the results of this study, Drepanoalpha reduces proportion of collagen (at the level of certain systems and devices in the body) as well as the body's main and collateral channels; decreases systolic volume (from 195,026 to 67,882), low-density lipoprotein (C-LDL: from 7,301 to 1,578); estrogen (from 11,084 to 8,828), gonadotropin (from 20,534 to 8.93), prolactin (from 8,101 to 7,846), progesterone (from 64,712 to 16,724) and neurotransmitters (from 3,168 to 0.973). The standardization of C-LDL and neurotransmitters by Drepanoalpha allows trait prevent respectively atherosclerosis and inflammation in sickle cell disease. To this end, it should be noted that various inflammatory agents are often increased in SCD patients and are likely to cause a kidney dysfunction [17].
V. Conclusion

The aim of the present study was to evaluate the clinical efficacy of Drepanoalpha, an anti-sickle cell nutraceutical, in a homozygous SCD patient using the RMQ analyzer. The results show the relevance of the use of this unconventional analysis in the SCD patient under treatment. The RMQ analyzer being a reliable way to understand the body's disorders in a holistic way (deficiency, balance or excess), it can be validated as an appropriate and robust means for monitoring and evaluating the effectiveness of anti-sickle cell drugs in large-scale clinical studies (nutritherapy program) in rural areas. This device is not only fast, practical, economical, accessible, non-invasive but also easy to use and adapted for this category of research in underprivileged areas.

References

[1] Ngbolua KN, Mpiana PT, Mudogo V, 2019. Chemical and pharmacological studies of Drepanoalpha: Powerful anti-sickle cell dietary supplement developed in the Democratic Republic of Congo. European University Editions, Riga: Latvia. ISBN: 978-613-8-46436-5.

[2] Ngbolua KN, Tshilanda DD, Djolu RD, Falanga MC, Masengo AC, Tshibangu DST, Iteku BJ, Mudogo V, Mpiana PT. Anti-Sickle Cell Anemia and Bacterial Inhibitory Effects of Uvariodendron molundense (Diels) R.E.Fr. (Annonaceae) from Ubangi River Basin, DR Congo. Journal of Biosciences and Medicines. 2017; 5: 71-84.

[3] Ngbolua KN, Mpiana PT, Akoundze BJ, Mwanza BF, Tshibangu DST, Masengo CA, Liesse L, Takaisi K. Anti-sickling and bacterial inhibitory effects of two medicinal foods from the Congo River basin: Gnetum africanum Welw. (Gnetaceae) and Grewia coriacea Mast. (Malvaceae). Current Traditional Medicine 2016; 2(1): 34-41.

[4] Mpiana PT, Ngbolua KN, Tshibangu DST. Ailments and sickle cell disease: A mini review. Chemistry Reviews. 2016;1 (6):884-89.

[5] Ngbolua KN, Gbolo BZ, Tshididi JD, Tshibangu DST, Memvanga PB, Mpiana PT. Effect of Storage on the Bioactivity of Drepanoalpha® (An Anti-Sickle Cell Disease Polyherbal Formula) and Comparative Biochemical Profile of Different Batches. International Journal of Chemical and Biomolecular Science 4(4): 60-68, 2018.

[6] Ngbolua KN, Mpiana PT, Tshibangu DST, Mazasa PP, Gbolo BZ, Atibu EK, Kadima JN and Kasali FM. In vitro antisickling and radical scavenging activities of a poly-herbal formula (Drepanoalpha®) in sickle cell erythrocyte and acute toxicity study in Wistar albinos rats. European Journal of Medicinal Plants. 2014; 4(10): 1251-67.

[7] Ngbolua KN, Mpiana PT. The possible role of a congolese polyherbal formula (Drepanoalpha®) as source of epigenetic modulators in sickle cell disease: A hypothesis. J. of Advancement in Medical and Life Sciences. 2014; 2(1):1-3.

[8] Mpiana PT, Kasali FM, Bbirwhonde F, Gbolo BZ, Tshibangu DST, Ngbolua KN, et al. Acute and sub-acute oral toxicity studies of Drepanoalpha® (a poly-herbal formula used in the management of sickle cell disease) in guinea-pig. British Journal of Pharmaceutical Research. 2016; 10(5): 1-8.

