Maternal Placenta Consumption in Mammals

Subjects: Zoology | Others

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Placentophagia is a common mammalian behavior, and the first scientific study of the potential effects of human maternal placentophagia on lactation was in 1917. More recently, in the 1970s, human placentophagia was reported in North America with a trend toward increased consumption. There are different hypotheses about the women and nonhuman mammals' motivation towards placentophagia, but few have been subject to hypotheses testing. In women, the controversy continues; on the one hand, researchers attribute benefits like increased breast milk, weight gain in newborns, decreased postpartum depression and fatigue, and improved mothers' mood. In contrast, bacterial or viral infections, hormonal, or trace elements that could become toxic for both the mother and baby are reported as possible health risks. Other reports argue a lack of scientific rigor to support the self-reported benefits of placentophagia. Also, the way the placenta is prepared (raw, cooked, dehydrated, processed, or encapsulated) alters its components, and thus the desired effects.

Keywords: placenta ; amniotic fluid ; placentophagia ; POEF ; mammals ; parturition

1. Introduction

The placenta is a complex, temporal, and dynamic organ that performs various synthetic, secretory, filtering, analytical, and transport functions[1]. Placental tissue derives from trophoblasts, which develop from the same blastocyst as the embryo[2]. In mammals, it is the organ through which gases, nutrients, and respiratory wastes are exchanged between mother and fetus[3]. It has immunological importance facilitating embryonic and fetal development, as well as embryo survival. Furthermore, it contains stem cells that can be used for medical purposes, such as allografts[2][4].

A few seconds or hours after parturition, the placenta, amniotic fluid, and associated membranes are expelled. Placentophagia is a behavior present in almost all female *terrestrial eutherian* mammals (more than 4000 species), consisting of the ingestion of some or all of the placental components released during parturition[1][5][6]. However, this behavior does not occur in large aquatic (cetacean) or semi-aquatic (pinniped) mammals[7][8] and has not been documented in camelids[1].

Placentophagia has been thoroughly studied, primarily in mice (*Peromyscus californicus*)[9], hamsters (*Phodopus campbelli*)[10], rats (*Mus musculus*)[11], rabbits (*Oryctolagus cuniculus*)[12][13], ungulates[14][15], and carnivores[16], and regularly occurs in all nonhuman primate species[17][18][19]. In contrast, it is assumed that traditionally, women did not carry out this practice for socio-cultural reasons. Nevertheless, there is evidence that dried human placenta is a centuries-old Traditional Chinese Medicine remedy consumed by postpartum mothers[19]. However, dried human placenta is a remedy prescribed for various conditions, for both men and women, including chronic cough and male sexual dysfunction.

The first scientific study of human maternal placentophagia was conducted in 1917, in which the increase in protein and lactose in the milk of lactating women who consumed their dry placenta stood out[20]. More recently, the first consistent reports of human placentophagia originated from North America in the 1970s and spread out among women living in industrialized cities[21], leading to a trend for an increase in consumption of the placenta, whether raw, steeped in liquid, steamed, cooked, dehydrated, processed and encapsulated, or as a tea[22].

On the other hand, in some animals, the appetite for placental materials depends on the female's reproductive stage, increasing during the peripartum period[12]. However, placentophagia is not exclusive to females, as some bi-parental and monogamous male rodents (mice, rats, and hamsters) also practice it[9][10][11][23]. Placentophagia is considered to have advantages not only for females but also for their offspring, such as increased mother–offspring interaction, potentiation of the action of brain opioids that promote caring behavior towards the young, aiding neonatal respiration by removing membranes from the nostrils, and providing analgesia enhancement in the parturient female[5]. In addition, it reduces the

incidence of postpartum pseudopregnancy[5], prevents postpartum hemorrhages, decreases postpartum depression [24], promotes lactogenesis, and provides nutritional benefits[25]. In humans, placentophagia has been considered a puerperal remedy[22]; however, some studies indicate that human placenta does not provide all its benefits[26].

2. Factors that Explain the Phenomenon

There are different hypotheses about the motivation towards placentophagia, but not all have been proven. Kristal et al. [27] suggest that the causes that motivate placentophagia in animals depend on the taxonomic group to which they belong. This behavior would be part of the repertoire of innate behaviors that animals exhibit in the peripartum, such as nest construction or site displacement.

Other studies propose that the placental intake is due to the feeling of hunger after fasting during the peripartum. However, there is evidence that not all females stop eating before giving birth; for example, rats and giraffes continue to ingest food 24 h before delivery [1].

On the other hand, a temporary change in feeding preference during parturition may be why herbivorous animals practice this behavior. In this same sense, Kristal[1] mentions that some females (rats and monkeys) reject any meat after giving birth. Similar findings were found by Melo and González-Mariscal[12]: they offered rabbits (*Oryctolagus cuniculus*) liver and placenta during parturition and observed that the behavior of ingesting placenta increased in this state up to practically a 100% frequency. In contrast, liver consumption was only 10%, compared to another physiological state[11].

It has also been mentioned that females perform placentophagia to avoid attracting predators' attention due to the volatile substances released by the placenta. Also, some great ape mothers have been observed climbing down from the tree's safety canopy to the forest floor to retrieve placentas that fall from the nest after birth. In addition, many primate species are mobile immediately following parturition—both examples counter 'predator avoidance' placentophagia hypotheses. However, Menges[28] suggests that this may not be entirely true since it is observed that some animals, such as the tree squirrel, prefer to remove the placenta from the nest and throw it towards the ground instead of consuming it.

Other hypotheses attempting to explain placentophagia are related to the need to counteract nutritional losses due to pregnancy and delivery or to maintain the nest's sanitary status[1][5].

3. Endocrine Effects

One of the causes of placentophagia may be related to the ingestion of hormones by females since the placenta contains hormones such as oxytocin, estrogens, progesterone, adrenocorticotropic hormone (ACTH), Releasing Factor Corticotropin[29], chorionic gonadotropin, hypothalamic releasing hormones (GnRH), placental lactogen, placental opioid enhancing factor (POEF), relaxin, and inhibin[30][31]. In females, the estrogens or similar sex hormones play a significant role in implanting the embryo and the development of the mammary gland. For its part, the amniotic fluid, contains hormones such as oxytocin, prostaglandins, androgens, renin, progesterone, corticosteroids, chorionic gonadotrophin, and placental lactogen[32]. It also has antibacterial activity and nutritional factors[32]. All these substances benefit the dam during the transition from pregnancy to the postpartum state and increase milk production.

Hammett and McNeile[20] were the first to publish that in humans, after postpartum ingestion of a dehydrated product derived from the placenta, an increase in protein and lactose was observed in breast milk. A subsequent study observed an increased growth rate in those children from mothers that ingested desiccated placenta capsules[33]. In the 1950s, Soyková-Pachnerová[34] confirmed the placenta's capacity as a stimulator of lactation due to the hormone placental lactogen's presence, among other components. Similarly, when cows can ingest the placenta and amniotic fluid, there is a marked increase in milk production[15].

The oxytocin present in the amniotic fluid and the placenta suggests that its ingestion may facilitate uterine contractility. Together with prostaglandins, it favors the cervix's opening during the dilation process[32], allowing labor, delivery of the placenta, the cleaning of the uterus, and faster uterine involution. All this is assuming its absorption through the digestive tract and its action on maternal biology.

The role played during pregnancy by the different hypothalamic, pituitary, and gonadal hormones that the placenta contains has been extensively studied in both the mother and the fetus. However, in placentophagia, the effects that most hormones have on the mother are still under study since it has been found that the effect of hormones can exert different responses, depending on the animal species in which they are analyzed, as is the case of placental progesterone[35]. In this sense, Chabbert-Buffet et al.[35] found, by using sheep as a model, that altering progesterone levels causes dramatic

changes in the GnRH pulse rate. Additionally, in the final stage of the follicular phase, progesterone plays a role in activating the Luteinizing Hormone (LH) surge in rodents, nonhuman primates, and women, but no such change is observed in sheep.

Most of the authors consider that in different animal species, the ingestion of hormones by placentophagia increases the mother and her offspring's recognition and contact. This contact accelerates the emergence of maternal behavior. In contrast, in rats (*Rattus norvegicus*), Moltz et al.[36] observed that in females who underwent cesarean section and were later reintroduced to their clean pups, the bond between mother and pup developed normally.

A factor that has not been entirely studied is the level of digestive absorption of the different hormones present in the placenta. Therefore, there is no information on the endocrine effects that hormonal components may have on humans and nonhuman mammal species performing natural placentophagia. In this sense, the placenta's preparation can modify the hormonal effect of placentophagia (fresh, raw, encapsulated, and processed). Therefore, minimal hormone levels have been found in processed human placenta capsules, which could hardly have endocrine effects in the body. However, some commercial placental preparations contain higher estradiol and progesterone concentrations, which could achieve high endocrine effects if the processed placenta's consumption is high and due to the maximum concentration they contain. However, this requires further investigation and will depend on the recommendations of these product providers[29].

