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## Nutritional Quality of Three Ivoirians Foods Consumed: Biochemical Seric Studies on Growing Rats (Wistar)

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**Abstract:** In order to elucidate the influences of ivoirians diets on the health of populations, a study was conducted on three dishes (Cabatoh with dah sauce, CsD: *Foutou* yam with *gouagouassou* sauce, FsG: Rice with palm nut sauce, RsG) on biochemical seric parameters of growing rats. Thus, the values in mg/g of serum parameters obtained for all sera from animals fed with dishes are typical for metabolites urea ( $0.11\pm 0.01$  to  $0.13\pm 0.04$ ), the creatinine ( $5.00\pm 0.70$  to  $6.40\pm 0.89$ ), triglycerides ( $0.51\pm 0.09$  to  $0.61\pm 0.03$ ), cholesterol ( $1.19\pm 0.10$  to  $1.27\pm 0.02$ ) total protein ( $60.40\pm 2.60$  to  $72.00\pm 2.91$ ), glucose ( $0.75\pm 0.05$  to  $0.79\pm 0.07$ ). Furthermore, the averages of the ions were determined for calcium ( $81.60\pm 3.91$  to  $82.80\pm 5.06$ ), phosphorus ( $28.80\pm 2.48$  to  $32.20\pm 3.27$ ). All these values show no difference between them and with the values obtained in rats fed with control diet respectively. In conclusion, such an assessment clearly shows the good quality of food consumed and the Ivorian would not be at the origin of the many nutritional diseases on health in the population. These dishes could be suggested and more valued.

**Key words:** Serics Parameters, metabolites, ions, evaluation, nutritional diseases

### INTRODUCTION

Many questions and concerns are recurring with the emergence of many non-communicable diseases (diabetes, cardiovascular diseases) observed in Africa and particularly in Cote d'Ivoire. However, a malnourished population is a risk factor for development (FAO, 1999). Indeed, malnutrition remains a public health serious problems it is still rife in developing countries (Oneyka *et al.*, 2002). In addition, a key number of malnourished people of all ages subsaharian African increased from 50million in 1970 to 225 million in 2008, with a further increase expected 100 million in 2015 and prior to the current increase in the price of foodstuffs (FAO/WHO, 2002; Murphy, 2003; Charles *et al.*, 2008). Cote d'Ivoire, despite the enormous resources easily accessible food on local markets, malnutrition remains a major obstacle to development in the country (Bobby *et al.*, 2002). Also, the dishes in Cote d'Ivoire are usually drawn from local and very diverse crops (Ouedraogo, 2008). Numerous studies on nutrition in Cote d'Ivoire have contributed to the pursuit of food security and not to ask questions about the health impact of these schemes from local plant products. Faced with this problem, studies on the health impact on ivoirians food were initiated to better understand the etiology of these numerous nutritional diseases prevalent in Cote d'Ivoire (Dally *et al.*, 2010). This study aims to study the values of biochemical serum parameters in rats fed with three typical dishes of Cote d'Ivoire in order to understand

whether these foods contribute to the development of these nutritional diseases observed.

### MATERIALS AND METHODS

#### Materials

**Biological material:** Three kinds of Ivoirians dishes from three different households specifically consumed by the respective peoples of the North (Cabatoh with dah sauce) Center (pounded yam with *gouagouassou* sauce) and West, rice with palm nut sauce. The rats were bred in the animal house of the Faculty of Biosciences Felix Houphouet-Boigny of Cote d'Ivoire University, under the conditions of stable and normal temperature. The photoperiod was 12 h.

**Laboratory equipment:** The assay of various blood biochemical parameters required the use of the material consists of a multiparametric automatic analyzer HITACHI 902 (German). The glucose, triglycerides, cholesterol are obtained by enzyme-colorimetric test; urea by the kinetic assay, creatinine test Kinetic JAFFE, total protein by Biuret reagent, phosphorus by colorimetric method and calcium by colorimetric assay reagent Arsenazo III mono.

#### Methods

**Treatment of growing rats:** Animals growing middleweight  $30\pm 5$  g are raised in cages individual batch cage of 7 rats metabolism. 3 groups of animals

were fed, respectively with three ivorians foods for 16 days. The control group fed the benchmark over the same period after 16 days of feeding with 2 days of adaptation, the animals have a maximum and constant weight. They are then fasted and sacrificed. Unique blood samples from each animal are performed respectively in each dry tube Ependhorf. These tubes are immersed in an ice tray and stored in a cold room until analysis in the laboratory of Biochemistry, Faculty of Medical Sciences of the University Felix Houphouët-Boigny place effective biochemical parameters were determined (Founzegue *et al.*, 2007).

**Packaging of blood samples wavelength**

**Statistical analysis:** Biological analyzes of blood samples from each animal were allowed to summarize the statistical data using test Newmen-Keuls and using STATISICA 6.0 software. The mean values accompanied by the same letter are not statistically different at the same probability level  $\alpha = 0.05$ .

