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Study of the chemical composition of human placenta by the ICP-MS technique in plancentophagy

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ABSTRACT: The placenta, which supports the growth and development of the fetus, is rich in chemical micronutrients and other elements such as amino acids, peptides, fats, growth factors and other active biological components. Analysis by the ICP-MS technique shows detectable levels of the following seven elements in the dehydrated placenta of 20 female samples: arsenic (As), cadmium (Cd), copper (Cu), lead (Pb), iron (Fe), selenium (Se), and zinc (Zn). The contents of these chemical elements are respectively: 0.05 ± 0.01 ppm for As; 0.03 ± 0.01ppm for Cd; 5.01 ± 1.12 ppm for Cu; 0.03 ± 0.02 ppm for Pb; 703.66 ± 174.41ppm for Fe; 1.68 ± 0.32 ppm for Se and finally 52.09 ± 6.14 ppm for Zn. The highest contents correspond to those of Fe (703.66 ± 174.41ppm), Zn (52.09 ± 6.14ppm) and Cu (5.01 ±1.12ppm). The other trace amounts correspond to micronutrients considered to be harmful (As, Cd, Pb, Se). This study shows that with the ICP-MS technique, even trace chemicals are detected in the powder of the placentas that are useful for mothers and newborns. The capsules ingested by female placenta donors are considered as a dietary supplement for lactation function. In eight weeks after giving birth, the study shows that the weights of newborns from all donors have increased by the right rate, a good breastfeeding and the babies have bowel movements several times a day.

KEYWORDS: Study, Chemical composition, placenta, technique, ICP-MS, Placentophagy.

1 INTRODUCTION

During childbirth, the mother loses a membrane called the placenta [1] and thus experiences several physical, physiological, and anatomical disturbances. It's a psychologically important time for her. The placenta physically and biologically connects the developing embryo to the uterine wall, providing the fetus with the water and nutrients it needs [2]. Its functions change according to the development of the fetus. These are nutritive, respiratory, recycling or excretory, hormonal, immune functions as a biochemical filter compared to the external, immunological by blocking the effects of maternal cytotoxic cells, general ecotonial and the function of preparation for birth [3].

The placenta behaves like a therapeutic agent because the dehydrated powder is used to stimulate lactation, fertility disorders [4]. The oral intake of its placenta powder provides an anti-inflammatory effect, especially in the case of lesions with a regenerative effect and stimulating growth [6].

In the placenta, there are also factors that facilitate endocrine signaling and regulate cell growth, proliferation, migration, and differentiation; these are, for example, cytokines [7]. It participates in a reunion between the endometrium and fetal tissue from the trophoblast.

Expelled after nine months of gestation, this membrane gave rise to placental therapy which has been applied to promote healing of certain diseases and tissue regeneration because of micronutrient composition since the 1900s [8].

As in primates, herbivores, and other mammals, placentophagy is considered to be ingestion after delivery of placental tissue by the mother. It is a practice often used in traditional Chinese medicine [9] as well as amniotic fluid [10], [11].

It is done in different ways, either by consuming a piece of raw placenta or by consuming it heated, dried and pulverized [12].

Although the smell is unpleasant, Selander et al **[13]** reported in 2013 the benefits of this technique. These are improved mood, increased energy, improved lactation, and less bleeding after childbirth. Consumption of the placenta, according to this author, leaves an aftertaste in the mother who consumes it, which is an undesirable effect. Placentophagy also involves risks related to potentially toxic elements above the toxicity threshold of elements such as Cadmium (Cd), Lead (Pb), Arsenic (As), Mercury (Hg).

There are fewer scientific studies that focus on placentophagy in humans although the placenta is a rich source of nutrients like iron (Fe), zinc (Zn), copper (Cu), selenium (Se) [14], [15] to which must be added:

- Significant amounts of calcium (Ca), magnesium (Mg), phosphorus (P), sodium (Na), potassium (K) [16],
- Very low doses of arsenic (As), lead (Pb), cadmium (Cd) and mercury (Hg) [17].

Other authors have determined the percentage of ash, proteins, fats in the placenta to show that the latter is not only a biological waste to be discarded or incinerated, but more it can be recycled under several shapes [18].

Essential and non-essential amino acids (alanine, aspartic acid, histidine, leucine, lysine, phenylalanine, proline, tyrosine, tryptophan, valine) and B vitamins are also part of the composition of the placenta.