[9] Ngbolua KN, Tshididi JD, Tshibangu DST, Memvanga PB, Gbolo BZ, Tshilanda DD, Mpiana PT. Drepanoalpha®: An Overview on the Quality Control Process and Standardization Feature of an Antisickling Herbal Drug from Democratic Republic of the Congo. J. of Modern Drug Discovery and Drug Delivery Research. 2016; V4I1. DOI: 10.15297/JMDDR. V4I1.01.

[10] Gbolo BZ, Asamboa LS, Bongo GN, Tshibangu DST, Kasali FM, Memvanga PB, Ngbolua KN, Mpiana PT. Bioactivity and chemical analysis of Drepanoalpha: An anti-sickle cell
anemia poly-herbal formula from Congo-Kinshasa American Journal of Phytomedicine and Clinical Therapeutics. 2017; 5(1):1-5.

[11] Gbolo BZ, Tshibangu DST, Asamboa LT, Bongo NG, Kasali MF, Feza BV, Ngbolua KN, Mpiana PT. Sickle cell anemia therapeutic approach based on Drepanoalpha®. About 34 cases. Journal of Complementary and Alternative Medical Research 2017; 4 (2): 1-8.

[12] http://www.senaturopathe.com/pages/analyse-quantique.html
[13] http://optumumsante.fr/analyse-quantique.htm
[14] https://hygiene-vital.com/analyseur-quantum-de-resonance-magnetic/
[15] GirotR, Begué P, Galacteros F. Sickle cell disease. John Libbey Eurotext Paris, 2003.

[16] Brugnara C, De Franceshi L, Alper SL. Inhibition of Ca\(^{2+}\) dependent K\(^+\) transport and cell dehydration in sickle erythrocytes by CLT and other imidazole derivatives. J. Clin. Invest. 1993; 92: 520-526.

[17] Rifkind JM, Mohanty JG, Nagababu E. The pathophysiology of extracellular hemoglobin associated with enhanced oxidative reactions. Frontiers in Physiology 2015; 5: 1-7. doi: 10.3389/fphys.2014.00500.

### Appendix: Test results

| Evaluated parameter | value | normal | J₀ | J₂₀ |
|---------------------|-------|--------|----|-----|
| **Systems cardiovascular and cerebrovascular** |       |        |    |     |
| Blood viscosity     | 48,264 - 65,371 | 64,599 | 64,601 |
| Cholesterol crystals| 56,749 - 67,522 | 72,58 | 72,602 |
| Blood lipids        | 0,481 - 1,043 | 0,607 | 0,623 |
| Vascular resistance | 0,327 - 0,937 | 1,417 | 1,423 |
| Blood vessel elasticity | 1,672 - 1,978 | 1,694 | 1,704 |
| Myocardide blood demand | 0,192 - 0,412 | 0,492 | 0,511 |
| Blood infusion volume of the myocardia | 4,832 - 5,147 | 5,095 | 5,111 |
| Oxygen consumption of the myocardia | 3,321 - 4,244 | 3,845 | 3,849 |
| Heart rate           | 1,338 - 1,672 | 1,152 | 1,149 |
| Ejection impedance of the left ventricle | 0,669 - 1,544 | 1,229 | 1,237 |
| Actual propulsion power of the left ventricular | 1,554 - 1,988 | 1,09 | 1,094 |
| Coronary artery elasticity | 1,533 - 2,187 | 1,57 | 1,593 |
| Coronary infusion tension | 11,719 - 18,418 | 17,221 | 17,221 |
| Elasticity of brain blood vessels | 0,708 - 1,942 | 1,078 | 1,088 |
| Brain blood supply situation | 6,138 - 21,396 | 13,703 | 13,735 |

| **Gastrointestinal function** |       |        |    |     |
| Pepsin secretion coefficient | 59,847 - 65,234 | 59,827 | 59,837 |
| Gastric motility factor | 58,425 - 61,213 | 60,141 | 60,159 |
| Gastric absorption coefficient | 34,367 - 35,642 | 33,916 | 33,904 |
| Digestive motor coefficient of the small intestine | 133,437 - 140,476 | 136,858 | 136,879 |
| Small intestine absorption coefficient | 3,572 - 6,483 | 2,924 | 2,94 |

| **Function of the large intestine** |       |        |    |     |
| Coefficient of peristalsis function of the large intestine | 4,572 - 6,483 | 21,55 | 6,444 |
| Colon absorption rate | 2,946 - 3,815 | 10,273 | 3,781 |

