

Introduction

This manual has been developed as a study guide for the Florida State Fair Skillathon which is part of the Champion Youth Program. The topic for this year's Skillathon is **reproductive management**. Animal reproduction has become a complex science that involves a series of physiological and psychological events that must be properly timed and managed. Reproduction has at least three purposes within the animal industry: 1) perpetuation of the species; 2) genetic improvement; and 3) to provide food.

The Florida State Fair recognizes that agricultural education instructors, 4-H agents, parents, and leaders provide the traditional and logical instructional link between youth, their livestock projects, and current trends in the animal agriculture industry. **PLEASE NOTE:** This manual is provided as a **study guide** for the Skillathon competition and should be used as an additional aid to ongoing educational programs.

Sections are labeled **Junior, Intermediate & Senior, Intermediate & Senior, or Senior** to help exhibitors and educators identify which materials are required for each age level.

******Denotes additional information in the study manual for preparing for the Champion of Champions competition but is not required as part of the Skillathon.

The knowledge and skills vary by age group and may include:

Juniors (age 8-10 as of September 1, 2023)

Breed Identification
Selection: Visual Evaluation

Intermediates (age 11-13 as of September 1, 2023)

all of the above plus...
Male and Female Reproductive Anatomy
Reproductive Functions
General Management Practices

Seniors (age 14 and over as of September 1, 2023)

all of the above plus....
Breeding Management Practices
Selection: Pedigree/Performance Evaluation
Genomics

GOOD LUCK!



Rabbit Breed Identification

Rabbits are selected for traits that are considered economically important. A purebred rabbit has the characteristics defined by a breed registry and purebreds are expected to pass those traits on to their offspring with a high degree of predictability. Crossbreeding has been used to develop new lines of rabbits that are now considered purebreds because they have a set of traits that are consistently passed on and a breed registry has been established. Some breeds of rabbits and their descriptions are listed below. The American Rabbit Breeder's Association (ARBA) recognizes 52 different breeds of rabbits. Visit the official website of the ARBA to learn more about the breeds of rabbits listed here as well as others not listed. <http://arba.net/breeds.htm>.



Californian:

This commercial breed is best known for its meat-producing qualities. The body is medium in length with a depth equal to its width. The profile is to rise gradually from the front of the neck to the highest point over the hips. This breed was developed in 1928 and is white with a black nose, ears, feet, and tail. At maturity, bucks ideally are 9 pounds, and does are 9 ½ pounds.



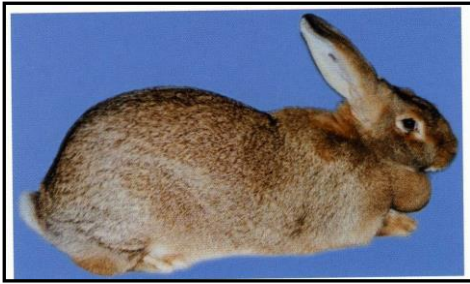
Dutch:

This breed is one of the oldest breeds and is said to originally trace back to Holland, but the breed was established in England in the 1830s. There are seven varieties of this breed: black, blue, Chinchilla, chocolate, tortoise, steel, and gray. Although small in size, 3 ½ - 5 ½ pounds at maturity, this breed carries a lot of meat on its compact body type. These rabbits have a unique distribution of points in the Standard of Perfection, with 48 points out of 100 devoted to markings.



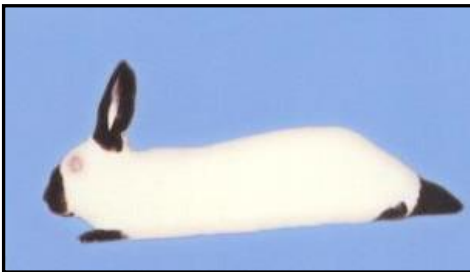
Florida White:

Developed in Florida, this breed has a close-coupled, meaty body type with well-developed shoulders, hips, and hindquarters. This breed comes only in red-eyed white and is characterized by fly-back, normal fur. A small rabbit, this breed is ideally 5 pounds at maturity.



Flemish Giant:

Possibly dating back to the 1500's the Flemish Giant is one of the original rabbit breeds. The Standard requires a 13-pound minimum for bucks and a 14-pound minimum for does. It is one of the largest rabbit breeds today. Accepted colors include Black, Blue, Fawn, Light Gray, Sandy, Steel Gray, and White. The Flemish Giant should be a well-balanced animal with a gradual arch starting from behind the shoulder blades. This breed is used in many commercial meat rabbit crosses but has limited use as a meat rabbit itself.



