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Master Program in Physical Cardiochemistry

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Authors' contributions

This work was carried out in collaboration among all authors. Author ABK designed and supervised the study and managed the proof reading of manuscript. Author SNL is the experimentalist of the Physical Cardiochemistry, wrote the first draft of this paper and managed the literature searching. Author PKK managed the proof reading and correction of manuscript. All authors read and approved the final manuscript.

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Commentary Article

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ABSTRACT

Background: The heart acting analysis leads to necessity of total energy quantization needful for its life from the cellular metabolism (Keith Flack node).
This energy is mainly distributed to make possible the cardiac muscle acting (Electrocardiogram) and to circulate the blood in aorta to be ultimately poured out the small circulation in upstream of general circulation, distribution obeying Lusamba diagram. A model has been elaborated to choose a thermodynamic system (KUNYIMA Chart) on which the needful energy of blood flow has been assessed. It stays to quantify the vital energy for the electrification of cardiac muscle (ECG) in order to have a definitive idea on total energy from Keith Flack node. Each heart failure demands energetic knowledge of Keith Flack node and the energetic repartition of ventricles shrinkages.
Aim and Objective: Presentation master program in cardiochemistry (new discipline) and Lusamba diagram to scientific world.

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Methodology: Observation, documentary research and calculations have been used.
Results: Physico-chemical and thermoexergetic grounds of heart acting have been published elsewhere and allowed thus to conceive this program.
Conclusion: Physical Cardiochemistry (PCC) is therefore a set of physico-chemical and thermoexergetic grounds of heart acting. It backs up the bio-medical sciences and helps in one sense to the comprehension of certain energetic phenomena occurring in the cardiac system. Therefore, this large knowledge will help physicians to efficient prescriptions for an effective energetic and appropriate supplying. It is supposed evidently that future cardiac healing will essentially be energetic.

Keywords: Physical cardiochemistry; Kunyima chart; exergetic cardiac yield; Lusamba diagram.

1. INTRODUCTION

In our previous works on the heart [1,2], by means of KUNYIMA chart, a thermodynamics system has been chosen [2,3,4,5]. So KUNYIMA equation, KUNYIMA formula, KUNYIMA relations have been discovered and KUNYIMA unit defined [2,6,7]. PhD thesis has been defended where thermodynamics distance has been framed on LUSAMBA diagram [3].Cardiac power (P_C), volumic cardiac power or volumic density of power (P_V), differential enthalpy (ΔH_D), Kunyima constants (k_K, Z_K), Technical volumic work power received by the system ($\dot{E}_V^+$), cardiac exergetic yield (η_{ex}), exergetic loss $[\dot{L}]$, volumic exergetic loss in power or volumic density of exergetic loss in power ($\dot{L}_V$), massic entropy variation (Δs), etc. have been calculated for the first time [2,3,8,9,10].

All those concepts have given rise to Physical Cardiochemistry (PCC), a new scientific discipline, whose Dr. KUNYIMA BADIBANGA Anaclet, Ordinary Professor, is the founder and Dr. LUSAMBA NTUMBA LUSE-LUA-MULOPO Séraphin-Vinhy the first PhD [3].

Indeed, ever since the world is world, the Scientifics have never said the physical parameters appearing on the digital sphygmomanometer namely the blood systolic pressure, the diastolic pressure and the cardiac frequency gave directly the cardiac volumic power (or volumic density of cardiac power) what would give a precise idea on the acting of this human engine, because all in all the heart is an engine.

Moreover, the Scientifics have never clearly shown that the cardiac frequency was simply a kinetic constant whose the meaning is making today understandable the sense of this parameter.
Also, some articles talk about differential pressure, a parameter however fundamental, in very fragmentary manner. The researchers have never thought to dial the energy accompanying the blood flux in the small circulation, energy furthermore decisive in the knowledge of the part generated by cellular metabolism (Keith Flack node).