http://biarjournal.com/index.php/bioex
|                        | Value 1       | Value 2       | Value 3       |
|------------------------|---------------|---------------|---------------|
| Bacteria coefficient   | 1,734 - 2,621 | 13,797        | 2,611         |
| Intraluminal pressure  | 1,173 - 2,297 | 26,291        | 26,287        |
|                         |               |               |               |
| **Liver function**     |               |               |               |
| Protein metabolism     | 116,34 - 220,621 | 147,868       | 147,887       |
| Energy production      | 0.713 - 0.992 | 0.803         | 0.816         |
| Detoxification function| 0.202 - 0.991 | 0.221         | 0.224         |
| Bile secretion function| 0.432 - 0.826 | 0.436         | 0.444         |
| Liver fat content      | 0.097 - 0.419 | 0.593         | 0.609         |
|                         |               |               |               |
| **Gallbladder function** |            |               |               |
| Serum-globulin (A/G)   | 126 - 159     | 142,833       | 142,835       |
| Bilirubin Total (TBIL) | 0.232 - 0.686 | 0.463         | 0.457         |
| Alkaline Phosphatase (ALP) | 0.082 - 0.342 | 0.289       | 0.305         |
| Total bile acid serum (TBA) | 0.317 - 0.695 | 0.483       | 0.489         |
| Bilirubin (DBIL)       | 0.218 - 0.549 | 0.269         | 0.279         |
|                         |               |               |               |
| **Pancreatic function** |            |               |               |
| insulin                | 2,845 - 4,017 | 3.59          | 3,593         |
| Pancreatic Polypeptide (PP) | 3,210 - 6,854 | 4.28       | 4,296         |
| Glucagon               | 2,412 - 2,974 | 2,762         | 2,778         |
|                         |               |               |               |
| **Kidney function**    |               |               |               |
| Urobilinogen index     | 2,762 - 5,424 | 5.678         | 5,676         |
| Uric acid index        | 1,435 - 1,987 | 1,845         | 1,829         |
| Blood urea index (BUN) | 4,725 - 8,631 | 9,514         | 9,524         |
| Proteinuria index      | 1,571 - 4,079 | 2,572         | 2,6           |
|                         |               |               |               |
| **Lung function**      |               |               |               |
| Vital capacity         | 3348 - 3529   | 5387,049      | 5387          |
| Total lung capacity    | 4301 - 4782   | 4219,895      | 4220          |
| Airway resistance      | 1,374 - 1,709 | 6,396         | 6,4           |
| Arterial oxygen content| 17,903 - 21,012 | 79,864     | 79,866        |
|                         |               |               |               |
| **Cerveau**            |               |               |               |
| Blood irrigation of the brain | 143,37 - 210,81 | 137,927    | 137,931       |
| Cerebral arteriosclerosis | 0,103 - 0,642 | 1,109        | 1,116         |
| State of cranial nerves | 0,253 - 0,659 | 1,252        | 0,641         |
| Emotional index        | 0,109 - 0,351 | 3,477        | 3,496         |
| Memory Index (ZS)      | 0,442 - 0,817 | 3,349        | 0,807         |
|                         |               |               |               |
| **Bone mineral density** |            |               |               |
| Osteoclast coefficient | 86,73 - 180,97 | 838,012      | 838,013       |
| Calciumrate            | 0,209 - 0,751 | 7,125        | 7,121         |
| Degree of bone hyperplasia | 0,046 - 0,167 | 0,227       | 0,243         |
| Degree of osteoporosis  | 0,124 - 0,453 | 4,313        | 4,323         |
| Bone mineral density   | 0,433-0,796   | 1,217        | 0,786         |
|                         |               |               |               |
| **rheumatism**         |               |               |               |
### Degree of cervical calcification

| Value Range          | Mean   | Standard Deviation |
|----------------------|--------|--------------------|
| 421 - 490            | 2676,72| 2678,682           |

### Degree of lumbar calcification

| Value Range          | Mean   | Standard Deviation |
|----------------------|--------|--------------------|
| 4,326 - 7,531        | 74,906 | 74,903             |

### Hyperostosis coefficient

| Value Range          | Mean   | Standard Deviation |
|----------------------|--------|--------------------|
| 2,954 - 5,543        | 0,155  | 2,976              |

### Osteoporosis coefficient

| Value Range          | Mean   | Standard Deviation |
|----------------------|--------|--------------------|
| 2,019 - 4,721        | 0,885  | 2,032              |

