Gamete cells are formed by

Multicellular organisms grow by increasing the number of cells they have. This is based on processes of cell division and differentiation. What is a gamete? A menta is the mature reproductive or sexual cell that contains a haploid number of chromosomes (i.e. 50% of the genetic material or just a set of dissimilar chromosomes) and is able to merge with another haploid reproductive cell to form a diploid zigote. The zygote consists of the fusion (or combination) of two almonds, that is, the male menta and the women's game. This union of minds resulting in a zigote is called fertilization. Gamete (definition of biology): a mature haploid reproductive cell produced by gametogenesis, and which merges with another of the opposite sex to fertilization resulting in the formation of a zigote that develops in a new individual. Etymology[1] Synonyms: sex cell; reproductive cell. Characteristically, one of the almonds is usually larger in size, not mobile. It is known as female mente or egg or egg cell. The other cell of menta is mobile and smaller in size. It is known as a male mente cell or sperm. In humans, each menta contains 23 chromosomes and their fusion results in the formation of a diploid zigote containing 46 chromosomes. In animals, these reproductive cells occur in the respective male and female gonads or reproductive organs. In plants that carry seeds, male minds are pollen, while female almonds are locked in the plant's eggs. However, in plants, the mentít may or may not always be a haploid cell. What are examples of almonds? What are the different types of bots? Gamees involved in fertilization may be similar (known as isogamy) or the two gamees may be different (known as anisogamy). Isogamy: gamedies with similar morphology, i.e. size and shape. This condition is also known as 'heterogamy'. These types of minds are not classified as male or female. These almonds are represented as + or -. Examples: single-celled algae gamete, Chlamydomonas reinhardtii and Carteria palmata. Anisogamy: gamedies with different morphology, i.e. size and shape. These types of minds are classified as feminine and masculine. The smaller-sized menta is known as male sperm or menta, while the larger-sized menta is known as ova or egg or female menta. In addition, these almonds can be mobile, as well as non-mobile. In the case of red algae, Polisifonia, both gamets are not mobile. The non-mobile sperm merges with the non-mobile egg to form a zigote. The non-mobile male menta or sperm is known as sperm. This is also seen in certain flowering plants in which the two almonds are not mobile and are present in the gametophyte. The male menta does not mobile in it is known as pollen. Oogamy: in humans and mammals, one of the gamemeters, male game animals or sperm, is mobile and the other female gamemete, egg or gamemete is not mobile. This condition is known oogamy, in which a large non-mobile egg is fertilized or fused with a small, mobile sperm to form the zigote. Figure 1: Isogamy, anisogamy and oogamy. Credit: M. Piepenbring - Source, CC BY-SA 3.0. Sexual reproduction with female and male gametes of different sizes is called anisogamy (or heterogamy). Isogamy, on the other hand, is a form of sexual reproduction in which both male and female gametes are the same size. Another form of classification of the armetes is based on their size. Depending on the size, the atems can be classified as: Microgametes: almonds that are smaller in size. These are mobile, usually produced in large quantities, and have no nutrient storage in them. Example: sperm cells. Macrogames: almonds larger or larger. These are non-mobile, produced in limited numbers, and have storage of a large number of nutrients in them. Example: egg or ova cells. Gametogenesis Both males and female minds are formed by a process known as gametogenesis in their respective reproductive organs. During the process of gametogenesis, a diploid cell (2nd) undergoes meiosis to produce four haploid cells (n). In general, the process of gametogenesis usually begins with gametogonia. Gametogonia is derived from primary germ cells (PGCs). These germ cells proliferate through the mitosis process. In the late embryonic stage, these cells are transferred to the gonadal crest where they are known as gametogonia. Once the gametogonia has developed, more gametogenesis will lead to the formation of egg or sperm, depending on the sex of the individual. The mentogenesis process is completely different in males and females. Gametogenesis resulting in the formation of sperm is known as sperm while the egg or egg formation process is known as oogenesis. A menta is a reproductive cell or sex cell containing the haploid set of chromosomes. It occurs through a germ cell that suffers from gametogenesis, a process that involves meiosis. The gametogenesis that leads to the production of the women's game is called oogenesis. The production process of male menta is called sperm. Figure 2: Structure of a sperm. Credit: Alberts et al., (2002). NIH Books The male reproductive cell or menta is known as a sperm cell. In animals, anisogamy is seen, in which the structure of the men's game is different from the women's game. In animals, including humans, sperm are small and mobile. The mobile organ of the