

SEASONALITY AND FACTORS AFFECTING REPRODUCTION

الموسمية والعوامل المؤثرة على التكاثر

Introduction

The reproductive process of an animal is a result of the **interaction** of the **endogenous regulatory mechanisms (mainly endocrine) and environmental signals**. The main environmental factors influencing animal reproduction are photoperiod, temperature, humidity, amount and distribution of rainfall, nutrition, and productive system management.

Factors Prompting Seasonality

Factors having an influence on seasonal reproduction in any animal can be classified as **inherent factors** (related to genotype and belonging to the individual itself) and **noninherent factors** (related to the animal's environment).

Inherent factors

- 1. Life expectancy:** in an animal having a life expectancy of about little years, seasonality will be just rare. Otherwise, an animal having a life expectancy of several years will have more chances of giving birth to viable offspring when limiting births to the most favorable seasons of the year.
- 2. Body size:** when the animal has a big body size; increases the chances of starting seasonal reproduction, since a big animal has higher energetic

body stores, and can delay easily its breeding activity to seasons more favorable for the newborn.

- 3. Diet:** an animal depending on a reduced range of food will generally breed much more seasonally than an animal of similar traits but which can feed on a mixed diet.
- 4. Gender:** Generally, males will tend to have longer breeding seasons than their female counterparts, since spermatogenesis commonly requires significantly more time to complete than ovarian follicle maturation and ovulation.

Noninherent (environmental) factors

1. Energy Balance and Nutrients

Generally, the periods of the year when food availability becomes scarce are very important factors for seasonal reproduction. So, a nutrition is a very important factor, and if food availability falls below a threshold that may vary according to species and populations, an animal will not breed. Moreover, changes in food availability can influence seasonal breeding patterns.

2. Temperature

Ambient temperature can also be a proximate factor since warmer temperatures could trigger reproductive activity. Conversely, too high temperatures could limit reproductive activity.

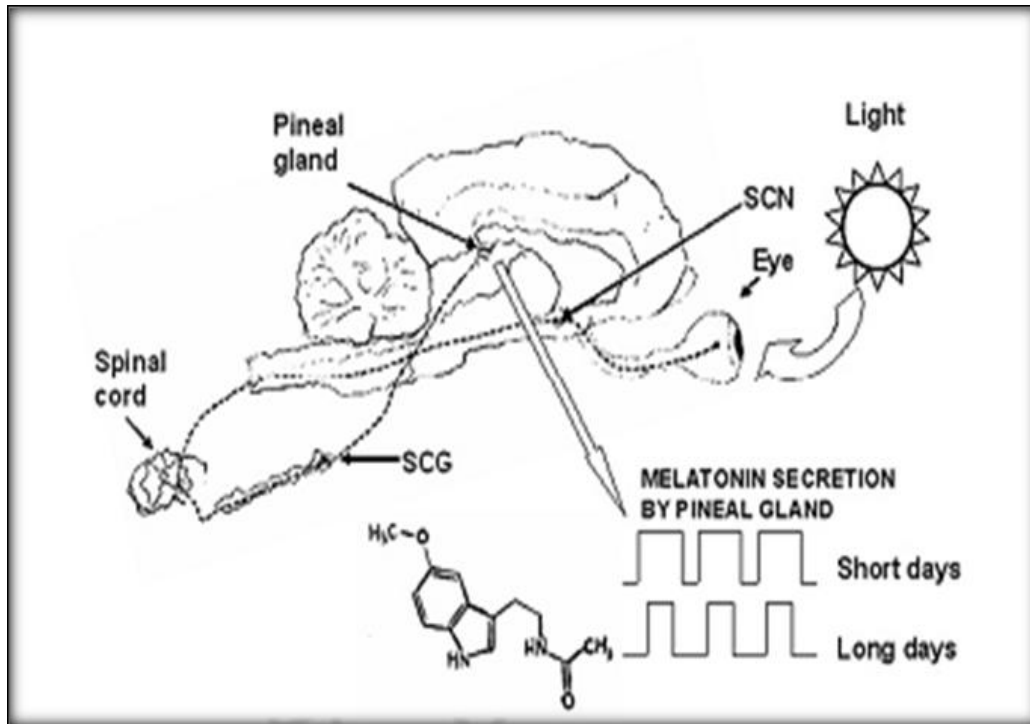
3. Photoperiod

The most widespread proximate factor timing seasonal reproduction is the annual photoperiodic variation. Some species (sheep, goats, deer) are known as 'short-day breeders' because their breeding season occurs mainly when days are

getting shorter (summer and autumn) and these species normally have gestation lengths of 5-6 months and are usually born in spring. On the other hand, other species having either short gestation lengths (1-2 months, i.e., hamster) or long gestation lengths (equine) are 'long-day breeders', and breed in late winter or spring, with their offspring, also being born mainly in spring.

Mechanisms Regulating Seasonal Reproduction with Photoperiod

- Light is perceived by the eye's retina (photic information is converted into neural information).
- Neural information generated in the retina is transmitted to the suprachiasmatic nuclei (SCN).
- Connections from the SCN reach the spinal cord. Spinal neurons send information to the anterior cervical ganglion (ACG).
- Postganglionic SCG neurons send neural paths to the pineal gland, where neural information is converted into hormonal information (high melatonin secretion levels during dark hours).
- The duration of high melatonin blood levels indicates dark hours to the whole animal's body.
- Melatonin is a small indole compound (chemically related to amino acids) secreted by the pineal gland when the animal is in a dark environment. Melatonin secretion is inhibited by daylight.
- High melatonin concentrations in blood transmit the information that the animal is in a dark environment to the animal's organs and tissues.
- Thus, melatonin can either inhibit ('long day breeders') or stimulate ('short day breeders') reproductive activity.



Regulation of pineal gland melatonin secretion by photoperiod