### Rheumatism coefficient

| Value Range          | Mean   | Standard Deviation |
|----------------------|--------|--------------------|
| 4,023 - 11,627       | 55,29  | 55,315             |

### Bone growth index

|Measure                        | Value Range          | Mean   | Standard Deviation |
|-------------------------------|----------------------|--------|--------------------|
|Bone alkaline phosphatase     | 0,433 - 0,796        | 6,327  | 0,778              |
|Ostéocalcine                   | 0,525 - 0,817        | 5,752  | 0,812              |
|Long Bone Healing Status      | 0,713 - 0,992        | 1,541  | 0,982              |
|Health of short bone cartilage| 0,202 - 0,991        | 0,237  | 0,25               |
|Epiphysary line               | 0,432 - 0,826        | 6,043  | 0,816              |

### Sugar in the blood

|Measure                        | Value Range          | Mean   | Standard Deviation |
|-------------------------------|----------------------|--------|--------------------|
|Insulin secretion coefficient | 2,967 - 3,528        | 12,421 | 12,412             |
|Blood glucose coefficient      | 2,163 - 7,321        | 1,286  | 1,297              |
|Sugar coefficient in urine     | 2,204 - 2,819        | 6,8    | 6,815              |

### Mineral elements and Oligo-elements

|Element                        | Value Range          | Mean   | Standard Deviation |
|-------------------------------|----------------------|--------|--------------------|
|Calcium                        | 1,219 - 3,021        | 0,058  | 0,062              |
|Do                             | 1,151 - 1,847        | 2,634  | 1,829              |
|Zinc                           | 1,143 - 1,989        | 4,007  | 1,984              |
|Selenium                       | 0,847 - 2,045        | 2,238  | 2,04               |
|phosphorus                     | 1,195 - 2,134        | 10,936 | 2,129              |
|Potassium                      | 0,689 - 0,987        | 5,411  | 0,982              |
|magnesium                      | 0,568 - 0,992        | 1,777  | 0,973              |
|Copper                         | 0,474 - 0,749        | 4,084  | 0,739              |
|Cobalt                         | 2,326 - 5,531        | 18,245 | 5,518              |
|Manganese                      | 0,497 - 0,879        | 2,230  | 0,874              |
|Iodine                         | 1,421 - 5,490        | 19,416 | 5,488              |
|Nickel                         | 2,462 - 5,753        | 19,315 | 5,736              |
|Fluor                          | 1,954 - 4,543        | 17,917 | 4,529              |
|Molybdenum                     | 0,938 - 1,712        | 1,481  | 1,491              |
|Vanadium                       | 1,019 - 3,721        | 30,35  | 3,706              |
|Tin                            | 1,023 - 7,627        | 47,264 | 7,617              |
|Silicon                        | 1,425 - 5,872        | 11,586 | 5,862              |
|Strontium                      | 1,142 - 5,862        | 11,568 | 5,857              |
|Bore                           | 1,124 - 3,453        | 17,806 | 3,443              |

### Vitamin

|Vitamin                        | Value Range          | Mean   | Standard Deviation |
|-------------------------------|----------------------|--------|--------------------|
|Vitamin A                      | 0,346 - 0,401        | 0,576  | 0,396              |
|Vitamin B₁                     | 2,124 - 4,192        | 3,402  | 3,411              |
|Vitamin B₂                     | 1,549 - 2,213        | 4,973  | 2,208              |
|Vitamin B₃                     | 14,477 - 21,348      | 84,344 | 21,348             |
|Vitamin B₆                     | 0,824 - 1,942        | 0,307  | 0,307              |
|Vitamin B₁₂                    | 6,428 - 21,396       | 123,552| 21,391             |
| Vitamin C     | 4,543 - 5,023 | 26,169 | 5,013 |
|--------------|--------------|--------|------|
| Vitamin D₃  | 5,327 - 7,109 | 13,574 | 7,093 |
| Vitamins E   | 4,826 - 6,013 | 13,151 | 6,008 |
| Vitamin K    | 0,717 - 1,486 | 6,795  | 1,472 |