sperm is known as flagellum. Sperm cells have a limited lifesa long and cannot be divided. Sperm in mammals have two different structures enclosed in a single membrane (Figure 2) None: it contains the haploid nucleus with tightly packed DNA. Apart from the highly genetic material a sperm cell also contains a thin, flattened structure in the form of a sack known as acrosome and a vacuol. Acrosome contains the enzyme needed to violate the ova or egg cell. The is released through the process of exocytosis. The head dimension is 5.1 μm by 3.1 μm. Tail: drives the sperm towards the egg and finally penetrates the egg and is located at the back end of the nucleus. This is also the longest part of the sperm cell. The tail length is 50 μm. The tail moves at a speed of 1-3 mm per minute. Connecting both parts, that is, the head and tail, is the neck, rich in mitochondria. Mitochondria are very essential for the sperm cell, as it provides all the energy for sperm movement. Mitochondria produces the ATP necessary for the movement of sperm. Apart from mitochondria, the neck also has centrioles. Sperm is a haploid gamete and in humans, it contains 23 chromosomes. Spermatogenesis In male humans, the sperm process occurs in tests and begins only at the onset of puberty. However, once it begins, sperm is a continuous process that occurs throughout life (unlike oogenesis). Sperm is produced in the tubular structure called seminiferous tuperes. Sperm, which are immature germ cells, are placed on the outer edge of the seminiferous tubula near basal lamina. These germ cells are continuously multiplied by the mitosis process. Some of these multiplying cells do not proliferate and become primary sperm. These primary sperm then move on to the first meiotic phase in which each mating eponymous chromosome contributes to cross-over and eventually undergo division I of meiosis resulting in the formation of two secondary sperm, containing 22 duplicate autosomal chromosomes (it may be a duplicate X or a duplicate Y chromosome). These secondary sperm then move on to phase II of meiosis resulting in the formation of haploid sperm, which further undergo differentiation to form sperm. Finally, these sperm then move in the lumen of the seminifer tucule. Subsequent sperm move in a rolled tube that oversizes the tests known as epidymis, where these sperm mature even more and are stored in a liquid known as semen. This whole process lasts about 70 days and can survive for almost 5 days in the female reproductive tract. However, outside the body, they cannot survive more than a few hours. Figure 3: The process of spermatogenesis.. Credit: Alberts et al., (2002). NIH Books Sperm can be stored for months or years in a frozen state and retain their ability to fertilize eggs when thawing. Sperm acquire energy for motility from fructose present in semen. Also, an interesting fact is that sperm cannot swim backwards. Plants such as ferns, cycads and ginkgo also have flagellated sperm. The sperm of the they are amoeboides. They exhibit crawling motion instead of swimming. Non-mobile sperm depend on environmental conditions for their dispersion and eventually reach the cells of eggs, for example, non-mobile polyphony sperm, which is a red seaweed, spread by water after its premiere. Flies, butterflies and insects act as a carrier of these non-mobile sperm. Sperm have acquired some important adaptations, which makes them efficient cells. Some of these adaptations are as follows: The simplified structure and the donated head of sperm help them achieve motility and agility. Condensed packaging of mitochondria (almost 70 in number) in the cervical region of sperm provides energy to sperm for their motility. Sperm contain some basic amines that help them create an alkaline microenvironment even in the acidic vaginal canal, thus helping in the success of fertilization of an egg. The sperm acrosome contains lysosomal enzymes (e.g. lysosome) that help the sperm penetrate through the egg during the fertilization process. The function of sperm is to reach the egg and merge it or fertilize it to form a zigote, and in this process, transfer the male genetic material and centriole (which finally determines the microtubule cytoskeleton). The genetic material of the sperm is responsible for the traits of the progeny such as eye color, hair and skin. The sperm contains X and Y chromosome that determines the sex of the progeny. The egg cell or egg is the ovoid or non-mobile cliché produced in the female reproductive structure known as ovaries. The size of an egg is larger than sperm. A human egg usually has a diameter of about 0.1 mm. In fish and frogs, it is about 1–2 mm. Ostrich egg is the largest egg - ~170 x 135 mm. Egg or ova is a haploid menta and in humans, contains 23 chromosomes. The egg contains cytoplasm known as ooplasma. The cytoplasm of the egg has two parts, i.e. formative yolk and nutritious yolk. The human egg is described as alecithal, as it contains a very small amount of the nutritious yolk. This is a contrasting feature with the eggs of birds in which the cytoplasm is rich in nutritious yolk (which is formed by lipoproteins, pigment granules and water). The cytoplasm contains the nucleus of the egg, known as the germinal gallbladder, and a vaculole known as the germ point. The nucleus of the egg is large, swollen with nucleoplasme, and is eccentric in position. Thus, giving polarity to the human egg, that is, animal stick and vegetable pole. The animal pole is the side where the nucleus and polar body of the egg are located, while the opposite side is known as the vegetable pole. The cytoplasm is enclosed in a peripheral layer known as bark that forms microvilli and cortical granules. Protective membranes of the egg The egg is wrapped in a thick and transparent envelope known as the striated area or skin area. Below the skin area, there is a thin layer known as the vitellaline membrane. There is a narrow space between the pellucida area and the vitellaline membrane known as perivitellaline space. While the outer most external layer, which is above the Pellucida is known as the radiated crown, which radiates from the surface of the egg. Figure 4: 4: of the ova. Credit: Samiksha S – YourArticleLibrary.com. The main function of the egg is to carry the genetic material, that is, 23 sets of chromosomes in human egg and after melting with the male menta results in the formation of a zigote. It also provides the necessary environment that allows its fertilization by sperm. After fertilization, the nutrients of the egg are necessary for the growth of the zigote. Oogenesis Oogenesis is the process of differentiation of the egg that occurs in the female reproductive organ known as ovaries. The process of oogenesis differs from species to species. In humans, the egg develops from germ cells that are present from the moment of birth of a child. Therefore, there are two broad stages of oogenesis that occur: Prenatal phase: Ova develops from the germ cell known as oogonia. Oogonia proliferates through the process of mitosis to form primary oocytes. All germ cells proliferate to form a large number of primary oocytes at the time of birth (approximately 2 million). After delivery, primary oocytes do not form (this is in contrast to sperm, in which primary sperm are continuously formed on puberty). Primary oocytes are surrounded by follicular cells and together form a primary follicle. Primary oocytes initiate the first meiotic division, before the birth of the child. However, this meiotic division is not completed and stops at prophase in the diplothene stage, until puberty. In short, the first phase of the meiotic division begins in the embryo and then remains in pause for about 12 years until puberty is established. At this point, it sends the signal to restart the meiosis. Interestingly, some oocytes continue to remain in the meiotic prophase for almost 50 years. In addition, of the population of millions of primary oocytes, only 400 of them mature in a woman's life. Postnatal phase: Primary oocytes remain in the latent phase until puberty. After delivery and before puberty, primary oocytes undergo the maturation process in the ovary. During maturation, primary oocytes remain within follicles where they increase in size and form a membrane known as the pellucida area. Before ovulation, primary oocytes resume meiosis and complete. However, cytoplasm suffers an uneven division in which most cytoplasm is acquired by secondary oocytes. On the other hand, the first polar body receives only a small amount of the cytoplasm. The first polar body is a small, non-functional cell that eventually degenerates. At the time of ovulation, the second meiotic division begins by the nucleus of secondary oocytes; However, it progresses only to metaphasic followed by the pause in the process of meiotic division. In the event of fertilization, the second meiotic division is resumed and completed. During each menstrual, the maturation of an oocytes occurs resulting in the formation of an egg through division. This division results in cells of uneven size, i.m. secondary oocytes (120-150 mm and fertilizer) and polar bodies (no more than 10 mm and non-fertilisable). In certain organisms, such as humans, there are two morphologically different types of minds: (1) male menta (i.m. sperm cell) and (2) female menta (i.m. ovum). The men's game is smaller in size and mobile, while the female game is several times larger and not mobile. The haploid condition of the two almonds is essential for fertilization during sexual reproduction to maintain the integrity of chromosomal numbers over generations. Table 1: Difference between sperm cells and oocyte sperm cells Highly mobile and small in size A very small amount of nutrients or cytoplasm and specializes for Oocyte motility contains a large amount of cytoplasm that provides nutrition during early development There are 2 types of normal sperm, regarding sexual chromosomes i.e. , 23, X and 23, Y Only 1 type of normal oocytes: 23, X Genetically, all mammals are diploid as a result of the fusion of two haploid almonds. Haploid stem cells ensure that in each generation the genetic content or number of chromosomes remains constant. If the cells of menta are not haploid, then each later generation will have twice the number of chromosome or genetic material of the previous generation. It is important to note that a non-diploid state is the characteristic of cancer cells. Excess or lack of a pair of chromosomes could lead to destabilization during the cell replication process. This, in turn, can