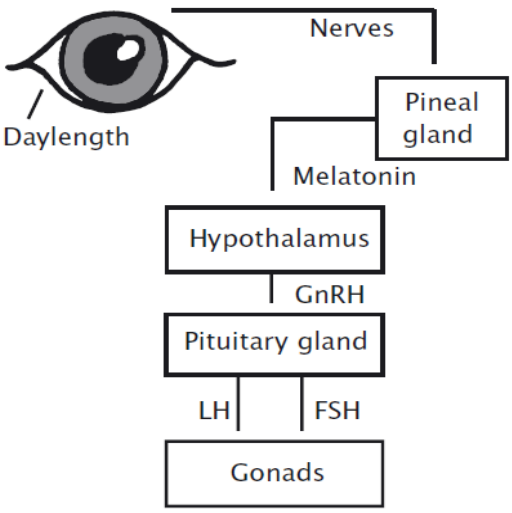
Seasonality

In temperate climates many species are seasonal breeders. Sheep, goats and horses are examples of them. This means that periods of sexual activity (the oestrus season) are alternated with periods of sexual inactivity (the anoestrus season). In sheep for instance, sexual activity starts when the day length shortens (short-day breeders), and in horses sexual activity starts when day length increases (long-day breeders). The difference in breeding season between species is connected with the differences in gestation length. In temperate and cold climates the result is that both horses and sheep give birth to their young in spring, a period with sufficient food, giving them the best chance of survival.

The pineal gland is the main regulatory organ in seasonality. Via the eyes and complex neural connections day length is registered in the pineal gland. See also Figure 5.

Figure 5 Role of the pineal gland and melatonin in reproduction.



The pineal gland produces indoleamins of which melatonin is the most important.

Melatonin is produced and secreted during the night (dark). When days become shorter the exposure of the animal to melatonin increases. This has, though not yet fully elucidated connections, a stimulating effect on the GnRH secretion by the hypothalamus in short-day breeders like sheep.

In long-day breeders (horse) the increased exposure to melatonin during long nights (short days) inhibits the GnRH release by the hypothalamus. In this way the day length differences are recognized and translated into signals that turn on or turn off sexual activity. Of the domesticated animals, the cow lost most of its seasonality due to the process of domestication over the centuries.

Breeding Season in Males

The duration of the breeding season of males is longer than in the females of the species. Even though rams can mate throughout the year, testis weight, testosterone, and gonadotropin levels are minimal from January to May during female anestrus.

Similarly, in the billygoat, the plasma testosterone level remains low from January to August, when it rises suddenly at the beginning of the breeding season.

An annual reproductive cycle in stallions is also well documented from both hemispheres. In northern temperate countries, low plasma testosterone and LH levels in stallions are observed from October to February.

FACTORS REGULATING BREEDING SEASON.

Environmental, physiologic, and social factors regulate the onset and maintenance of the breeding season.

The patterns of photoperiod, rainfall, and temperature are considered environmental cues that either entrain an endogenous rhythm or directly trigger

the physiologic changes of the breeding season. These are mediated by endocrine and neuroendocrine mechanisms.

Among the domesticated bovine species, the Zebu cattle exhibits the most distinct seasonality in reproductive efficiency. For example, the frequency of estrus and ovulation, as well as conception rate in Zebu cattle is higher during the summer than during the winter in Kenya.

Temperature may modify the seasonal effect of photoperiod on reproductive function.