4. Analgesic Effects

The amniotic fluid and the placenta may act as morphinic inducers, facilitating analgesia and activating the release of endorphins[37][38] because the placental villi synthesize opioid peptides such as β-endorphin, metencephalin, and dynorphins. Ahmed et al.[39] found that dynorphin 1–8 is the main opioid peptide in placental extracts, associated with a substance also found in the placenta, called the placental opioid enhancing factor (POEF). POEF exerts an important influence in suppressing pain during parturition and triggering maternal behavior, producing changes in the central nervous system's endogenous opioid activity[32]. This influence is due to increased delta and kappa receptors' activity and mediators and a decrease in the mu receptors[40][41][42][43](Table 1). It is essential to clarify that POEF is not an analgesic by itself[27]and does not potentiate analgesics such as aspirin[40]or nicotine. It is worth mentioning that the benefit to pregnant female mammals by ingesting amniotic fluid and placenta is that it improves opioid-mediated antinociception in the peripartum[44].

Abbott et al.[45] found that the POEF effect is generalizable to other species since it was observed in rats (*Rattus norvegicus*) that consume placental material from humans, dolphins, and cattle. It is also suggested that POEF is a product of the gastrointestinal system's enzymatic or hydrochloric acid action. The rats injected with amniotic fluid subcutaneously and intraperitoneally did not show changes in morphine-mediated analgesia level compared to the rats administered orogastrically. Findings strongly suggest that POEF is a common mammalian substance, which suggests the possibility that all mammalian species, including humans, possess the capacity to respond to POEF. Currently, there are no controlled studies of the effects of POEF through placental consumption in humans[22][26][32].

The time to produce analgesia after ingesting placental material varies within species. In Holstein cows (*Bos taurus*) [41] and male rats (*Rattus norvegicus*)[45], analgesia occurs immediately and lasts up to 60 min; while in female rats (*Rattus norvegicus*), only a 30 min duration of the analgesic effect was registered[46]. Likewise, the dosage in the ingestion of placental material with an analgesic effect differs among mammal species. Kristal et al.[47] suggested that, in rats (*Rattus norvegicus*), the ideal amount of placental material to ingest was 0.25 mL of amniotic fluid and one placenta (500 mg), which are released at the birth of each pup. In contrast, Corpening[38] found that the effective dose of bovine amniotic fluid in rats (*Rattus norvegicus*) was 0.5 mL.

Table 1. Potential advantages of placentophagia in women and nonhuman mammals.

Species	Condition	References
Women and nonhuman mammals		

Analgesia (Placental Opioid Enhancing Factor, POEF).	Amniotic fluid and placenta act as morphinic inducers, facilitating analgesia, and activating the release of endorphins	[37][38][39][40][41][42][43][45]
Women		
Postpartum benefits	Additional protein supplement in regions of extreme poverty.	[48]
	Source of trace elements and essential and non-essential amino acids and B vitamins	[22]
Benefits for the newborn	Increases the concentration of lactose and protein in breast milk	[20]
	Increases the weight gain of the newborn	[33]
Benefits for the mother	Improve mood after childbirth, convalescence is faster, and increases the amount of energy	[2][22][26][49][50][51]
	Relief of symptoms of depression and increase milk production	
Nonhuman mammals		
Increase in milk production	Prolactin level increases, progesterone level decreases, and a possible increase in milk production	[52]
Protect from attack by predators	As there are no attractive chemicals, reduce nest contamination	[53]
Maternal behavior	It could accelerate the mother–calf bond in some species due to the oxytocin in the amniotic fluid or the placenta (sheep, primates, dog, rabbits, and river buffalo)	[16][54][55][56][57][58][59][60]

5. Nutritional Factors

Women may consume the placenta as an additional protein contribution in poor regions[48]since a single placenta weighing 450 g contains an average of 234 calories, 4 g fat, 899 mg cholesterol, 48 g protein, 513 g of sodium, plus significant amounts of trace elements such as iron, selenium, calcium, copper, magnesium, phosphorous, potassium, and zinc[22]. Placenta also contains essential and non-essential amino acids, such as alanine, aspartic acid, arginine, histidine, leucine, lysine, phenylalanine, proline, tyrosine, tryptophan, and valine, in addition to vitamins B1, B2, B5, B6, B7, B9, and B12[22] (Table 1). Regarding Vitamin A and retinoids, the placental retinyl stores could be considered a local reserve for placental use. Transformation of retinyl esters into active retinol derivatives (RAs) could be a simple way to regulate in situ cellular proliferation and differentiation. This retinoid metabolism has been described in mouse and porcine placenta. Studies suggest that villous mesenchymal fibroblasts are primary sites of retinol esterification and storage in the placenta[61].

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