**Amino acid**

| Lysine       | 0,253 - 0,659   | 2,932  | 2,965 |
|--------------|-----------------|--------|------|
| Tryptophan   | 2,374 - 3,709   | 4,183  | 4,175 |
| Phenylalanine| 0,731 - 1,307   | 1,122  | 1,124 |
| Methionine   | 0,432 - 0,826   | 0,617  | 0,614 |
| Threonine    | 0,422 - 0,817   | 1,47   | 1,481 |
| Isoleucine   | 1,831 - 3,248   | 17,471 | 17,481|
| Leucine      | 2,073 - 4,579   | 31,952 | 31,951|
| Valine       | 2,012 - 4,892   | 11,052 | 11,059|
| Histidine    | 2,903 - 4,012   | 10,927 | 10,923|
| Arginine     | 0,710 - 1,209   | 13,471 | 13,496|

**Coenzymes et oligopeptide**

| Nicotinamide | 2,074 - 3,309 | 18,299 | 3,302 |
|--------------|---------------|--------|------|
| Biotin       | 1,833 - 2,979 | 9,114  | 2,974 |
| Pantothenic acid | 1,116 - 2,101 | 5,947  | 2,096 |
| Folic acid   | 1,449 - 2,246 | 7,032  | 2,239 |
| Coenzyme Q10 | 0,831 - 1,588 | 0,844  | 0,878 |
| Glutathione  | 0,726 - 1,281 | 2,677  | 1,271 |

**Endocrine system**

| Thyroid secretion index | 2,954 - 5,543 | 9,418  | 5,538 |
|-------------------------|--------------|--------|------|
| Parathyroid secretion index | 2,845 - 4,017 | 2,498  | 2,524 |
| Index of adrenal heats | 2,412 - 2,974 | 10,815 | 2,959 |
| Hypophysis secretion index | 2,163 - 7,34  | 2,132  | 2,164 |
| Pineal secretion index | 3,210 - 6,854 | 37,457 | 6,844 |
| Thymus secretion index | 2,967 - 3,528 | 20,559 | 3,523 |
| Glandular secretion index | 2,204 - 2,819 | 12,235 | 2,8 |

**Immune system**

| Lymph node index | 133,437 - 140,47 | 787,062 | 787,073 |
|------------------|------------------|---------|--------|
| Immune Index asmygdal | 0,124 - 0,453 | 1,288  | 0,448 |
| Bone marrow index | 0,146 - 3,218 | 16,591 | 3,208 |
| Rate index | 16,137 - 35,642 | 253,757 | 35,637 |
| Index Thymus | 14,825 - 61,213 | 3,773  | 3,784 |
| Index immunoglobulin | 3,712 - 6,981 | 1,489  | 1,503 |
| Respiratory Immune Index | 3,241 - 9,814 | 83,932 | 9,809 |
| Gastrointestinal immune index | 0,638 - 1,712 | 7,653  | 1,702 |
| Mucous membrane immune index | 4,111 - 18,741 | 12,858 | 12,866 |

**Thyroid**

| Thyroxine libre (FT4) | 0,103 - 0,316 | 0,841  | 0,849 |
|----------------------|--------------|--------|------|
| Thyroglobulin        | 0,114 - 0,202 | 1,83   | 1,843|
| Anticorps anti-thyroglobuline | 0,421 - 0,734 | 3,185  | 0,729 |
| Triiodothyronine (T3) | 0,161 - 0,308 | 1,583  | 1,593 |

**Qualité physique**

| Response capacity | 59,786 - 65,424 | 288,094 | 65,419 |
|------------------|-----------------|---------|-------|
| Mental capacity  | 58,715 - 63,213 | 21,1    | 21,1  |

http://biarjournal.com/index.php/bioex - 45 -
| Lack ofe        | 33,967 - 37,642 | 323,023 | 37,637 |
|---------------|----------------|---------|--------|
| Hypoxia       | 133,642 - 141,476 | 1208,137 | 141,467 |
| pH            | 3,156 - 3,694 | 6,094 | 6,111 |

**Obesity**

| Lipid metabolism coefficient | 1,992 - 3,713 | 3,954 | 3,708 |
|-----------------------------|----------------|-------|--------|
| Fat tissue colour coefficient (from Brown) | 2,791 - 4,202 | 11,555 | 4,197 |
| Insulin increase coefficient (hyper insulin) | 0,097 - 0,215 | 1,227 | 1,237 |
| Hypothalamus core coefficient | 0,332 - 0,626 | 5,547 | 5,549 |
| Triglyceride content coefficient | 1,341 - 1,991 | 1,216 | 1,356 |