It also contains hormones. The presence of oxytocin, estrogen, progesterone, lactogen, which are found both in the powder and in the raw placenta has been reported there [5].

The main objective of this study is to determine the elemental (chemical) composition of the placenta (organ considered as anatomical waste to be discarded) by the ICP-MS technique. The secondary objective is to produce the capsules from the placenta collected by the encapsulation technique.

2 Materials And Methods

Extensive research has been carried out from the scientific literature with regard to the chemical elements to be studied, then the preparation of the placenta capsules by the encapsulation technique and the use of detection methods for the dose or the concentration of chemical elements by inductively coupled plasma mass spectrometry (ICP-MS). An analytical survey (part of the research-action study) made it possible to select the women or donors who wanted to participate in this preliminary study.

2.1 Placenta Donors

Placenta samples were collected from 20 healthy donors after childbirth at the Saint Pierre University Hospital in Brussels (CHU Saint-Pierre). Their age ranges from 21 to 39 years (mean age = 30 years), non-smokers and who have accepted to ingest their postpartum placenta in the form of a capsule. Of the 20 women selected, 13 were first-time mothers (65%), 3 had given birth three times (15%), 2 had given birth twice, (10%), and 2 had given birth four times (10%). Table 1 gives the breakdown by ethnic origin or country of origin of the study participants.

Table 1. Ethnic origin of the placenta donors (n = 20)

Ethnic Origin	Nationality	Number	Percentage (%)
Belgian	Belgians	2	10
Congolese	Belgians	9	45
Asians	Belgians	5	25
Gabonese	Belgians	4	20
Totals	-	20	100

The representative population in the group of placenta donors is African represented by 65% followed by the Asian population with 25% and finally the native Belgian population by 10%. Regarding their training, Table 2 indicates this.

Table 2. Level of training of placenta donors (n = 20)

Training	Nationality	Number	Percentage (%)
Professional	Belgians	10	50
Upper Secondary	Belgians	4	20
Baccalaureate	Belgians	5	25
Master	Belgians	1	5
Totals	-	20	100

The category of donors who have completed vocational and upper secondary training represents 70% of this population. In this category are represented the 9 original donors from DR Congo, 4 original donors from Gabon. The one who studied for a master's degree is the donor of Asian origin with 5% and 4 other donors of Asian origin and 2 donors of Belgian origin, ie the 25 % of populations having completed the baccalaureate. The average income level of each donor is not necessary as the payslip is confidential and individual. Regarding the civil status of each candidate, the result is shown in Table 3.

Table 3. Marital Status of Placenta donors (n=20)

Civil Status	Nationality	Nombre	Percentage (%)
Single	Belgians	6	30
Cohabiting	Belgians	7	35
Married	Belgians	5	25
Divorced	Belgians	2	10
Totals	-	20	100

The married candidates in the study represent 25%. This population is made up of 3 and 1 candidates originally from DR Congo and Gabon, respectively. In the cohabitant series, which represents 35%, there are 4 original candidates from DR Congo, one Belgian candidate and two Asian candidates. The other 40% represent divorced and single women, ie 8 candidates. According to the study data, no donor took the dietary or nutritional supplements during the 35th week of pregnancy. Only one Belgian donor, or 5%, reports a vegetarian diet reduced to vegetables and without dairy products during pregnancy.

2.2 Sample Treatment

the placenta is treated a few hours after childbirth according to established standards. He is treated with cold running water in the delivery room and cleared of blood and blood clots [16]. Placental tissue is sliced into thicknesses of 4-5 cm by removing the umbilical cord and fetal membranes. The dehydrator is used to dry tissue slices at 55 ° C and at this temperature the organ is well cooked [19]. In a Magic Bullet model food processor, the slices are powdered and filled into gelatin capsules of about 500 mg (encapsulation technique). The powder thus obtained will be used for the determination of the chemical elements by ICP-MS. It can also help in this capsule form to be administered to each candidate placenta donor at the rate of 3000 mg per day (i.e. 1000 mg three times a day at a rate of 500 mg x 2 in the morning, at noon and in the evening) for the first 14 days postpartum. In the case of this study, the delivery did not take place at the donors' homes but within the CHU.

