The Type of Feeding of Domestic Cats by Humans Causes the Brain Development of these Animals

Mohammad Saleh Ranaiy* and Asaad Ranaei

Department of Biology, Faculty of Sciences, Urmia University, Urmia, Iran

Corresponding Author*

Mohammad Saleh Ranaiy
Department of Biology, Faculty of Sciences, Urmia University, Urmia, Iran
E-mail: ms.ranaiy@gmail.com
Tel: +989107421580

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Abstract

Today's human is the result of millions of years of evolution. Human evolution has been the result of various factors. Humans are not the only mammals affected by the evolutionary force, but the evolutionary force has also affected other mammals, including cats. One of the factors that played a significant role in the evolution of humans was the type of nutrition, which also affected other mammals. Domestic cats are among the favorite pets of many people around the world. These cats have been living close to humans for thousands of years, and even today, they are considered part of many people's families. Today, domestic cats are fed processed foods that their owners have forbidden. The use of fire and the expansion of the use of cooked foods have played an influential role in the evolution of the brain of today's humans. Feeding domestic cats industrial and processed foods has also caused effects on the brain and cognition of domestic cats. As a result, the type of feeding of domestic cats can affect the brain development of these animals.

Keywords: Brain development, Humans, Neurology, Cats

Introduction

The theory of evolution has been widely used in the scientific community since Charles Darwin published Natural Selection [1]. Since then, many studies have been done on the evolution of organisms. One of the reasons that play an influential role in the evolutionary process of organisms is the discussion of energy and nutrition [2, 3]. The control of fire and the exploitation of fossil fuels had made it possible for Homo sapiens to release, in a short time, vast amounts of energy that accumulated long before the species appeared. Indeed, the ability to use energy extra-somatically (outside the body) enables human beings to use far more energy than any other heterotroph that has ever evolved. By using extra somatic energy to modify more and more of its environment to suit human needs, the human population effectively expanded its resource base so that for long periods it has exceeded contemporary requirements [4]. The results of studies show the effect of nutrition on babies' brain development. Early postnatal growth and nutrient intake affect brain growth and maturation with subsequent effects on neurodevelopment that continue into childhood and adolescence [5]. Brain size increase relative to body size encephalization is intimately linked with human evolution [6]. Mammals have an adventurous evolutionary history [7]. Felines are also classified as mammals and they, like other mammals [3], have not been able to escape the force of evolution. In this study, the brain evolution of domestic cats is focused on the effect of nutrition in the circle of human living environment.

Hypothesis

Feeding domestic cats with foods introduced into their food system by humans affects the evolution of the brain of these animals.

Discussion

The domestic cat (Felis catus) is a popular domestic species that are kept by many people around the world [8]. Humans keep cats as companion animals, but cats live in self-sustaining feral populations in urban and non-urban areas [9]. Domestic cats are predators that humans have introduced globally and have been listed among the 100 worst non-native invasive species in the world [10]. Cats and other members of Carnivora last shared a common ancestor with humans 92 million years ago [11, 12]. The cat family Felidae includes 38 species widely distributed worldwide, inhabiting diverse ecological niches that have resulted in divergent morphological and behavioral adaptations [13]. Cats were domesticated approximately 9000 years-10,000 years ago in the Near East and are thought to originate from at least five distinctive subspecies of *F. silvestris* from across the Near East region, namely *F. silvestris, F. lybica, F. ornate, F. cafra and F. bieti* [14]. The earliest archaeological evidence for human coexistence with cats dates to 9.5 kya in Cyprus and 5 kya in central China [15, 16]. They live in many ecosystems including urban ecosystems [9,17]. Feral cats are opportunistic and generalist carnivores that use food resources in proportion to their availability [18]. Predators are opportunistic and kill billions of birds and mammals yearly [17]. They can exploit various food sources, including wild animals, waste food, large animal carcasses, and even plant matter [19]. A study showed that cats tend to kill fewer rodents in urban areas [20]. While in another study, there was not even any animal prey in the stomach of the studied cats [21]; these results show that cats do not want to hunt animals. The reason is the availability of food provided to cats by human society. The results of Alexandra et all study show that cats living near natural habitats have a greater diversity of prey species than cats living in more populated areas [22]. Unlike other domestic animals, cats are strict carnivores, which influences their nutritional requirements and food preferences. Cats have very high protein requirements, and their diet must contain some nutrients, such as arginine, taurine, niacin, vitamin A and arachidonic acid [23]. The results show that feral cats are obligatory carnivores, with their daily energy intake from crude protein being 52%, crude fat 46%, and N-free extract only 2% [24]. Domestic cats have a diet consisting of 52% protein, 36% fat, and 12% carbohydrates [24]. Cats are hypercarnivores. Cats have a higher protein requirement as a hypercarnivore than most other carnivores [25]. Cats cannot downregulate protein metabolism. If they do not get enough meat-based protein the only source of protein that provides them with all of the amino acids they need they rob their muscles for it [26].