Himalayan:

This is the only breed that has a cylindrical type, characterized by a long, narrow body. They are white with color on their ears, nose, feet, and tail. Accepted colors are Black, Blue, Chocolate, and Lilac They reach 2 ½ - 4 ½ pounds at maturity. The Standard specifically states this breed must be posed stretched out on the show table.



Holland Lop:

Developed in the Netherlands, this breed is shown in two varieties: solid pattern and broken pattern. This fancy breed is known for its good-natured personality and lovable face. The smallest member of the lop family; this breed only reaches 4 pounds at maturity.



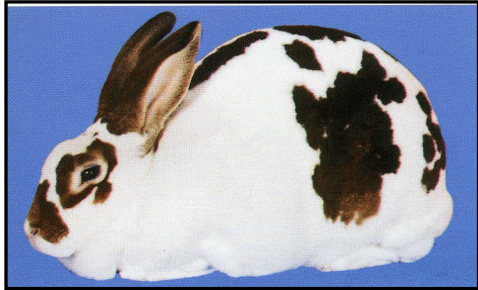
Jersey Wooly:

This short, compact breed is one of the newest to the Standard. The body type resembles that of a Netherland Dwarf, but it is covered in wool instead of fur. Although the wool can be spun, the Standard recommends it should not be used for commercial purposes. This breed is shown in five groups: Agouti, AOV, Self, Shaded, Tan, and Broken Pattern. A small, fancy breed, these rabbits are only 3 ½ pounds at maturity.



New Zealand:

Accepted by the A.R.B.A. in the mid-1920s, this commercial breed comes in four different varieties: Black, Broken, Red, and White with white being the most popular for laboratory use. At maturity, this breed's bucks weigh 9-11 pounds and the does, 10-12 pounds. They are known for their excellent meat-producing qualities.



Rex:

Though its fur is the standout characteristic of this breed, a commercial meat body is found under the velvety pelt. An extremely dense, plush coat with guard hairs almost as short as the undercoat gives the Rex its name. The colors appear deeper in hue compared to a normal rabbit coat due to the unique texture. This breed has sixteen different varieties: Amber, Black, Otter, Blue, Broken Group, Californian, Castor, Chinchilla, Chocolate, Lilac, Lynx, Opal, Red, Sable, Seal and White. These make wonderful meat rabbits reaching ideally 8-9 ½ pounds when mature.



Satin:

This unique commercial breed gets its name from the satin sheen the fur gives off. This quality is a mutation of the normal hair shaft that turned it translucent. This breed has eleven different varieties: Black, Blue, Broken Group, Chocolate, Chinchilla, Californian, Copper, Otter, Red, Siamese, and White. They have a medium-length body with depth that equals its length. These too are excellent meat rabbits, ideally reaching 9 ½-11 pounds at maturity.

Adapted from the A.R.B.A. Standard of Perfection, and Official Guide to Raising Better Rabbits and Cavie.

When selecting breeding stock, it is important to choose a breed with a body type that will help you meet your production goals. Are you raising rabbits for food, show, wool, fur, or pet stock?

Commercial-type breeding stock should have excellent meat-producing qualities. Examples of commercial breeds are Californian, New Zealand, Florida White, and Satin.

Fancy-type breeding stock should be good representatives of their breed according to their breed standard of perfection. Dutch, English Spot, Belgian Hare, Rex, Netherland Dwarf, and Lops could all be classified as fancy-type breeds.

Wool-type breeding stock should have a high-quality wool coat. Jersey Wooly and Angoras are examples of wooly-type breeds.

In all rabbits intended for show, all breeds, regardless of what the breed is intended, should conform to that breed's established ARBA standards of perfection.

Selection: Visual Evaluation



Jr., Int. & Sr.

Many traits of economic importance can be evaluated by simply looking at the animal. In purebreds or registered animals, the “ideal” is usually described or illustrated by the breed registries like the ARBA Standard of Perfection. Most rabbit show judges are trained to evaluate the way the animal looks, moves, and feels to make their decisions on class placings. Learn to evaluate rabbits by type, structure, and color patterns and be familiar with faults and disqualifications.

Feet and Leg Structure

How well an animal can stand and move around will have a major impact on its ability to find food, mate, and care for its young. Often, an animal that stands correctly will move freely while a crooked-legged animal may have trouble getting around and may become sore or lame. Feet and leg structure as well as movement are important evaluation criteria for breeding animals. Rabbits should be straight-legged, free from sore hocks, with clean, well-furred feet.

Criteria for Selection

The criteria listed below are commonly considered most important in the evaluation of rabbits. The priority or emphasis placed on each may change with market demand, breed, age, management scenario, and performance data.