In this case the protocol requires freezing the placenta before treatment. With this encapsulation technique, trace mineral elements are concentrated in the powder for subsequent examination by physicochemical methods. The encapsulated powder will be ingested by the study candidate [20]. All 20 placentas were treated exclusively by the encapsulation technique. This technique, which basically consists of steaming the placenta, dehydrating it and making it into powder (crushing) to put this powder in pills or capsules ready to be consumed. It is taken by a mother after childbirth and will be beneficial for health. The technique that will not be used in this study is placental isotherapy, which involves mixing a sample of the placenta with the drops of cord blood. It consists in making a homeopathic treatment with a sample of the placenta by giving the child its own placenta to stimulate its immune response [21].

2.3 Preparation Of Samples For Icp-Ms Analysis

2.3.1 Principles And Development Of The Icp-Ms Analysis Method

The principle adopted for this method is based on two situations, the first, the sample or the solution is introduced by a peristatic pump into the ICP-MS. It is nebulized there in a spray chamber [21]. The argon which has a temperature between

6000-8000K is injected into the aerosol. The second, the solution is withdrawn from the sample inside the plasma torch. The reaction produced at this level is that of ionization and atomization. We then move on to the mass spectrometer part where only part of the ions produced in the plasma enter it. The small amount of free ions generated by the plasma is passed through the sample and skimmer cone. Ions migrate from an environment with too high temperature and atmospheric pressure to a compartment at room temperature and high vacuum (<0.001Pa). Positive ions focus on electrostatic lenses. The signal is thus read for analysis of study data [21].

2.3.2 Preparation Of The Study Samples For The Application Of The Icp-Ms Method

500.6 mg of treated tissue was collected from each encapsulated placenta for an average of 490.4 ± 0.6 mg in the range of 467.5 - 512.7 mg. Samples were digested following the microwave digestion procedure according to 3052 [25**a**] standards.

Each sample was placed in the microwave followed by the addition of 10 mL of 5% nitric acid (HNO_3), 15 mL of 75% hydrogen peroxide and 12 mL of hydrofluoric acid (HF50%). The purpose of this mixture is to allow digestion of samples [26**].**

To start the measurements, the sample is taken from two 12 to 15 mL tubes and the salt content of the samples should be kept below 0.2%. Before processing, the samples were allowed to cool for 4 hours. The sample volume is reduced with water to 50 mL.

Element analysis was performed on an Agilent 7700X ICP-MS model for the search for useful micronutrients such as copper (Cu), iron (Fe), zinc (Zn) and other supposedly toxic elements cadmium (Cd), lead (Pb), arsenic (As).

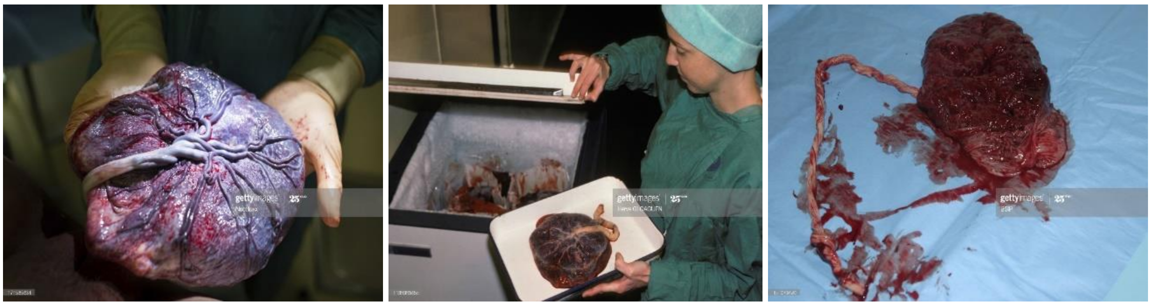
For treated placenta samples (n = 20), the study determined the content of the following 7 elements As, Cd, Cu, Fe, Zn, Pb, Se.

3 Results

3.1 Encapsulation Technique

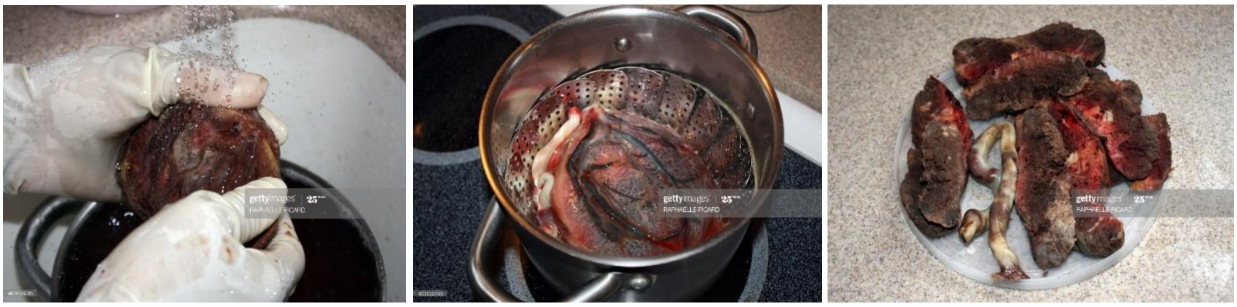
The following figures show that the production of placenta capsules as soon as the sample is taken after childbirth goes through the following stages successively:

- To clean with cold water
- Cut into slices 0.5 cm thick by removing the umbilical cord
- Dry the slices in a dehydrator at 54 ° C for eight hours
- To mix the slices in a cooking robot to produce a powder
- To put powder in gelatin capsules
- Obtain a capsule of volume filled with 500 mg of powder to use



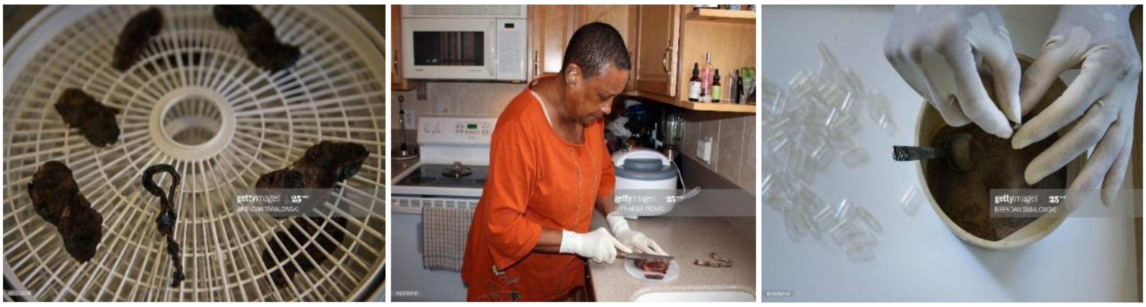
(1) (2) (3)

Fig. 1. Collecting the placenta (1) as anatomical waste intended for incineration or burial (2) and (3) recovering the placenta for encapsulation



(4) (5) (6)

Fig. 2. ***Cleaning of the placenta with cold water (4), removal of amniotic fluid (5), recovery by isolating the umbilical cord (6)***



(7) (8) (9)

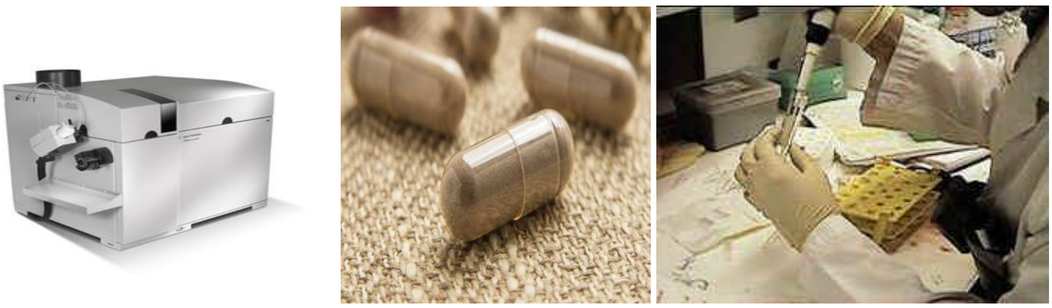
Fig. 3. ***Dried or dehydrated placenta (7), cut into slices, put in the microwave and in a food processor (8) and reduced to powder to be treated with ICP-MS and put into a 500 mg gelatin capsule (9)***

3.2 Application Of The Icp-Ms Technique

The powder obtained and encapsulated was used for the determination of the content of nutrients or of the chemical elements mentioned above.

The apparatus used is the Agilent Series 7700 ICP-MS supplied by the ULB Analytical and Inorganic Chemistry Laboratory, along with the test tubes and sample gun. This method consists, in fact, of creating a magnetic field at very high intensity by radiofrequencies around the torch then sending the gas (Argon) which will then be ionized by the creation of an electric arc with a Tesla coil and will form plasma. The device is accompanied by MassHunter software which assists in data analysis.

It was chosen for its sensitivity to the detection of microparticles. Figure 4 shows the Agilent 7700X Series ICP-MS, capsules, and sample collection.