**RESULTS AND DISCUSSION**

Blood levels of parameters in rats fed with witness diet served in the appreciation of those obtained with rats fed with food studied. Thus, the present study biochemical parameters serics rats responds to an elucidation of the etiology of non-communicable diseases and an assessment of Ivorian population health.

The results of these studies on the nutritional efficiency of Ivorian foods (Dally *et al.*, 2010) samples used with a number of 28 rats in growth confirmed or presumed quality obtained in biochemical studies of these foods consumed in Cote d' Ivoire made in previous work. The mean value of creatinine and urea observed, respectively between  $5.00 \pm 0.70$  and  $6.40 \pm 0.89$   $0.11 \pm 0.01$  to  $0.13 \pm 0.04$  (mg/mL) for animals fed with ivorian food. All these values are very close to each other and with the value of creatinine or blood urea of rats fed the control diet respectively  $4.80 \pm 0.80$  and  $0.11 \pm 0.01$  mg/mL. Indeed, the determination of creatinine and urea is currently used for the routine evaluation of renal function (Labbe *et al.*, 1992; Seronie *et al.*, 2004). In humans, it is normal between 4 and 16 mg/L (Brener, 1986; WHO, 2004). A change in the level of this

substance in the blood can raise a suspicion training cannulas kidney (Brener and Rector, 1986; William, 1994). Triglycerides and cholesterol are regulated by the liver (Taylor *et al.*, 1974; Becker *et al.*, 1983). Blood cholesterol levels in rats fed with witness diet is  $1.17 \pm 0.09$  mg/mL. However, the values obtained for rats fed with food (CsD, FsG and RsG) give, respectively  $1.26 \pm 0.08$ ,  $1.19 \pm 0.10$  and  $1.27 \pm 0.07$  mg/mL. These values with those fed rats with Ivorian dishes show no significant difference between them and with that of control rats. Indeed incubating in a saturated fatty acid feed is causing a hypercholesterolemia in rats (Lutz *et al.*, 1994; Durand *et al.*, 1978). Furthermore these triglycerides in rats in control give  $0.55 \pm 0.07$  mg/mL, then the results in those fed with food are tested between  $0.51 \pm 0.09$  and  $0.06 \pm 0.61$  mg/mL. Like cholesterol, triglycerides from these rats showed no significant difference between them and those of the control rats ( $p \geq 0.05$ ). Blood glucose circulating result of the balance is between the production of triglyceride-rich lipoproteins and their purification device (Crapel *et al.*, 1985). These recorded values are statistically equal and with triglycerides values in control rats ( $p \geq 0.05$ ). It could be suggested that, these dishes implies no disturbance of the metabolism of these biochemical parameters (Anonymous, 1995; Seyrek *et al.*, 2004). As well as the total protein glucose in fed with Ivorian foods show no significant difference between them and the respective controls is  $0.75 \pm 0.04$  and  $63.40 \pm 4.97$  mg/mL. Blood glucose obtained with rats fed ivorians foods is between  $0.75 \pm 0.05$  and  $0.79 \pm 0.07$  mg/mL. However the total proteins obtained from these same rats are between  $2.60$  and  $60.40 \pm 2.91 \pm 72.00$  mg/mL. In chronicals situations, a synthesis of hardware components becomes excessive and hepatic fibrosis may develop (Gressner *et al.*, 1994; Albanis *et al.*, 2001). This is not the case in this study. Indeed, the serum of an adult contains about 72 g/L of total proteins, the rate within a broad range between 68 and 72 g/L (WHO, 2004) Ionic analysed elements fed from these rats with the tested dishes give the average values of calcium between  $81.60 \pm 3.91$  and  $82.80 \pm 5.06$  g/L. Values that do not differ among themselves and with that of the control ( $82.00 \pm 2.91$ g/L) ( $p \geq 0.05$ ). The phosphorus values

Table 1: Method of analysis of metabolites

Parameters	Colorimetrics methods	Wavelength (micron) $\lambda$ $\mu$ m
Glucose	Glucose oxydase and peroxydase	500
Urea	Urease	600
Creatinine	Cinetic in alkcalin and acid picric	500
Totals proteins	Ion cuivric in alkcalin	550
Cholesterol	Cholesterolestérase oxydase and peroxydase	500
Triglycerides	Lipase, glycérolkinase, oxydase and peroxydase	500

Table 2: Methods of ions analysis

Parameters	Colorimetrics methods	Wavelength (micron) $\lambda$ $\mu$ m
Calcium	In alkcalin with O-cresol phtaléin	500
Phosphorus	In milieu acid with ammonium molybdate	600

Table 3: Creatinine and urea

Diets	Value of biochemical parameters (mg/mL)	
	Urea	Creatinine
Witness	0.11±0.01 <sup>a</sup>	4.80±0.80 <sup>a</sup>
CsD (Nord)	0.11±0.01 <sup>a</sup>	5.40±1.34 <sup>a</sup>
FsG (Centre)	0.13±0.04 <sup>a</sup>	5.00±0.70 <sup>a</sup>
RsG (Ouest)	0.12±0.02 <sup>a</sup>	6.40±0.89 <sup>a</sup>