It has been a very long time since humans have controlled and used fire [27]. The control of fire is undoubtedly an important event in the technological evolution of early humans [28].Some claims for regular fire use by early hominins in Africa at 1.6 million years ago [29-31]. The latter hypothesis suggests fire is an evolutionary force towards larger human brains [32-34]. Eating cooked foods made early hominin digestion easier, freeing up energy that was previously spent digesting food, allowing their brains to grow [28]. Evidence shows the effect of diet on brain function and structure [35]. Mechanisms contributing to energy from cooking include increased starch and protein digestibility, reduced digestive costs for cooked versus raw meat, and reduced energy costs of detoxification and defense against pathogens. Cooking has important effects not easily achieved by nonthermal processing, including relatively complete gelatinization of starch, effective denaturation of proteins, and killing of foodborne pathogens. Cooking leads to a significant increase in energy availability [36]. Cooking reduces food toxins and also increases its digestibility, thereby optimizing digestion and saving energy [3,37]. The energy savings that result from cooking food can increase energy that affects many aspects of evolutionary biology, including body mass, growth and reproductive rates, defense against parasites and pathogens, and investing in movement affects [36].

Cooking at a temperature above 80ºC coagulates the collagen of the connective tissue and hydrolyzes it into a soluble protein (gelatin). This allows the muscle fibers to be easily separated and gives them a short, brittle texture that allows for easy chewing [38]. Therefore, it is much easier to eat cooked meat than raw meat. Probably the first effect of cooked foods was the reduction in the size of the teeth and jaws that accompanied the evolution of Homo ergoster approximately 1.9 million years ago [39, 40]. Among the effects of cooking, it can affect the production of saliva and stomach fluids [41]. The use of fire and the development of cooked foods [27] has played an effective role in the evolution of the human brain and has been a key factor in human evolution [28]. According to this hypothesis, it

is very likely that the increasing use of cooked meats and industrially processed foods [42, 43] can affect the evolution of domestic cats. As stated, cooked foods have affected the teeth, digestive system [39, 40], and generally the energy level of the first humans [36], and it has facilitated the evolution process towards the current human. Domestic cats have lived in a typical environment with humans for thousands of years [15, 16]. Nowadays, domestic cats have entered the personal life of humans as much as possible and are in very close contact with their owners or the people around them [44]. Companion animals acquire lousy eating habits from their owners [45]. The type of lifestyle, the type of human food, and even the type of human food residues can cause various changes in the behavior [46, 47] and physiology of domestic cats [48-50].

Commercially prepared pet foods may contain a wide range of ingredients from many sources. These include meat, poultry, cereal, vegetable, fish products, by-products, and added nutrients. The pet food industry is dynamically changing as consumer demand for higher-quality products increases. The pet population is increasing daily and is increasingly fed with prepared pet food [42]. Pet owners provide a variety of good foods for the well-being of their animals. For example, inulin and oligofructose, two functional foods, can alter the intestinal microflora in dogs and cats [51]. Today, processed pet foods use a variety of grains [50], while a cat may never eat grains under normal conditions. Dietary fibers, commonly found in pet foods can improve digestion [52-54], absorption, and excretion processes in the digestive tract [55, 56]. On the other hand, having relatively large brains, cats require a lot of endogenous glucose, which must be supplied through gluconeogenesis in an overly carnivorous diet [57, 58]. As a result, manipulating the normal eating style of cats can cause changes in their brain function. The studies show increased BDNF levels in dogs fed with antioxidant-enriched and plant-based diets [59]. A five-year study showed that feeding older cats a diet containing antioxidants, essential fatty acids, and whole dried chicory root led to healthier and longer lifespans compared to cats without supplements [60]. The older human population has demonstrated a link between nutritional status, quality of life, and overall physical and cognitive health [61-64]. The relationship between nutrition and physiology has also been investigated in mammals. Environmental enrichment can lead to an increase in nerve growth factors, the growth and survival of nerves, and an increase in cognitive function [65, 66]. The results of one study showed improvement in one or more cognitive functions in 70% of cats receiving nutritional supplements [67]. As a result, this level of close contact can affect domestic cats' brain, physiology, and other behavioral aspects [68,69].

Conclusion

Almost all humans know that animals, including cats, are essentially raw-eating animals. The important point is that domestic cats nowadays eat all kinds of fast food, meat, and fried and cooked foods. As a result, this level of close human contact and nutritional manipulations in the diet of domestic cats can optimize the level of available energy and also affect the nervous system and its physiology and other cognitive aspects of domestic cat. The evolutionary course of their brain faces an artificial evolutionary challenge. Although there is very little research in this field, the evolution requires millions of years. Still, this close relationship of humans today with domestic animals such as cats will not be without influence. As a result, the evolution of the brain of domestic cats due to close contact with Humans is a predictable prospect.

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