(10) (11) (12)

Fig. 4. ***The Agilent 7700 ICP-MS device used (10), the placenta capsules (11) and sample (12)***

Storage of placenta capsules was performed, and the sampling is in Fig. 5.

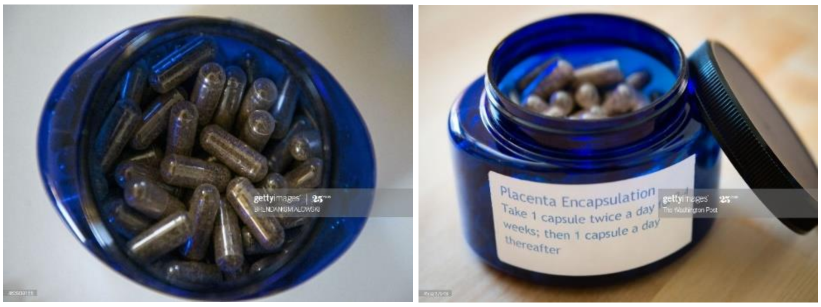


Fig. 5. Storage of placenta capsules for a donor

Table 4 shows the concentration of nutrients or chemicals measured in the placenta.

Table 4. Content of chemical elements in treated placenta samples in ppm (n = 20 and iteration = 7)

Placenta	As	Cd	Cu	Pb	Fe	Se	Zn
P1	0,02±0.01	0,03±0.01	6,31±3.01	0,05±0.02	600,28±110.61	1,17±0.21	41,65±5.39
P2	0,03±0.02	0,02±0.01	4,21±1.15	0,02±0.01	470,62±80.38	1,19±0.25	49,51±8.61
P3	0,04±0.02	0,02±0.01	5,11±2.39	0,04±0.02	480,12±71.22	1,51±0.29	54,21±7.44
P4	0,06±0.03	0,03±0.01	4,12±1.11	0,03±0.01	558,25±84.64	1,28±0.22	58,15±9.67
P5	0,04±0.02	0,04±0.02	3,24±1.12	0,02±0.01	480,23±79.42	1,25±0.25	50,29±8.72
P6	0,05±0.02	0,02±0.01	7,01±3.09	0,05±0.02	810,14±115.72	1,32±0.28	45,79±6.20
P7	0,06±0.03	0,03±0.01	6,12±2.79	0,04±0.02	890,25±120.79	2,04±0.35	49,86±6.21
P8	0,07±0.03	0,02±0.01	6,51±3.09	0,04±0.02	914,24±146.88	2,11±0.39	54,25±7.41
P9	0,05±0.02	0,02±0.01	3,42±1.13	0,04±0.02	705,48±112.56	2,07±0.36	61,87±8.39
P10	0,02±0.01	0,04±0.02	3,56±1.14	0,03±0.01	765±104.64	1,18±0.28	54,63±7.42
P11	0,04±0.01	0,03±0.01	4,12±1.11	0,02±0.01	1000,78±184.99	1,92±0.21	50,27±8.72
P12	0,05±0.02	0,02±0.01	4,52±1.14	0,04±0.02	900,34±123.84	2,01±0.31	49,87±8.69
P13	0,06±0.02	0,03±0.01	6,21±2.81	0,03±0.01	678,15±100.61	2,12±0.39	61,23±8.39
P14	0,07±0.02	0,03±0.01	5,55±2.41	0,04±0.02	580,46±86.62	1,68±0.29	60,45±8.27
P15	0,03±0.01	0,04±0.02	5,81±2.55	0,02±0.01	669,27±115.61	1,52±0.29	55,12±5.21
P16	0,04±0.02	0,02±0.01	4,62±1.15	0,02±0.01	800,65±116.71	1,67±0.31	47,64±6.25
P17	0,05±0.02	0,02±0.01	5,02±2.01	0,03±0.01	701,29±160.57	2,14±0.42	49,56±8.70
P18	0,06±0.02	0,03±0.01	5,06±2.02	0,02±0.01	664,38±182.58	1,51±0.29	51,57±6.19
P19	0,04±0.01	0,03±0.01	4,55±1.13	0,02±0.01	690,84±109.61	2,32±0.35	54,23±6.91
P20	0,05±0.02	0,02±0.01	5,06±2.02	0,04±0.02	712,24±168.65	1,51±0.29	41,65±5.12
mean	0,05±0.01	0,03±0.01	5,01±1.12	0,03±0.02	703,66±174.41	1,68±0.32	52,09±6.14
Total	0,93	0,54	100,13	0,64	14073,22	33,52	1041,8
SD	0,01	0,01	1,08	0,01	151,39	0,38	5,72
MSD	0,002	0,001	0,15	0,002	21,628	0,055	0,818
CV%	4%	4%	3%	5%	3%	3%	2%
Interval	0.02-0.07	0.02-0.04	3.30-7.81	0.02-0.05	440.86-1185.18	1.16-2.48	40.65-63.59