**Skin**

| Free radical skin indexes | 0,124 - 3,453 | 0,618 | 0,608 |
|--------------------------|----------------|-------|--------|
| Index of collagen in the skin | 4,471 - 6,079 | 8,456 | 6,069 |
| Fat index in the skin | 14,477 - 21,348 | 136,897 | 136,913 |
| Skin immunity index | 1,035 - 3,230 | 2,232 | 2,251 |
| Skin moisture index | 0,218 - 0,953 | 18,854 | 18,855 |
| Lost skin moisture | 2,214 - 4,158 | 42,595 | 42,604 |
| Red blood trace index under the skin | 0,824 - 1,942 | 12,278 | 12,282 |
| Skin elasticity index | 2,717 - 3,512 | 1,255 | 1,267 |
| Skin melanin index | 0,346 - 0,501 | 3,917 | 3,914 |
| Skin Keratinization Index | 0,842 - 1,858 | 15,384 | 15,388 |

**Eyes**

| Pockets under the eyes | 0,510 - 3,109 | 28,379 | 28,379 |
|------------------------|----------------|--------|--------|
| Collagen Eye Wrinkles | 2,031 - 3,107 | 3,842 | 3,102 |
| Dark circles | 0,831 - 3,188 | 1,808 | 1,839 |
| Lymphatic obstruction | 1,116 - 4,101 | 7,861 | 7,859 |
| subsiding | 0,233 - 0,559 | 1,915 | 1,926 |
| Edema | 0,332 - 0,726 | 5,341 | 5,345 |
| Eye cell activity | 0,118 - 0,892 | 4,8 | 4,801 |
| Visual fatigue | 2,017 - 5,157 | 2,219 | 2,23 |

**Collagen**

| Eyes            | 6,352 - 8,325 | 23,258 | 8,315 |
|-----------------|---------------|--------|------|
| Dentition (Dents) | 7,245 - 8,562 | 4,055 | 4,063 |
| Hair and skin   | 4,533 - 6,179 | 15,301 | 6,169 |
| Endocrine system | 6,178 - 8,651 | 45,077 | 8,641 |
| Circulatory device | 3,586 - 4,337 | 2,351 | 2,368 |
| Igestif device | 3,492 - 4,723 | 17,074 | 4,718 |
| Immune system | 3,376 - 4,582 | 8,911 | 4,581 |
| Engine system | 6,458 - 8,133 | 26,619 | 8,125 |
| Fabric of the muscles | 6,552 - 8,268 | 36,164 | 8,265 |
| Big metabolism | 6,338 - 8,368 | 15,757 | 8,358 |
| Cellular detoxification | 6,187 - 8,466 | 10,234 | 8,461 |
| Reproductive device | 3,778 - 4,985 | 9,109 | 4,975 |
| Nervous system | 3,357 - 4,239 | 2,059 | 2,054 |
| Main and collateral channels | Urinary device | 6,256 - 8,682 | 46,912 | 8,672 |
|-----------------------------|----------------|----------------|--------|-------|
| Lung meridian               | 48,264 - 65,371| 424,114        | 65,361 |
| Meridian of the large intestine | 56,749 - 67,522| 214,753        | 67,512 |
| Meridian of the stomach     | 0,481 - 1,043  | 0,031          | 0,031  |
| Meridian of the heart       | 1,672 - 1,978  | 0,162          | 0,215  |
| Meridian of the small intestine | 0,192 - 0,412  | 5,539          | 5,529  |
| Meridian of the bladder     | 4,832 - 5,147  | 27,934         | 5,142  |
| Meridian of the kidneys     | 3,321 - 4,244  | 10,512         | 4,184  |
| Meridian of the pericardy   | 1,338 - 1,672  | 1,282          | 1,293  |
| Shaoyang triple burner meridian | 0,669 - 1,544  | 7,458          | 1,534  |
| Gallbladder Meridian        | 1,554 - 1,988  | 6,246          | 1,958  |
| Liver meridian              | 1,553 - 2,187  | 7,259          | 2,177  |
| Jen May                     | 11,719 - 18,418| 19,135         | 18,408 |
| Meridian Governor           | 0,708 - 1,942  | 14,524         | 1,855  |
| Vital meridian              | 6,138 - 21,396 | 121,802        | 21,387 |
| Tai more                    | 5,733 - 7,109  | 26,706         | 7,033  |