Each value is the mean±SD of 21 rats fed blood with three specific dishes. a, there is no significant difference ( $p \geq 0.05$ ) gets two values designated by the same letter. After analysis of variance, classification averages for an assessment of urea or creatinine test performed using the Newman-Kaul

CsD: Cabatoh with Dah sauce (North)

FsG: Foutou (pounded yam) with gouagouassou sauce (Centre)

RsG: Rice with palm nut sauce (West)

Table 4: Triglycerides and cholesterol

Diets	Value of biochemical parameters (mg/mL)	
	Triglycerides	Cholesterol
Witness	0.55±0.07 <sup>a</sup>	1.17±0.09 <sup>a</sup>
CsD (Nord)	0.52±0.09 <sup>a</sup>	1.26±0.08 <sup>a</sup>
FsG (Centre)	0.51±0.09 <sup>a</sup>	1.19±0.10 <sup>a</sup>
RsG (Ouest)	0.61±0.03 <sup>a</sup>	1.27±0.02 <sup>a</sup>

Each value is the mean±SD of 21 rats fed blood with three specific dishes. a, there is no significant difference ( $p \geq 0.05$ ) gets two values designated by the same letter. After analysis of variance, classification averages for an assessment of Triglycerides or Cholesterol test performed using the Newman-Kaul

CsD: Cabatoh with Dah sauce (North)

FsG: Foutou (pounded yam) with gouagouassou sauce (Centre)

RsG: Rice with palm nut sauce (West)

Table 5: Totals proteins and glucose

Diets	Value of biochemical parameters (mg/mL)	
	Totals proteins	Glucose
Witness	63.40±4.97 <sup>a</sup>	0.75±0.04 <sup>a</sup>
CsD (Nord)	60.40±2.60 <sup>a</sup>	0.79±0.07 <sup>a</sup>
FsG (Centre)	61.80±5.11 <sup>a</sup>	0.75±0.06 <sup>a</sup>
RsG (Ouest)	72.00±2.91 <sup>a</sup>	0.75±0.05 <sup>a</sup>

Each value is the mean±SD of 21 rats fed blood with three specific dishes. a, there is no significant difference ( $p \geq 0.05$ ) gets two values designated by the same letter. After analysis of variance, classification averages for an assessment of Triglycerides or Cholesterol test performed using the Newman-Kaul

CsD: Cabatoh with Dah sauce (North)

FsG: Foutou (pounded yam) with gouagouassou sauce (Centre)

RsG: Rice with palm nut sauce (West)

Table 6: Calcium and phosphorus

Diets	Value of biochemical parameters (mg/mL)	
	Calcium	Phosphorus
Witness	82.00±2.91 <sup>a</sup>	30.40±1.51 <sup>a</sup>
CsD (Nord)	82.80±5.06 <sup>a</sup>	32.20±3.27 <sup>a</sup>
FsG (Centre)	81.60±3.91 <sup>a</sup>	29.80±3.34 <sup>a</sup>
RsG (Ouest)	82.40±2.30 <sup>a</sup>	28.80±2.48 <sup>a</sup>

Each value is the mean±SD of 21 rats fed blood with three specific dishes. a, there is no significant difference ( $p \geq 0.05$ ) gets two values designated by the same letter. After analysis of variance, classification averages for an assessment of calcium or phosphorus test performed using the Newman-Kaul

CsD: Cabatoh with Dah sauce (North)

FsG: Foutou (pounded yam) with gouagouassou sauce (Centre)

RsG: Rice with palm nut sauce (West)

obtained from these same animals are between 28.80±2.48 and 32.20±3.27 g/L. Like calcium, phosphorus values obtained showed no significant

difference between themselves and the values obtained for rats fed the benchmark diet 30.40±1.51 g/L ( $p \geq 0.05$ ). These results are similar to those obtained by Cadwell, 1970; Durlach *et al.*, 1985; Gueguen, 2005. All parameters serics values obtained in rats fed with ivorians foods have no difference statisticly speaking ( $p = 0.05$ ). This could prove a good renal physiology (Arhens *et al.*, 2007; Darton *et al.*, 1998; Shepherd *et al.*, 2006) and confirm the good quality of food consumed in Cote d' Ivoire.

**Conclusion:** Analyses showed that despite of the fundamental difference that could find between rat and human, these two elements present same anatomic functioning (physiologically speaking). Indeed, all of the observed data with serics parameters from these Ivorian dishes fed rats showed no significant difference between them and with their respective control specimens just as well for metabolite and ions. These various dishes therefore not squeezed originally observed in the population of functional failures of an organ (kidney) noticed in ivorian population. These studies confirm the good nutritional quality of foods consumed in Cote d'Ivoire, concerning essential metabolites and ions. This assessment could be an essential tool for comparative studies with many dishes consumed and dishes comes from other countries which are consumed in Cote d'Ivoire.

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