Legend: P = placenta, n = number of placenta donors, CV = coefficient of variation. SD= standard deviation. MSD= mean standard deviation

DISCUSSION: The results in Table 4 reflect the data produced by ICP-MS.

The concentrations obtained are within the ranges provided by the literature [25b]. The highest nutrient value is attributed to Iron (703.66 ppm) which has the high concentration in this sample, followed by Zinc (52.09 ppm) and Copper (5.01ppm). The value of the iron concentration shows that the dehydrated placental tissue provides a beneficial source of nutrient to the mother who swallows or ingests the placenta capsules during the postpartum period.

Toxic elements at low concentrations in the placental sample amount to As (0.05ppm), Cd (0.03ppm) and Pb (0.03ppm), respectively, can be considered as biomarkers of toxic exposure [27].

Interpretation of the coefficient of variation (CV) of Table 4.

The statistical analysis indicates through the dispersion obtained by the variance and the mean of the standard deviations and the percentage of the coefficient of variance, the heterogeneity of the sample. It is therefore to verify the representativeness of the data.

The number corresponding to seven iterations (which are variable) is less than 10 (that is to say that only 7 chemical elements are sought), from the point of view of the whole sample (n = 20), the CV is less than 15%, the sample is representative. Above 20%, the data are outliers, which suggests that the variation is large [28].

In this study, we carried out on 20 placentas the search for 7 chemical elements (or 7 iterations, As, Cd, Cu, Pb, Fe, Se and Zn), all the coefficients of variation have percentages ranging from 2 to 5%. Values are less than 15%, implying that the data is representative of the sample.

The study also evaluated the virtues or benefits of taking the placenta capsules after a few days of childbirth. It was difficult for all mothers to come to terms with being placentophagous. But taken by chance in the group of 20 donors (the advantage of the action research technique), 5 donors including 4 donors of Asian origin and one donor of DR Congo origin agreed to consume the capsules of their placenta. The choice of four donors of Asian origin is justified by the fact that in the traditional medicine of their continent (for example in China), the placenta, due to the virtues it offers, is used by some women raw with some herbs after childbirth [29]. And the donor from DR Congo voluntarily chose herself in order to make her personal experience as to seeing (according to her) and out of curiosity, the effects of placentophagy on lactation (indicates that this one has small udders and c is her first child).

And the donor from DR Congo has voluntarily chosen in order to make her personal experience of seeing (according to her) and out of curiosity, the effects of placentophagy on lactation (indicates that this one has small udders and c is her first child). During the study, the donors are followed by a midwife and agree not to add anything to their diet as food supplements. Only one parameter was followed. This is the lactation function [30]. It is a function that finds its fulfillment in the months following childbirth. The abundance of milk allows some women to feed their children only with breast milk without food supplements [25].

Table 5 was used to monitor the intake of placenta capsules by their donors and the effect on lactation and growth of babies (in terms of weight). It should be noted that all children, a few days, or a month after birth, decrease their weight. For girls for example, they take 190 grams per week which is different from boys who take 230 grams on average per week. However, in the two months following birth, girls have an average weight gain of 140g per week [30]. However, babies can have varying weight gain either lower or higher weight.

So, weight gain should be based on the baby's age. It will then be necessary to check the progress of the mother's breastfeeding. Taking the placenta capsule is considered a food supplement for the mother. The child's weight changed as shown in the results in Table 5.