| Heart and brain pulses      | Urinary device | 6,256 - 8,682 | 46,912 | 8,672 |
|-----------------------------|----------------|----------------|--------|-------|
| Race index                  | 60,735 - 65,396| 600,525        | 600,54 |
| Systolic volume (VS)        | 63,012 - 67,892| 195,026        | 67,882 |
| Peripheral cardiac resistance (RRT) | 0,983 - 1,265 | 3,059         | 3,033  |
| Pulse wave coefficient K    | 0,316 - 0,401  | 0,257          | 0,271  |
| Cerebrovascular blood oxygen saturation rate | 0,710 - 1,109 | 2,745         | 1,077  |
| Volume of cerebrovascular oxygen (CaCO3) | 7,880 - 10,090 | 4,044         | 3,983  |
| Cerebrovascular Oxygen Pressure (PaO2) | 5,017 - 5,597 | 48,354        | 5,579  |

| Blood lipids                | Urinary device | 6,256 - 8,682 | 46,912 | 8,672 |
|-----------------------------|----------------|----------------|--------|-------|
| Blood viscosity             | 4,131 - 4,562  | 19,253         | 19,242 |
| Total Cholesterol (CT)      | 1,833 - 2,979  | 0,809          | 1,843  |
| Triglycerides (TG)          | 1,116 - 2,101  | 1,413          | 1,382  |
| High-density lipoprotein (C-HDL) | 1,449 - 2,246  | 9,123          | 9,147  |
| Low-density lipoprotein (C-LDL) | 0,831 - 1,588  | 7,301          | 1,578  |
| Neutral fat (MB)            | 0,726 - 1,281  | 13,072         | 13,103 |
| Complexes immuns circulants (CIC) | 13,012 - 17,291 | 12,94         | 13,027 |

| gynaecology                 | Urinary device | 6,256 - 8,682 | 46,912 | 8,672 |
|-----------------------------|----------------|----------------|--------|-------|
| Estrogéndard                | 3,296 - 8,840  | 11,084         | 8,828  |
| Gonadotropine               | 4,886 - 8,931  | 20,534         | 8,93   |
| Prolactine                  | 3,142 - 7,849  | 8,101          | 7,846  |
| Progestérone                | 6,818 - 16,743 | 64,712         | 16,724 |
| Vaginitis coefficient        | 2,204 - 2,819  | 15,159         | 15,173 |
| Coefficient de PID           | 1,348 - 3,529  | 23,554         | 23,559 |
| Appendicitis coefficient     | 2,301 - 4,782  | 26,83          | 26,838 |
| Cervicitis coefficient       | 2,845 - 4,017  | 4,815          | 4,81   |
|                          | to be                                           |     |     |
|--------------------------|-------------------------------------------------|-----|-----|
| Ovarian cyst coefficient  | 2,012 - 4,892                                   | 41,143 | 41,16 |
| Hyperplasia coefficient  | of the mammary glands                           | 0,202 - 0,991 | 0,895 | 0,895 |
| Acute mastitis coefficient| 0,713 - 0,992                                   | 2,947 | 2,973 |
| Chronic mastitis coefficient| 0,432 - 0,826                                  | 5,477 | 5,462 |
| Endocrine dyscrasia coefficient| 1,684 - 4,472                                  | 8,313 | 8,32 |
| Breast fibroadenoma coefficient| 0,433 - 0,796                                  | 1,277 | 1,296 |

**Menstrual cycle**

|                          |                                               |     |     |
|--------------------------|------------------------------------------------|-----|-----|
| Hormone beta             |                                                | 2,942 - 3,407 | 29,623 | 3,401 |
| Protein reflection       |                                                | 4,713 - 5,345 | 38,685 | 5,34 |
| Fibrinogen               |                                                | 2,807 - 3,294 | 2,508 | 2,526 |
| Sedimentation rate       |                                                | 6,326 - 8,018 | 8,278 | 8,013 |

**TDAH**

|                          |                                               |     |     |
|--------------------------|------------------------------------------------|-----|-----|
| Oxygen-hydroxy-phenyl-ethanol |                                                | 1,163 - 2,206 | 13,449 | 2,201 |
| GE Neurotransmitters     |                                                | 0,753 - 0,972 | 3,168 | 0,963 |
| Vaniloid                 |                                                | 0,232 - 0,981 | 5,238 | 0,978 |
| Créatine kinase          |                                                | 0,150 - 0,240 | 1,071 | 1,074 |