General type - varies greatly and depends on intended use (food, show, wool, pet).

Includes evaluation of:

Body	Fur	Pedigree
Head	Color	Breeding Record
Ears	Condition	Overall Health

Faults - Some criteria considered faults for show rabbits of all breeds include hutch stains, stray white hairs in colored fur, poor tail carriage, poor ear carriage, poor eye color, flabby or overly fat, thin or extremely poor flesh condition, and a specimen in molt.

Disqualification - can arise from ailments like ear canker, abnormal nasal or eye discharge, tumors, hernia, and infestation with mites, fleas, or lice. Other factors related to structure (eyes, legs, ears, teeth, toenails, etc.), color or color pattern, or altering appearance that can lead to disqualification are outlined in the Standard of Perfection. <http://www.thenaturetrail.com/rabbit-equipment/arba-standard-of-perfection/>

Rabbit terms are listed at: <http://www.angelfire.com/tx3/rabbitpad/terms.html>

You can research breeds and types at: <https://rabbitbreeders.us/rabbit-breeds/#chart>

There are five different body types found in rabbits: Commercial, Compact, Cylindrical, Full-Arch and Semi-Arch. Those body types are described and illustrated below.



Jr., Int. & Sr.

Commercial:



Rabbits with commercial type are considered to be the ideal meat type. They are medium in length, with depth equaling width and showing roundness of body. This group is posed down on the table. Included in this group are: New Zealand, Californian, Crème d'Argent, Champagne d'Argent, Blanc de Hotot, French Angora, Giant Angora, Satin Angora, Cinnamon, American Chinchilla, French Lop, Harlequin, Palomino, Rex, American Sable, Satin, Silver Fox and Silver Marten.

Compact:



Most rabbits with compact body types possess commercial-type characteristics but are smaller. Most of this group is posed down on the table, but a few are posed standing up. Included in this group are: American Fuzzy Lop, English Angora, Standard Chinchilla, Dwarf Hotot, Dutch, Florida White, Havana, Holland Lop, Jersey Wooly, Lilac, Mini Lop, Mini Rex, Netherland Dwarf, Polish, Mini Satin, Thrianta, and Silver.

Cylindrical:



This group has a type that is long, slim, and cylindrical with fine bone and a long slender body. They are posed and stretched out on the table. This group includes one breed, the Himalayan.

Full-Arch:



Rabbits with the full arch type show an arch (rise) starting from the back of the neck over the body. Most rabbits in this group show more depth than width and pose standing up. Most are allowed to move naturally on the show table. Included in this group are: Belgian Hare, Britannia Petite, Checkered Giant, English Spot, Rhinelander, and Tan.

Semi-Arch:



Rabbits with semi-arch (mandolin) type show an arch (rise) starting from **behind** the shoulders and over the body. This group is posed down on the table but may be allowed to move about for further evaluation. Included in this group are: American, Beveren, English Lop, Flemish Giant, and Giant Chinchilla.



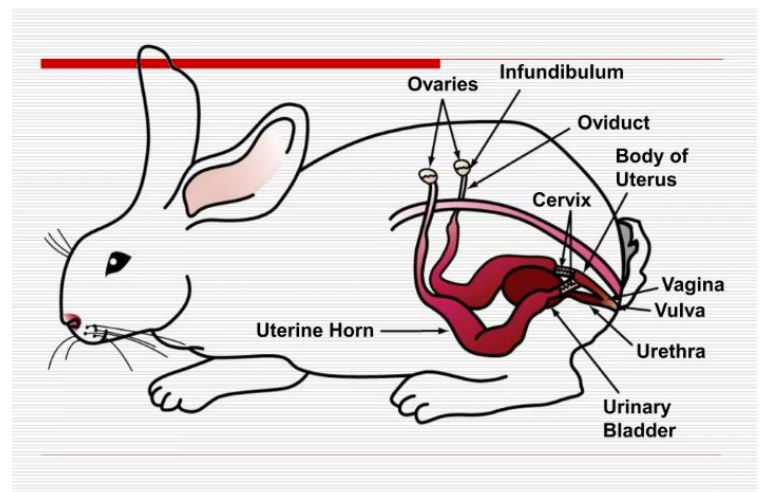
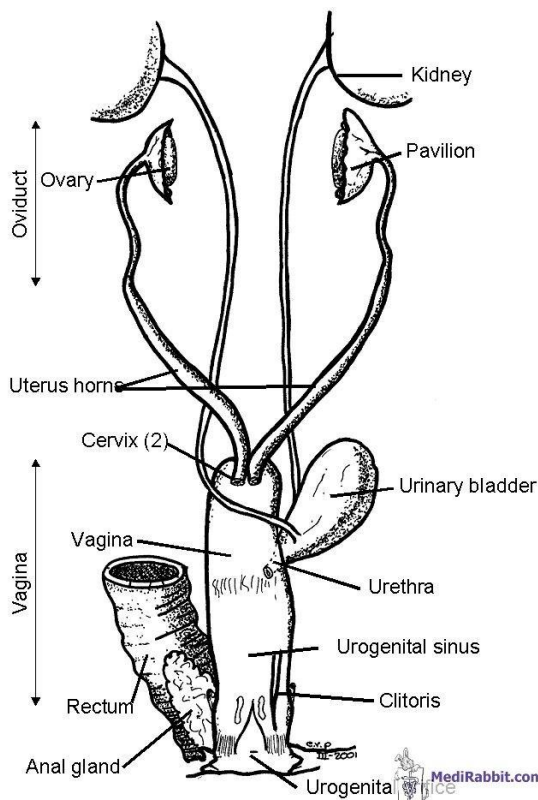
Reproduction Overview