Table 5. Monitoring of placenta capsule intake (n = 5)

D	1	2	3	4	5	6	7
D_1	3200	3305	6700	112	280	3	7
A_1	2700	2850	6200	84	224	2	6
A_2	2900	3050	7100	84	252	3	5
A_3	2800	2940	6500	112	192	3	5
A_4	3100	3240	6250	84	224	3	7

Legend: D = placenta donors, D_1 = Congolese donor, A_1, A_2, A_3, A_4: Asian donors. 1 = weight expressed in grams of baby at birth (no premature birth because the pregnancies have come to term). 2 = weight expressed in grams of baby after one month (4 weeks) of birth (after childbirth) which according to the theory increases in the standards. 3 = weight in grams of baby after taking the placenta capsule by the mother (two months later). 4 = average number of feeds per month (4 weeks from delivery). 5 = mean number of breastfeeds after taking a placenta capsule after two months of childbirth. 6 = average number of baby's stools per day after childbirth. 7 = average number of baby's stools two months after childbirth following the taking of the placenta by the mother.

Ascertainment

All target donors have given birth to girls. For three to four days, the girls increase weight not significantly. The average figures are shown in Table 5 and show:

- That the baby for the weights indicated, have the frequency of stools at least 2-3 stools per 24 h almost not abundant either liquid or moles depending on the quality of breast milk. Wet diapers also follow the same proportion.
- After the mother consumes the placenta capsule, the baby's weight increases as well as the number of breastfeeds. The Asian girl's weight increased significantly from her initial net weight, dropping from 2.9kg to 7.1kg after two months. The girl gained about 5 kg in 4 weeks. Even though there is no theory to back it up, this study does seem to claim that placenta capsules can be taken as a dietary supplement in the mother (breasts sink more, suddenly and become more flexible).
- For all donors, the table shows that the number of times babies have a bowel movement increased from an average of two stools in 24 hours to seven stools in 24 hours.
- It is therefore obvious not to consider the placenta as anatomical or biomedical waste intended for incineration or burial. But it can be recovered or recycled as part of the sustainable development strategy. The correct technique proposed would be encapsulation and, on the contrary, placental isotherapy.

4 DISCUSSION

The content of various nutrients or chemical compounds in the placenta capsule was demonstrated after the powder was produced following the procedure given in this study. The concentrations measured in 20 placentas vary considerably. Thus, the individual concentrations vary respectively: As = 0.05 ± 0.01 ppm, Cd = 0.03 ± 0.01 ppm, Cu = 5.01 ± 1.12 ppm, Pb = 0.03 ± 0.02 ppm, Fe = 703.66 ± 174.41 ppm, Se = 1.68 ± 0.32 ppm and Zn = 52.09 ± 6.14 ppm.

The results of the study suggest that the dehydrated and encapsulated placenta provides an important source of nutrients such as Fe in high concentration followed by Zn and Copper. Other detected chemicals such as Arsenic, Cadmium, Lead and Selenium appear to have no beneficial effects.

For the 7 elements of the study, the material intake for the recommended daily dose of encapsulated placenta shows that the limit levels are within the minimum risk range allowed from the point of view of the toxicity profile. Thus for the daily intake of placenta capsules in mg (n = 20), we have:

- As <0.001 (mg) ^{2} for an exposure limit of 0.005 mg / kg / day
- Cd <0.001 (mg) ^{2} for an exposure limit of 0.0005 mg / kg / day
- Cu = 0.014 ± 0.002 (mg) ^{2} for an exposure limit of 10 mg / day [31]
- Fe = 4.26 ± 0.621 (mg) ^{2} for an exposure limit of 45 mg / day [31]
- Pb <0.001 (mg) ^{2} not established in the standards
- Se = 0.013 ± 0.001 (mg) ^{2} for an exposure limit of 0.4 mg / day [31]
- Zn = 1.80 ± 0.015 (mg) ^{2} for an exposure limit of 40 mg / day [31]

The very low contents of the so-called toxic elements are below the toxicity threshold. The results are in harmony with those of Iyengar and Rapp [26]. The consistency of the results of this study places the placental tissue as a biomarker for toxicity studies.

This study includes only the elements selected as above. Suspected toxic substances and persistent organic pollutants such as polychlorinated biphenyls which accumulate in the placental tissues of placentophagous donors have not been studied. This is also the case for all environmental contaminants in the placental tissue.

Likewise, the presence of hormones (prolactin, oxytocin, etc.) and microorganisms in placental tissue is not the subject of this study. The upcoming study should focus on the potential risks of placentophagy to ensure that the practice is not safe for the donor and her newborn. This is a first study because placenta donors do not constitute a representative sample. She started the debate on recycling placentas as a dietary supplement or postpartum supplement for mothers using the encapsulation technique.

