



## Comparing and contrasting spermatogenesis and oogenesis

The processes by which male and female gametes are produced are easily compared and contrasted, as in Table 11.4.

**Table 11.4 Comparing and contrasting spermatogenesis and oogenesis**

Spermatogenesis	Oogenesis
Mitosis replaces germinal cells daily	Mitosis replaces germinal cells only early in a female's development
Some cell growth occurs before meiosis I begins	A great deal of cell growth occurs before meiosis I begins
The two divisions of meiosis result in four haploid spermatozoa	The two divisions of meiosis result in one ovum and three possible polar bodies
Spermatids must remain in seminiferous tubules until differentiation into spermatozoon occurs	Differentiation of the oocyte into an ovum occurs partly in the ovary and continues after ovulation
The resulting gamete is extremely small with very little cytoplasm and limited organelles	The resulting gamete is extremely large with a great deal of cytoplasm, nutrients, and numerous organelles
Millions of spermatozoa produced every day throughout life (starting at puberty)	Ovulation of one of a total of thousands of oocytes occurs with each menstrual cycle, then stops at menopause

## Fertilization in animals can be external or internal

If a female animal lays eggs to allow the male of the species to fertilize the eggs outside the female's body, the fertilization is said to be external. There are many animals that use this physiological and behavioural strategy in order to reproduce. Good examples are the majority of fish species. A typical female fish often lays hundreds of eggs at a time. A male of the same species swims above where the eggs were deposited and releases a fluid called milt. Milt contains millions of spermatozoa. The system is not very efficient because many of the eggs may never become fertilized, but the vast numbers of eggs laid coupled with the millions of spermatozoa deposited locally typically ensures that a reasonable number of the eggs do become fertilized. Animals that use this mode of fertilization rarely provide parental care for the developing young, and that is another reason for the large numbers of eggs that are laid. Many of the young do not in fact survive predation and other dangers as they mature.

### NATURE OF SCIENCE

Contraceptive pills containing relatively high levels of oestrogen and progesterone (sometimes simply referred to as the 'pill') have revolutionized birth control in many areas of the world. The pill fools the female's body into acting as if it was pregnant, by keeping the levels of the two hormones most associated with pregnancy (oestrogen and progesterone) high. Thus the series of events leading to ovulation do not occur when the pill is taken regularly. We also give steroids to other animals. Some cattle farmers use steroids to 'bulk up' their beef cattle. Any organism that takes an outside source of steroids metabolizes the steroid molecules and deposits some of them into its environment in their faeces and urine. In some areas, there is evidence of steroid contamination affecting aquatic ecosystems. In areas of high steroid contamination fish species with lowered egg production and other species of animals with sex determination problems have been documented. This problem was not foreseen, nor was it scientifically studied before steroids had become a common dietary additive for both people and livestock.

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## CHALLENGE YOURSELF

- 4 Identify each of these reproductive cells as being haploid or diploid:
- a spermatogonium located in the outer perimeter of a seminiferous tubule
  - a secondary spermatocyte located in a seminiferous tubule
  - an oogonium located in a foetal ovary of an unborn baby girl
  - a primary oocyte located in an ovary of a newborn baby girl
  - a secondary oocyte soon after ovulation in an adult female
  - a recently fertilized zygote.



To learn more about internal versus external fertilization, go to the hotlinks site, search for the title or ISBN, and click on Chapter 11: Section 11.4.