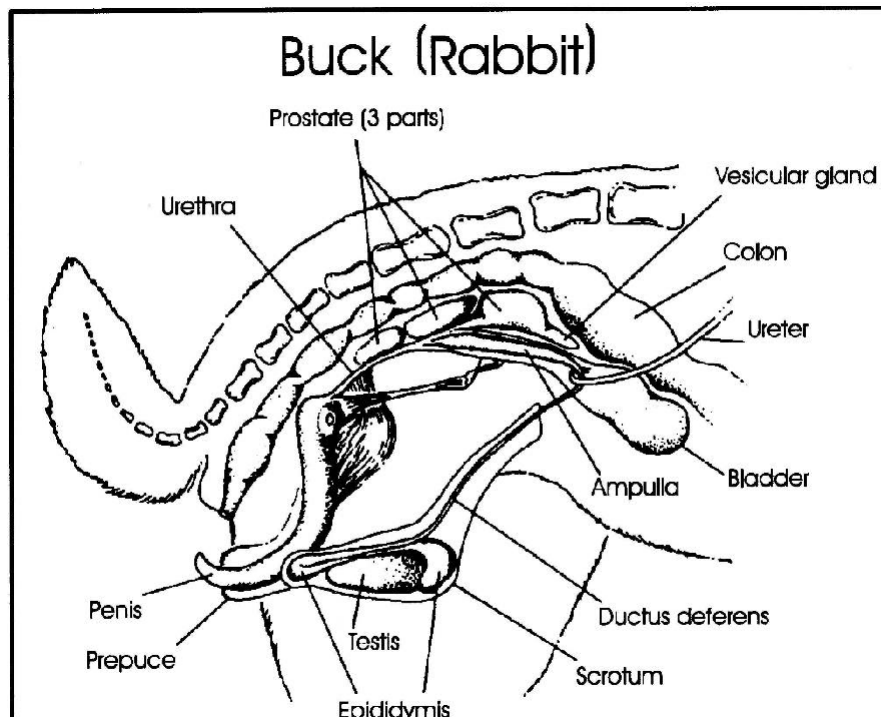
Puberty is reached when a rabbit can reproduce (4-8 months of age or 75-80% of mature body weight). Sexual reproduction begins with the buck and doe mating, called *copulation*. Rabbits do not have heat cycles so mating occurs throughout the year when the doe will accept the buck. During mating, the buck deposits *sperm* in the reproductive tract of the doe. Rabbits are *reflex ovulators* meaning the act of mating causes the release of eggs from follicles on the ovary of the doe. *Fertilization* is the union of sperm and egg cells. The number of young or *kits* a rabbit gives birth to at one time is an indication of the number of egg cells released and fertilized. The normal *gestation* period or pregnancy in the doe lasts 30-33 days followed by *parturition* or *kindling* which is the process of giving birth.

Reproductive Anatomy

Rabbits can give birth to multiple kits at each kindling and may have multiple litters per year. Understanding reproductive anatomy is basic to managing reproduction. http://www.medirabbit.com/EN/Uro_gen_diseases/Fem_rabbit/Fem_en.htm

Doe (Rabbit)





Reproductive Functions

Once you know the names of all of the reproductive structures, the next step is to understand the role of each part. Understanding normal functional anatomy allows the manager to apply reproductive management tools.

Female Functional Anatomy

Ovaries Paired female gonads that produce eggs and hormones. Follicles are blister-like structures that grow on the ovary which produce estrogen (causes doe to allow mating) and release the eggs at ovulation (rupture of the follicle). Following ovulation, the remaining cells change and form the corpora lutea which produce progesterone (maintains pregnancy).