Finally, the cardiac exergetic yield which, nonetheless, can be the measure of the heart longevity, has never been studied and ciphered. This prominent parameter stayed a mystery even though one spoke in some books about only cardiac yield in purely misty and theoretical way without giving for it a rational outcome [1,2,3].

In the thermoexergetic study undertaken on the heart in LACOPA and PCC, it has been clearly demonstrated that systolic pressure, diastolic pressure and cardiac frequency gave well and truly cardiac volumic power (or volumic density of cardiac power) and therefore the cardiac power could be known with precision when the ejection fraction of blood in aorta is known. It has been also seen that the cardiac frequency is simply a kinetic constant giving a clear idea psychological fixable on the facility with which the blood circulates in the small circulation [3,6,7].

In this above mentioned study it has been demonstrated that differential pressure has been a parameter of great importance because it allows not only to define differential enthalpy leading to knowledge of cellular metabolism energy (Keith Flack node) but also to cipher precisely the exergetic yield of the heart, capital parameter measuring the longevity of the heart [3,7].

This parameter, exergetic yield, has been proposed by the way to Figure on the futurs sphygmomanometers (KUNYImeters) besides the traditional parameters (systolic pressure, diastolic pressure and cardiac frequency). It has been clearly established that the cardiac exergetic yield depends exclusively on

differential pressure if the ejected blood volume in aorta is known, that means the measure and knowledge of differential pressure suffice to dial and to know the exergetic yield of the heart and therefore to get idea on the quality and cardiac health. The cardiac exergetic yield is the trustworthy yield of the heart because it gives quantitatively an account of what is qualitatively called energy loss contributing thus to have idea on heart electric nutrition (Keith flack node) and on cardiac health [2,3].

Knowing additionally that a good heart that means a heart destined to live for a longtime should have a weak exergetic yield (energy given by heart in comparison with energy received by it from Keith Flack node), it is evident that the cardiac exergetic yield will decide physician of good heart acting. We are convinced that the study of this important parameter should be extended to people of all nations (Africa, Asia, Europa, America, Australia) as a function of their alimentary lifestyles, their weights and their sizes in order to state its definitive limits giving thus the norms characterizing people health [3].

The entropy variation that has led to the definition of thermodynamic distance for the first time (LUSAMBA diagram) has been quantified. This thermodynamic distance, expressed in energetic term, enlightens the position of the man in stationary state outside the thermodynamic equilibrium, synonymous of the death that means the place where the man is situated before dying [3].

Others parameters such as coenergy, coenthalpy, work copower, transformation power, etc. will be dialed and interpreted in the future [1,3].

All those parameters will lead to the matrix establishment of the heart and to the manufacture of an ad hoc apparatus capable to bring out shortfalls in the parameters and to orient such those who have chosen all their life the heart as raw material that means cardiac specialists.

In addition, Physical Cardiochemistry is therefore a set of physico-chemical and thermoexergetic grounds of heart acting [2,3,11]. It should be noted the cardiac biophysics as studied by mechanics aspect [12] is for us one part of Physical Cardiochemistry and is not contradictory. The courses contributing to acquire background are hereby proposed.

2. MOTIVATION

It will never be repeated enough, the heart is one of the noble organs whose life is greatly depending on. Its study is and will remain of importance across the ages and generations [2,13,14,15].

The heart is an engine of weak yield which has been successfully calculated and proposed to appear on the future sphygmomanometer (KUNYImeter) [2,3] together with volumic cardiac power, exergetic loss, cardiac exergetic yield; the other calculated parameters such as coenthalpy, coenergy, have been proposed with the formers to give the heart matrix [2,3,16,17,18].

Research in LACOPA-PCC is continuing to complete this study. Note that the exergetic yield is a measure of the longevity of the heart [2,3] and therefore the longevity of life essentially.