lead to a state of illness, such as cancer. The alteration of hatred in humans and most mammals is usually fatal. Apart from this, haploids are used to improve crops (especially in rice and tobacco) since haploids can occur in a very short period of time. Therefore, haploids are useful for reducing the breeding cycle and creating a new genetic composition for the improvement of crops. Haploids are also a very useful cytological tool especially for the study of mutations and genetic disorders. Sexual determination in humans (and other mammals) In mammals, the determination of primary sex is the determination of gonads and is determined by chromosomes and not by the environment. It is the presence of a Y chromosome that determines sex in placental mammals. Normally, female cells contain two X chromosomes, i.e. XX, while male cells contain an X and a Y chromosome, i.e. XY. In this way, each of the females' eggs contains individual X chromosomes, while the male sperm are of two types, one containing the X chromosome and the other containing The Y chromosome thus, the fusion of egg (containing the X chromosome) with the sperm containing the X chromosome results in the formation of female progeny with chromosomal composition XX. On the contrary, the men's game containing the Y chromosome that merges with egg containing the X chromosome will lead to the formation of a zigote with sex chromosomes, XY, will develop into a male offspring. The Y chromosome carries an SRY gene encoding the determining factor of testis resulting in the formation of tests in male offspring. Figure 5: Human cariotype In birds, Z and W chromosomes are the sexual determinants and females are those that are heterogametic (i.m. with ZW chromosomes) as opposed to males who are homomorphic (i.m. with ZZ chromosomes). The size of the Z chromosome is larger than the W chromosomes. This process of sexual determination is unclear in chickens. However, like mammals, in chickens, the differentiation of gonads in male or female reproductive organs occurs after some time after birth. Chicken needs estrogen for sexual determination. Interestingly, if eggs are injected with estrogen during the developmental phase, then a male chicken can become a female chicken. Some reptiles, fish and amphibians also show determination of zw chromosomal sex. Determination in insects (and other invertebrates) Different insects have a different pattern of sexual determination. In butterflies and moths (Lepidoptera order), females are heterogamous and males are homomodic. W and Z chromosomes determine sex in Lepidoptera. Female characteristics are associated with the W chromosome. The absence of the W chromosome results in the development of ZZ chromosomal males, while zo chromosomal content results in the development of females. A moth, Tubulose talaeporia, determines sex, in the absence of the W chromosome, by using room temperature. Warm temperatures lead to the formation of more female eggs and colder conditions lead to a greater number of males. This is a good example of adaptation in which certain conditions, for example, warmth, tend to favour the formation of more female progeny, since warm conditions will guarantee the availability of resources for later reproduction. In lobsters, XX/XO sexual determination system, which is a single chromosome system, is used. Males only possess a sexual chromosome, i.e. XO (heterogametic), while females are XX and homomotic. Sexual determination in Drosophila The fruit fly, Drosophila melanogaster, has been widely studied to understand heredity. In Drosophila, sexual determination is based on the ratio of the number of X chromosomes to the number of sets of autosomes i.e. X: A relationship. The determining factors of women are encoded in the X chromosome, while male determining factors are encoded in autosomes. The balance between X and A thus determines sex in a of the fruit. Female flies are XX, XXY and XXYY; male flies have XY and XO chromosomes. Table 2: Different chromosomal contents and factors that govern sexual determination in various animal species Female male examples Chromosome determining sex or factor XX XY Most Most including humans; few amphibians and insects Y chromosome governs the masculinity ZW ZZ birds, reptiles, amphibians W chromosome governs the female XX XY Drosophila and few insects X:Y~ ratio > 0.75~ female X:Y~ ratio < 0.75~ male XX XO hemiptera (real bugs) – Diploid Haploidplo ants – XX XO C. elegans XX – hermaphrodite XO – male XX, XY, YY XX, XY, YY Fishes Sex determined environmentally or natural sexual reversal Evolutionary advantage of gamete anisogamy is the evolutionary successor of isogamy Individuals who produce the same type of gamet gamet are known as isogams, for example fungi, algae, yeasts. The iogamous gamemeters are represented as '+' and '-'. Whereas in anisogamy the two gamees are morphologically different and are known as men and women. Conventional theory believes that the origin of anisogamy is based on the fact that the greatest number of positive fusion gamees occurs when the glytic material accessible to the population has been subjected to division with a high degree of anisogamy. This, therefore, assumes that a fixed amount of the reserve material is essential for the development of zygotes and only