Oviducts Two tubes that connect the ovaries to the uterine horns. The oviducts transport eggs and sperm cells, are the site of fertilization, and move the fertilized ova (eggs) into the uterus.

Uterus Supports, nourishes, and protects the embryos as they develop and expels the fetuses at parturition. Walls are soft and spongy in non-pregnant animals. Unlike other farm animal species, the rabbit has no uterine body; rather it is made up of two distinct, separate uterine horns.

Cervix Rabbits have two cervixes, each made of a thick-walled tube connecting directly to the uterine horns. The cervixes prevent microbial contamination of the uterine horns and serve as a reservoir for and transport of sperm. The cervixes are also part of the passageway for delivery at kindling.

- Vagina** The passageway from the vulva to the cervix that serves as the organ of copulation and birth canal during parturition. This is the site of semen deposit. The urethra enters the floor of the vagina.
- Urethra** Tube connecting the bladder to the vagina that serves as a passageway for urine excretion.
- Vulva** External opening of the female reproductive tract.

Male Functional Anatomy

Scrotum

External sac; contains, supports, protects, and provides temperature control for the testes. Bucks have the unique ability to retract the testicles into the abdominal cavity when threatened.

Testicles or Testes

Paired male gonads produce sperm cells and the male sex hormone, testosterone.

Epididymis

Long coiled tube that sperm enter upon leaving the testicles. It is the site of sperm storage, concentration, maturation, and transport.

Vas deferens

Long tube that connects the epididymis to the urethra near the bladder and transports sperm. The ampulla is the section that dumps into the urethra.

Seminal Vesicles

Paired glands that secrete seminal fluid into the urethra which serves as a transportation medium and provides protection for sperm.

Prostate

Found near the urethra and the bladder. It adds fluid to the semen.

Bulbourethral Gland

(Also referred to as the Cowper gland.) Secretes a fluid similar to that of the seminal fluid that flushes urine residue from the urethra.

Urethra

The tube that passes through the penis and is the common passageway for semen and urine.

Penis

The organ used for copulation that deposits sperm into the female reproductive tract. Rabbits do not have an S-shaped bend called the sigmoid flexure, found in other species, which allows the penis to be retracted into the body by the retractor penis muscles.

Prepuce

Fold of skin serving to protect the penis by enclosing the free end when retracted.

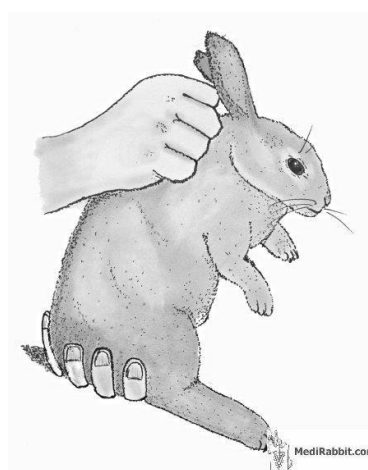
<http://www.notesonzoology.com/rabbit/reproductive-system/reproductive-system-of-rabbit-with-diagram-chordata-zoology/7728>



General Management Practices

Handling and Restraint

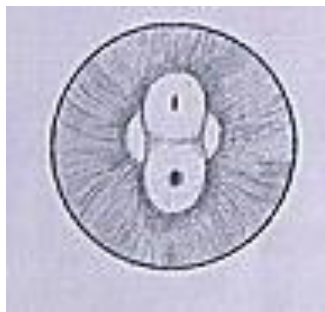
Rabbits are generally timid and excitable. They may resist handling and can cause harm to themselves as well as the handler. Due to this one must practice proper restraint. When carrying a rabbit, its head should be tucked into the crook of the arm that is supporting the hindquarters. This allows the handler to control the animal with one hand leaving the other hand free to open doors and cages. Never pick a rabbit up by the ears as it can cause pain and damage to the cartilage in the ears. A rabbit should be picked up under the belly with one hand, and the other hand should support the rump. If the rear quarters are not properly supported, expect a powerful kick. For sexing, rabbits are picked up by placing fingers at the base of the ears and by the scruff of the neck and supporting the rump. The rabbit is tucked under the arm that is holding the scruff of the neck and sexing can be done with the free hand. To check for pregnancy, restrain the rabbit belly down on a non-slippery surface with one hand holding the ears or a fold of skin over the shoulders and place the free hand under the body slightly in front of the pelvis.



