**Extension of semen**

The main objective in extending semen is to increase the volume of the ejaculate so that to protect sperm during cooling and extend sperm life.in natural mating one ejaculate , and often more is used to inseminate one female, where as through artificial insemination and the extension of semen one ejaculate may be used for several hundered female. In the bovine each ejaculate averges 5ml of semen, containing between 0.8 and 1.2 billion spermatozoa per milliter , therefore, that the averge ejaculate from a normal bull can be used to inseminate 300 to 500 cows if the volume is increased by appropriate extension.extension depened on sperm activity and semen ejaculate concentration

Extenion = 1 ml semen : 50 ml extension

Extension = 1ml semen: 10 ml extension

Extension = 1ml semen: 200 ml extension

**Such as:**

Semen ejaculate volume = 5 ml

Sperm concentration = 1000 million / ml

Extension = 1:50

Extension volume = 250 ml inseminate =250 cow

1ml extension contain = 20 million sperm

**Characteristics of good extender ((a diluter))**

1-Adiluter must be isotonic with semen ( have the same free ion concentration )

2.9 % sodium citrate dihydrate or other suitable salt.

2-Buffering capacity must be provided (( prevent PH change by neutralizing acid produced by sperm metabolism – isotonic sodium citrate solution ))

3-Diluters must protect the sperm from cold shock injury during the cooling from body temperature to 5c – lecithin and lipoprotin from egg yolk or milk

4-Nutrient must be provided for sperm metabolism –egg yolk , milk and some simple sugars.

5-Microbial contamination must be controlled – antibiotics such as gentamicin , tylosin and lincospectin.

6-Sperm must be protect from injury during freezing and thawing – glycerol

**Extender components**

1. Sugars such as ((glucose, fructose, lactose))
2. Buffer salts such as ((sodium citrate, sodium phosphate,Tris (hydroxymethyl).))
3. Antibiotics such as ((penicillin, streptomycin))
4. Egg yolk
5. Milk
6. Glycerol
7. Hormones such as (( oxytocin))
8. Vitamin such as ((vit B12))

**Type of extender**

**1-Egg – yolk extenders**

Egg yolk citrate is one of the commonly used semen extender. Egg yolk contain to lecithin and lipoprotein which is sperm protective from cold shock . only the yolk portion is used because egg white contains a substance (( lysozyme )) toxic to spermatozoa. Variation from 5 to 50 percent in the amount of egg yolk used appear to give good results , however, lower concentration ((20 percent or less)) are commonly used today.

**2-Milk extenders**

Whole homogenized milk and skim milk satisfy the requirements of a good semen diluter . milk heated to normal pasteurization temperature contains a material, ((lactenin)) which is spermicidal . heating the milk to 90c to 95c for 10 minutes inactivates lactinin . whole milk has the disadvantage of poor sperm visibility under the microscope . this problem is apparently caused by light refraction by the fat globules contained in the whole homogenized milk.

**3-Tris buffered – yolk extender**

Tris buffered yolk diluter is prepared by adding 20% fresh egg yolk to the tris buffered solutions ((hydroxymethyl))

**4-Extender for frozen semen**

The use of glycerol and selected sugar is important in the extension of semen to be frozen

**Buffer solutions used in semen diluters**

**1-Phosphate buffer solution**

The phosphate buffer solution was a component of the first satisfactory semen diluter reported in 1939. **It was composed of 2.0g of Na2Hpo4 .12H2o and 0.2g of KH2po4 insufficient distilled water to make 100ml of solution**. Phosphate buffer has not been as popular because it produces an opague mixture when added to egg yolk , resulting in poor sperm visibility.

**2-Citrate buffer solution**

The suitability of sodium citrate dihydrate solution as buffer for semen was discovered in 1941. **It is composed of 2.9g of sodium citrate dihydrate in sufficient distilled water to make 100ml of solution** . the sodium citrate buffer soon replaced the phosphate buffer in preparing semen diluters. When mixed with egg yolk it leaves the mixture sufficiently transparent to give good visibility of the individual sperm.

**3-Tris buffers solution**

Tris ((hydroxy methyl )) amino methane has been extensively studied as a buffered medium for bull and boar sperm . tris buffer can be made by mixing(( 2.42g of tris (hydroxy methyl) + 1.38g of citric acid monohydrate + 1g of fructose + with sufficient distilled water to make 100ml of buffer))