unlucky mergers occur (i.c. between small and large almonds). Thus, according to this theory, a large number of sperm are produced in males to increase the likelihood of fertilization. The evidence suggests that fertility (i.e. the proportion of eggs released to this fertilization) is positively affected by the density of sperm in the female tract. Therefore, the greater the number of sperm in semen, the greater the possibility of fertilization. This is also based on the fact that the greater number of sperm causes competition between sperm for fertilization and, therefore, greater fertility. On the other hand, the function of the male sperm is to transfer only the genetic material, and a large number of small sperm provide an evolutionary advantage. While the egg invests a lot of energy in creating a viable zigote than a male gamete. In order to ensure a greater probability of survival, the egg provides genetic material from its nucleus, mitochondrial genes, and provides essential nutrition for the initial development of zigote. Thus, to provide all the necessary content, the egg is large with an adequate amount of all the required content. In this way, it is believed that this led to the development of anisogamy in which eggs are not mobile, large in size and are limited in number, while sperm are small moving structures produced in large quantities. The presence of an abnormal number of chromosomes is known as aneuploidey. A normal human cell contains 46 chromosomes. a person of 45 or 47 years is aneuploid. This abnormal chromosomal number results in a genetic imbalance causing a disorder. form of mutation is the second most common type of mutations. Aneuploid is the result of chromosomes not separated between two cells during cell division, i.e. non-disjunction. Cases of aneuploid in germinal germ causes A 46 XX is a normal female, while 46 XY is a normal male. The most common form of aneuploid is trisomy. Some known forms of aneuploid are as follows: Partial aneuploids or trisomy: caused by the loss or gain of a part of a chromosome. Monosomy: lack of a normal complement chromosome. Turner syndrome is an example of monosomy. In Turner syndrome, women only have an X chromosome, i.e. 45XO. These individuals have reduced fertility and the growth of reproductive organs. Patients with Turner syndrome are often referred to as mosaics. Dysomy: presence of two copies of a chromosome. It is a normal condition, however, when both copies of chromosomes are from the same parent is known as uniparental dystheomy. Trisomy: the presence of three copies of a particular chromosome, rather than the two normal ones, i.e. the presence of an extra chromosome. The trisomy of 18 is known as Edwards syndrome and the trisomy of 13 is known as Patau syndrome. The trisomy of Y chromosomes is also possible, for example (47, XXX), (47, XXY), and (47, XYY). Most trisomy is not viable and ultimately do not survive, only some of them are able to survive. The most common trisomy that is able to survive is Down syndrome. Extra chromosome 21, results in Down syndrome. It can occur in 1 in 750 births. By using prenatal detection methods such as serum screening and U.S. surveillance nearly 75% of cases are detected before birth. Patients with down syndrome have symptoms of cognitive impairment. Another trisomy that is able to survive is Klinefelter syndrome, in which males have 47 chromosomes, i.m. two X chromosomes and a Y chromosome (47 XXY). These individuals have a normal life; However, they also have low fertility and reduced development of reproductive sexual organs. Tetrasomy/pentasomy: Presence of four or five copies of a chromosome, respectively. It is rarely seen in humans. We have seen how almonds are crucial in the perpetuation of the species through sexual reproduction and how they are essential components in the promotion of biodiversity (especially during events of formation and fertilization of minds). Therefore, if these almonds become dysfunctional, the species may have to deal with the reduced spread and diversity of species. Both are crucial in the survival of the species. In the previous section, we learned how chromosomal abnormalities in humans could lead to a decrease in physiological functions and reproductive abilities in the affected people. Now, let's look at the impact of dysfunctional totems on other organisms. In the plasmodium life cycle In the sexual development of malaria parasitic protozoa, (Plasmodium spp.), circulating female and male gametocytes undergo gametogenesis in a vector of See the figure below. Figure 6: Plasmodium life cycle. Credit: Le Roche Lab, UC Riverside – Source, CC BY 3.0. Notice how gametocytes develop into two types: macrogame (female menta) and microgame (male menta). The gamete finally fertilizes the female menta resulting in the formation of oocytes, which eventually develop into an ookinete. However, host immune factors act on these males and women throughout their sexual development and can make them dysfunctional. A dysfunctional totem can participate in the fertilization process, however, the fusion of a healthy mentít with a dysfunctional mind results in the formation of an unviable zigote that does not survive to reach the ookinete stage. 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