3. OPPORTUNITY OF JOBS

- Physical Cardiochemistry leads to the researches concomitantly in medical sciences, basic sciences and engineering for example conception, sizing and manufacture of devices;
- It presents a socio-economical dimension: marketing of new medical apparatus, for example KUNYImeter;
- It is possible to frame medicines susceptible to prevent, heal and to maintain the heart;
- For practitioner, the heart matrix has to be discovered;
- Physical cardiochemistry gives rise to opportunities allowing to work in hospitals, industries, Universities, research laboratories and /or commercial laboratories; etc.

The content of physical cardiochemistry will be itemized in a book in nearest future. Nevertheless, this content will lie on three major components: basic sciences, sciences of health, engineering. So, our target students will come from these fields and the minimum qualification is licence.

4. PROPOSED PROGRAM

4.1 The First Year of Master (M1)

a) Fluid mechanics
b) Blood physiology
c) Small circulation anatomy

d) Chemical thermodynamics
e) Technical English
f) Biomathematics
g) Informatics (part 1)
h) General biophysics (Bioenergetics, Biological membranes and transfers)
i) Physical Cardiochemistry and society
j) Biomaterials
k) Advanced Research Initiation
l) Biochemistry (food and subcellular structures)
m) Energetics thermodynamics
n) Cardiovascular diseases
o) Electrocardiogram

4.2 The Second Year of Master (M2)

a) Informatics (part 2)
b) Echo-cardio
c) Physical Cardiochemistry Grounds
d) Biochemical genius
e) Electronics (part 1)
f) Original dissertation.

5. CONCERNING LUSAMBA DIAGRAM

In this paper a special note should be mentioned with respect to massic entropy (Fig.2).

The entropy variation observed in all performed experiments is almost constant, weak and negative. This means the state (1), (systolic state), of the chosen thermodynamics system is somewhat more disturbed than state (2), (diastolic state) (Fig.1) [2,3,19,20].

It has been observed it does not depend neither on cardiac frequency nor on age. The sign of entropy variation is supported by the literature according which the variation of entropy is negative for an irreversible system [1,3,16,20].

Indeed, for the healthy person or patient, as long he is still alive, it is said he lives in stationary state out of the thermodynamics equilibrium because the thermodynamics equilibrium state is a synonym of death (the heart stopping) [1,2,3].

To maintain this stationary state out of equilibrium the organism should, in order to offset the internal entropy production, dissipate the entropy through an exchange of heat and matter with its environment according to the exigency of thermodynamics second law ($\int dS = 0; \int d_i S = \int -d_o S$).

This is also evident for the system studied (Fig.1) [2,3].

The internal entropy production $d_i S > 0$ originates from chemical reactions occurring in the organism, the external entropy dissipation $d_o S < 0$, beyond the heat dissipation, arises from the clear exportation of entropy by means of the matter exchange with outside.