Gender Determination

Knowing if your rabbit is a male or a female is useful in making management decisions and preventing unwanted pregnancies. Older animals give you clues by the way they look. Bucks usually have a blockier head and body than does. Does usually have much larger dewlaps than bucks (the dewlap is the large fold of skin under the chin). On a hot day, the older buck's testicles may protrude from the body as a means of keeping them cool.

Sexing younger rabbits from 3 weeks of age is tricky but not impossible with a bit of training and practice. This is done at close range by laying the bunny on its back, upside down in your lap, placing the palm of one hand behind the ears and the thumb in front of the ears, placing the thumb and index finger of your free hand on opposite sides of the sex organ and applying gentle pressure. At around 6 weeks of age, the organ of the buck will appear rounded with a small hole, while the doe will appear slit-like or V-shaped. With increasing age, the differences will become more obvious.



Young male with testes partially descended. Female with slit-like genital opening.

<http://www.pet-informed-veterinary-advice-online.com/sexing-rabbits.html#rabbitsex>



Breeding Management Practices

Breeding and raising rabbits can be a fun and rewarding hobby or small business. As you plan your breeding program, you should have a good understanding of breeding and management techniques. Equally important is that you have a marketing plan for the babies before mating your doe. <http://www.thenaturetrail.com/rabbit-breeding/>

Mating

Unlike most mammals, rabbits do not have regular estrous cycles. Instead, they are ready to breed about 12 out of every 15 days. Does that are receptive to the buck will often lift their hind end upwards if touched on their hindquarters, even if a buck is not nearby. Often the vulva will appear bright pink to purple rather than being pale. Some does show no signs while others may show signs and yet not accept the buck. If the doe does not get pregnant after mating, she may go through false pregnancy “pseudo pregnancy” for 17 days. Most does will not breed during this time but will make a nest. See the Rabbit Breeding Schedule on Pg 12.

When breeding rabbits by natural mating, it is important to NOT bring the buck into the doe’s cage but to take the doe to the buck. Many does object to having another rabbit placed into their territory and will often attack or injure the intruder. Another problem is that the buck will investigate the new surroundings, mark his territory, and not be interested in the doe. If everything is done correctly and the doe is receptive to the buck, mating will occur immediately. After the mating is complete the buck will usually fall over on his side and the doe should be returned to her cage immediately. Sometimes the doe will squat in a corner and will not accept the service. If the doe will not accept the buck she can be placed with another buck to see if she is receptive to him. If she still does not accept the buck, she should be returned to her cage and rescheduled for the next day. A doe may be non-receptive for several days. A buck and doe should NOT be left together unattended for more than a few minutes because the buck may become injured. It is thought that allowing the rabbits to breed again 1 to 12 hours after the initial mating may increase litter size. <https://www.raising-rabbits.com/rabbit-mating.html>

Palpating

A doe may be checked for pregnancy 12 to 14 days after mating. Restrain the doe in your lap, or on a flat surface, and reach one hand under the area between the hind legs. With the thumb on one side and the forefinger on the other, press slightly and move the hand gently back and forth. The fetuses will feel like small grapes slipping between the thumb and forefinger. Use caution to avoid bruising or abortion.



Kindling

About 3 weeks after the doe has been bred it is time to prepare for kindling. At 28 days post-breeding, a nest box should be placed into the cage to allow her to start a nest. If the nesting box is placed in the cage too soon, the doe may use it as a litter box and it will be unsanitary when the kits arrive. The size of the nest box will vary depending on the size of the doe. (Dwarfs:

12" long x 8" wide x 8" tall - Medium: 15" long x 10" wide x 10" tall - Large: 18" long x 12" wide x 12" tall)

Materials such as straw or shavings should be placed in the pen to be used by the doe in building her nest. After building the nest, the doe will pull fur from her hips, dewlap, and mammary glands to complete the nest. A doe's appetite will usually decrease 2 to 3 days before kindling. She should be left alone at kindling as there are no real problems that should occur if the kits are of normal size. In some cases, there are only a few kits, and in these cases, one or two may be abnormally large and they are usually a day or two late. As each kit is delivered, the doe licks it and may nurse it immediately. When the entire litter is kindled, the doe will pull out more fur and cover the litter. Kindling the entire litter often takes less than 15 minutes. The doe will eat the placentas, probably an instinct that developed to prevent attracting predators.



<https://www.raising-rabbits.com/rabbit-nest-box.html>

Rabbit Breeding Schedule

- A. If your doe does not have a litter
1. Buck > 6 months Doe > 5 months Breed doe
 2. 12- 14 days post-breeding – palpate doe
 3. 28 days post-breeding - provide a nest box
 4. 31-33 days post-breeding - doe kindles
 - a. 10 days old eyes open
 - b. 5-6 days after eyes open remove nest box
 - c. 39 days after eyes open wean litter

Note: If the doe does not kindle by 33 days post-breeding, start over 3 days later.
If the litter dies, rebreed the doe one week after the birth.