Using the placenta capsules as a dietary supplement for mothers has an advantage in lactation. The capsule consumed helps the mother to recover iron levels to prevent iron anemia. According to many donors, consuming the placenta would help breastfeeding. The donor body normally produces the volume of milk that meets the newborn baby's needs.

The fact is that newborn weight loss does not exceed 7% of its birth weight as breastfeeding is done well. In the first month, ie 4 weeks, the average weight gain of the lines varies around 140 grams.

The other finding of the study is that within two months (8 weeks) and after taking a placenta capsule, the newborns gained weight considerably and the breasts increased as well. So:

- For donor D_1, the baby sucks 4 times / day x 7 days x 4 weeks = 112 feeds in a month and after taking the placenta capsules, the baby sucks 10 times / day x 7 days x 4 weeks = 280 times and so her initial weight increased from 3.2kg to 6.7 kg.
- For donor A_1, the baby sucks 3 times / day x 7 days x 4 weeks = 84 feeds in a month and after taking the placenta capsules, the baby sucks 8 times / day x 7 days x 4 weeks = 224 times and thus her weight initial went from 2.7 kg to 6.2 kg.
- For donor A_2, the baby sucks 3 times / day x 7 days x 4 weeks = 84 feeds in a month and after taking the placenta capsules, the baby sucks 9 times / days x 7 days x 4 weeks = 252 times and thus her weight initial went from 2.9kg to 7.1 kg.
- For donor A_3, the baby sucks 4 times / day x 7 days x 4 weeks = 112 feeds in a month and after taking the placenta capsules, the baby sucks 7 times / day x 7 days x 4 weeks = 192 times and so its initial weight fell from 2.8kg to 6.5kg.
- For donor A_4, the baby sucks 3 times / day x 7 days x 4 weeks = 84 feeds in a month and after taking the placenta capsules, the baby feeds 8 times / day x 7 days x 4 weeks = 224 times and so her initial weight increased from 2.8kg to 6.5 kg.

Newborn weights increased in proportion to the intake of breast milk (suckling) as did the increase in the number of times the newborn had a bowel movement. In fact, it is also important to point out that for D_1 and A_4 donors the number of times the babies have bowel movements is the same, ie 7 times a day. Likewise, for donors A_2 and A_3, 5 times a day except for donor A_1 who has a baby who has a bowel movement 6 times a day after taking a placenta capsule.

Numerous breastfeeds assure the donor that the newborn is getting enough that permanent contact with the mother stimulates lactation and therefore often sucks [31].

In this study, the baby often sucks after being fed, and the fact that he has several bowel movements per day, shows that breast milk is digested more quickly and the baby exerts less strain on his immature digestive system.

This work shows that the breastfed baby has a more frequent demand, so the infant is not recommended to use formula for its good growth [30]

Finally, it is not advisable to compare the weight gain of a baby to other babies because there are several factors that cause the weight to be disturbed or not evolving as it should, for example the rhythm factor of sleep, the social level of parents... milk therefore covers the needs of the child.

5 CONCLUSION

Placental tissue powder is a source of trace chemicals (and even a source of hormones, essential amino acids, bacteria, microorganisms, etc.). With the ICP-MS method, the study shows that the following micro-nutrients are in the studied placentas. These are high in iron (Fe), zinc (Zn) and copper (Cu). The other trace elements are, arsenic (As), cadmium (Cd), lead (Pb), selenium (Se).

Ingestion of dehydrated placenta in capsule form influences lactation and recovery after childbirth. The described effect of ingestion of the placenta is beneficial to the donor mother and provides well-being and better health to the mother and the newborn. This increases the weight because the mother adds the capsules of her placenta to her diet. The risks of poisoning and the transmission of infections are not excluded and may be possible. However, the donor mother must be made aware that the treatment and use of her placenta is her responsibility [32]

Additional studies on placentophagous patients must take into account all physicochemical risks (by studying any trace chemical elements) and inform patients of the side effects of the bioavailability of hormones and their potential physiological effects.

Since the placenta is biomedical or anatomical waste, it is not only intended for incineration or burial but also it can be recycled in the form of a capsule by the encapsulation technique or the placental isotherapy technique. The reason is that it contains trace elements necessary for the mother and the newborn.

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CONFLICT OF INTEREST

This study is made possible by the protocol from Las Vegas to the University of Nevada for encapsulation. There was no fee for the service rendered. The protocol was received free of charge. No outside personnel were involved in the study design, data collection, data analysis or manuscript preparation. The results of this study should be considered preliminary and questionable.

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