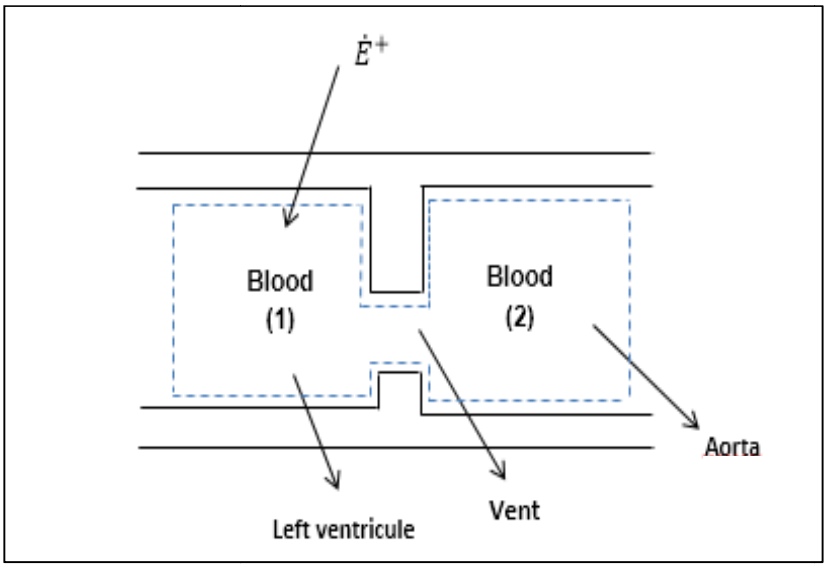

Fig. 1. Studied thermodynamics system

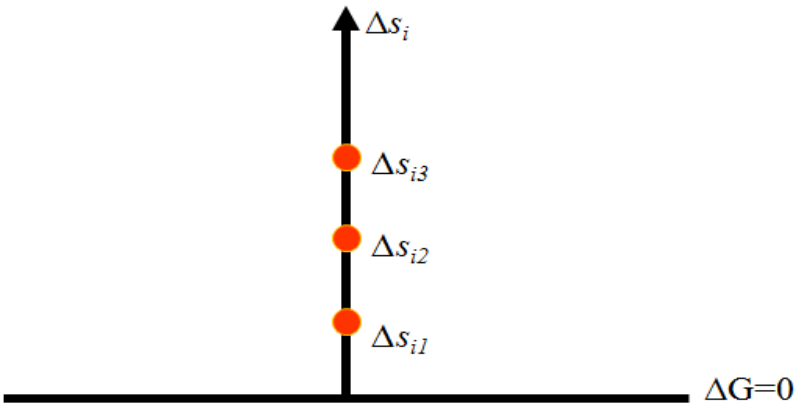

Fig. 2. LUSAMBA diagram: Entropy, a thermodynamics distance
Made in LACOPA-PCC, DRC, 2019

So it has been proposed for better understanding to consider Δs as a distance (not in physical sens) situating a heart from thermodynamics equilibrium state (Fig.2). As long as a heart is acting (health person or patient) $\int dS = 0$; $\int d_i S = \int -d_o S$ and $d_i S$ has a certain value. More $d_i S$ is near the thermodynamics equilibrium, more the patient situation is unhealthy. Larger is this distance, better is the health. When $d_i S$ = $-d_o S$ = $dS = 0$, the ventricles contractions stopping can be observed, the heart stopping can be declared and thereby the patient physical death [3].The limits of these entropy variations are to be compulsorily calculated.

Fig. 2 has been called LUSAMBA diagram to note the name of LUSAMBA NTUMBA LUSE-LUA-MULOPO Séraphin-Vinhy, the first PhD in Physical Cardiochemistry, who proposed it.

Ultimately it can be said that the entropy is a thermodynamic distance separating a man from his thermodynamic equilibrium state (Fig.2) [2,3].

6. CONCLUSION

Physical Cardiochemistry offers a large knowledge of thermodynamics parameters (internal energy, coenergy, enthalpy, coenthalpy) allowing to deal with the heart, to uptake its acting and eventually to afford widespread field for the building of artificial hearts.

Different researchers tackled the mechanics aspect complementary to thermoexergetic one (aspect) hereby differently mentioned.

The great advantage of thermodynamic study arises from the precise quantification of energy degradation.

It is hereby proposed for example, besides traditional parameters on sphygmomanometers, to add cardiac exergetic yield, fundamental parameter giving idea on performance and longevity of heart, volumic density of heart, exergetic loss, entropy leading to define thermodynamic distance, cardiac power and so on.

For the practitioner, heart matrix should be determined including coenthalpy, work copower, transformation power, etc. It is hopeful to see these new parameters on all apparatus used to detect the efficiency of the heart.

Physical Cardiochemistry (PCC) is therefore a set of physico-chemical and thermoexergetic grounds of heart acting. It backs up the bio-medical sciences and helps in one sense to the comprehension of certain energetic phenomena occurring in the cardiac system. Therefore, this large knowledge will help physicians to efficient prescriptions for an effective energetic and appropriate supplying.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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