- B. If your doe has a litter timeline begins at kindling
1. 32 days after eyes open breed doe
 2. 39 days after eyes open wean current litter
 - a. Wean a few kits at a time over a 7-day period
 - b. Sort litter based on sex.
 - c. Evaluate quality
 - d. Tattoo kits
 - e. Schedule breeding 5-6 months old

Note: If the litter dies, rebreed the doe one week after the birth.
Multiple times per year, evaluate production records and cull non-producers.

Planning and preparation prevent poor performance. Using the schedule provided, you can plan calendar dates on which to perform various breeding management practices.

An excellent manual covering 4H rabbit project management can be found at:
www.gov.pe.ca/photos/original/4h_rabbit_RG.pdf or
<https://lafeber.com/vet/rabbit-reproduction-basics/>

Care of kits

Kits are born with little fur and their eyes closed. They need to be in the nest to survive. A doe must be checked after she kindles to make sure she cares for all of her young. If she happens to kindle on the hutch floor rather than in the nest box, the young must be warmed and placed in the nest box so that they will not die from exposure. The doe will not move a kit that falls out of the nest.

If a doe becomes frightened at the kindling time or just after, she may jump into the nest box and injure or kill the kits by stamping her back feet. Another cause of loss at kindling time is cannibalism. It is not common but can happen if the doe does not have an adequate diet or becomes disturbed, nervous, or frightened after kindling. These problems can be prevented with proper supervision, by providing a good diet, and by using care around the doe. If kits have chewed toes or go missing, do not assume the doe is eating them. Sometimes rats, snakes, or opossums will eat the kits or chew their toes so the nest boxes should be well protected.

On day 10, the bunnies will be covered with fur and their eyes will open. They may start to climb out of the nest box at that time. They start to eat solid food between 11 and 14 days old. If it is necessary to foster babies to another litter, it is important to do it before day 12 so the doe will be less likely to reject them. The nest box should be removed between days 14 and 18, depending on the weather.

Weaning should occur between 4 to 8 weeks after birth. To enhance record keeping, tattoo the kits before weaning. The tattoo number is given by the breeder and is tattooed in the left ear. <https://ohioline.osu.edu/factsheet/4h-35>

Kits are rarely castrated as there is little justification.



Keep Accurate Records

Good management requires accurate record-keeping. Many commercial record systems are available at very little cost. Choose one and stick with it. Types of records include pedigree, herd records, show records, health records, and feeding records. If you are raising purebreds, you may want to register them with the American Rabbit Breeders' Association (ARBA). Unlike most other livestock, rabbits are not automatically eligible for registration if their parents are registered and rabbits with no registered parents can be registered if they are examined and passed by a licensed registrar. You must provide a three-generation pedigree as seen in the graphic below. By registering your rabbit, it is eligible for a grand champion certificate. Only rabbits with no disqualifications can be registered. Registered rabbits with registered parents and grandparents will get a red and white seal on their papers. Rabbits must be at least 6 months old before they can be registered. For more information go to: <http://www.thenaturetrail.com/showing-rabbits/registration/>

Name Ear No. _____ Color _____ Reg. No. _____ Weight _____	Sire _____ Ear No. _____ Color _____ Reg. No. _____ Weight _____	G. Sire _____ Ear No. _____ Color _____ Reg. No. _____ Weight _____	GG Sire Ear No. _____ Color _____ Reg. No. _____ Weight _____
		G. Dam Ear No. _____ Color _____ Reg. No. _____ Weight _____	GG Dam Ear No. _____ Color _____ Reg. No. _____ Weight _____
	Dam Ear No. _____ Color _____ Reg. No. _____ Weight _____	G. Sire Ear No. _____ Color _____ Reg. No. _____ Weight _____	GG Sire Ear No. _____ Color _____ Reg. No. _____ Weight _____
		G. Dam Ear No. _____ Color _____ Reg. No. _____ Weight _____	GG Dam Ear No. _____ Color _____ Reg. No. _____ Weight _____
Bred by Name Address	Sold to Name Address		



Selection: Pedigree/Performance Evaluation

Proper selection is a critical factor in establishing a good breeding program. The goal of animal selection is to produce an animal that will yield/produce high-quality products at a low cost to the farmer and the consumer. This goal is the foundation of the standard “ideal animal” in the various species. That is the animal that expresses, to the highest degree, traits that are of economic importance like milking ability, litter size, body weight, carcass merit, or even coat color is the type selected.

The expression of observable or measurable traits is called the animal’s *phenotype*. Phenotype is affected by both heredity and environment. The inherited portion of a trait is referred to as a *genotype*. How well an animal expresses its genotype is affected by the environment in which it is raised. Therefore, when making selected matings, the use and management of the offspring should be considered.

We use both visual appraisal and performance records when selecting breeding stock. The following section outlines various traits and methods used to evaluate breeding animals. Use and management are expressed as *scenarios*.

Performance Evaluation

How an animal looks may be important on the show table but how that animal performs is more important to the farmer. With advancements in the understanding of heredity and the increased use of computers for keeping records, the use of genetic information in selected matings has become easier. By keeping records on desirable traits and then carefully selecting males and females to be mated using the available data, producers can improve the genetics, and thus the performance of their offspring.

Performance Data

There are several types of performance data that, when used properly, are important tools in the selection and genetic improvement of animals. Many breed associations and commodity groups provide information, assistance, and technical support to producers wishing to collect and use performance data.

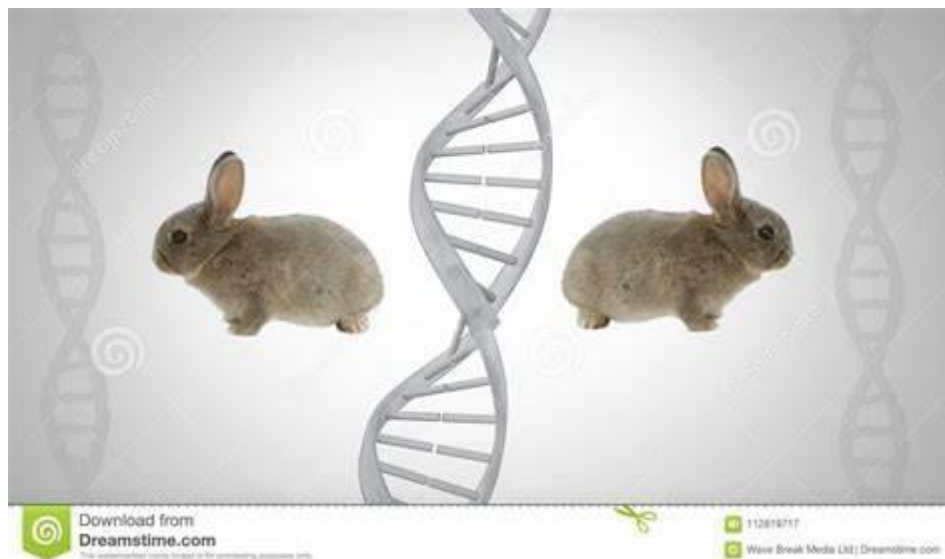
- Conception rate
- Litter size born
- Litter size weaned
- 21-day total litter weight
- 56-day total litter weight
- Dressing percentage
- Type

Genomics

Genomics is the study and mapping of a species or individual animal's genome, or all of the animal's genes and their interactions with one another. The expression of the genome is what one sees in the animal's phenotype or performance/appearance. In short, genomics is the study of an animal's DNA. DNA, or deoxyribonucleic acid is composed of two polynucleotide chains that coil around each other to form a double helix. The chain contains the genetic instructions for the development, function, growth, and reproduction of an organism. For animal agriculture, the genome also influences (along with nutrition, health, environment, etc.) the animal's quality and quantity of meat, milk, reproductive life, growth rate, heat tolerance, and about any other trait one can imagine. Understanding the blueprint of a particular animal at the genetic level by studying the animal's genetic code has immense ramifications for animal agriculture. Livestock genomics is an emerging field in which breeding sires and dams with specific genes that directly influence specific traits is possible (muscling, marbling, milk fat, milk production, sexual maturity, etc.). Over the past 20 years, the use of genomics has emerged in livestock and poultry production. Unlike simple genetics, genomics studies the entire genetic makeup including all of the interactions of each gene with all the other genes in an animal. Producers can utilize genomic testing to predict future profitability. To this point, the genome of just about every major livestock species has been mapped, including cattle, goats, sheep, swine, rabbits, and poultry. Genomics is currently primarily used as a tool to make decisions on selected breedings to result in offspring with targeted genetics. The potential for editing genes to produce offspring with targeted traits exists but is not currently utilized because the regulatory frameworks are still being developed. Still, genomics is among the latest cutting-edge technologies in animal agriculture and animal reproduction management.

Here is an interesting article on rabbit genomics:

<https://gsejournal.biomedcentral.com/articles/10.1186/s12711-022-00696-9>



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