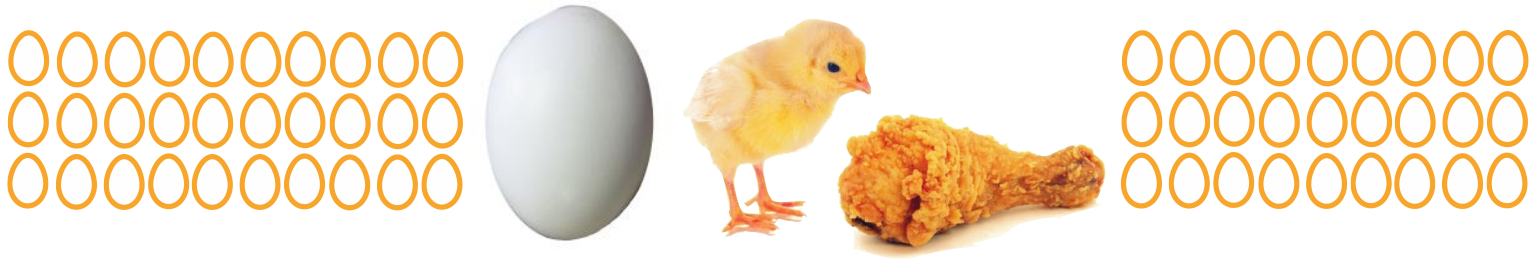

Embryonic Development and Hatchery Management

AgScience Poultry Science Curriculum

Chapter.6

Introduction

A well run hatchery is critical for any integrated poultry company

- **Directly impacts profitability**
- **Hatch of fertile**
- **Chick quality**

Automated hatchery equipment drastically improved production efficiency

- **One factor that has lead to improvement in production poultry genetics**

Many commercial hatcheries are completely automated and advancements …

Egg supplies all needs of chick – nutrition protection etc

- **In many ways mimic the way hen would treat eggs in nest**

Hatching Eggs – Role of the Breeder Farm

At the breeder farm:

Eggs unsuitable for hatching should be removed

- **PICTURES OF UNSUITABLE HATCHING EGGS**

Eggs packed on incubator trays or cart

- **Often eggs will not be handled again**
- **Big end up!**
  - **Chick needs to develop with head near air cell**
  - **If egg placed in tray with big end down hatchability can be decreased approximately 10%**

PICTURES OF CARTS ON FARM STORAGE??

On farm egg storage conditions:

- **Temperature – 65oF**
- **Humidity – 75%**
  - **Must prevent dehydration prior to incubation**
- **On farm no more than 2 to 3 days**
- **Pick up eggs from farm 2 times per week**

Embryonic Development

Embryo development can be broken into 2 phases

Phase 1 – Occurs in hens body prior to oviposition

4.5% of embryonic development

1st cell division 3 hr post-fertilization

Phase 2 – After oviposition if conditions are correct

Temperature above 70 ¼°F

Collect eggs timely and get into on-farm cooler

In a fertile egg there are 3 additional embryonic membranes

Allantois – Breaks down albumen, aids in Ca absorption, storage of excretory products

Chorion – fuses wit allantois and shell, produces carbonic acid releases Ca from shell, weakens shell

Amnion – Surrounds and protects embryo

Embryonic Development

Hatchery Responsibilities

Primary hatchery responsibilities

Fertile Egg

On-farm pick-up
Transportation
Incubation
Hatching

Chick

Processing
Vaccination
Counting
Holding
Delivery

Hatchery Responsibilities

Flow of eggs through hatchery

Clean → **Dirty**

Dirty → **Clean**

In a commercial hatchery even air flow is controlled

Positive pressure in clean rooms – air pushed out

Unloading dock **Egg Storage** **Incubation** **In-ovo Vaccine**

Loading **Holding** **Chick Storage** **Hatchers**

Egg Storage

Egg Storage is critical for maintaining viable embryos

During storage temperature of eggs should not exceed 58-64.25oF

- **Maintain temperature towards high end could reduce sweating when begin incubation**
  - **Sweating can reduce air exchange**
  - **Could cause cross-contamination**

Relative humidity should be maintained around 60-70%

- **RH control maintains rate of moisture loss through shell membranes and pores**

Incubator (Setter)

In the incuabtor the majority of embryo development will occur
In many ways attempted to mimic nature and the way hen would care for eggs

- **Chicken eggs in incubator days 1-19**
- **Turkey eggs in incubator days 1-25**

Egg Rotation

- **Commonly done 1 time/hour**
- **At least 6-8 times/day**
- **Prevents embryo from sticking as albumen thins**

Temperature

- **Chicks – 98.6oF – 102.4oF**
- **Poults – 97.8 – 99.2oF**
- **Sometimes hatchery dependent**

Embryos have low tolerance for temps over 104oF; particularly towards end of incubation
-For short time is ok
- Prolonged will decrease hatchability, and increase abnormal chicks

Relative humidity

50-60%
Too low – chick losses too much moisture
Too high – chick losses too little moisture
Egg should loss 10.5-12% moisture during incubation

Incubator – Measuring Relative Humidity

Monitoring temperature and relative humidity throughout incubation is critical

Temperature is measured using the dry bulb temperature

- **Thermometer in the incubator**

Relative humidity is measured at the intersection of the dry bulb temperature and the wet bulb temperature on psychometric chart

- **Wet bulb temperature – temperature of bulb immersed in water**

Insert chart excerpt

Setters display the wet bulb temperature

- **Dry bulb temperature 97-100oF**
- **Wet bulb temperature 79-80oF**
- **RH – 50-60%**

Hatcher

At transfer, eggs will be moved to hatching trays
At commercial hatcheries this is done automatically using machines with suction cups

Egg Rotation

- **No longer required in the hatcher**
- **Chick is covered with feathers and sticking is no longer a concern**

Temperature

- **Remains important**
- **Chicks particularly sensitive to high temperatures**

Relative Humidity

- **Should increase in the hatcher**
- **Chicks – 75%**
- **Poults – 80-85%**
- **Aid in shell softening and ease in chick hatching**

Air Quality

Air exchange across the shell as the embryo grows

- **Oxygen absorbed through shell pores and membranes**
- **Embryos producing CO2 through normal metabolism**
- **Controlling CO2 critical**

In the hatcher air quality is most important

- **Lots of fresh air required for hatching (physically demanding!)**
- **1% drop in O2 in hatchery = 5% drop in hatchability!**
- **During hatching chicks will pip through the air cell to get first breath of fresh air to continue hatching**

Chick Sorting and Processing

Not all of eggs set in the incubator will hatch

- **Un-hatched eggs as well as empty shells must be separated from live chicks**

Most hatcheries use automatic sorting machines

Insert picture

Chick counting and processing is completed with a combination of automatic machinery and manual labor

- **Broiler hatcheries much more automated than turkey hatcheries**

Chick processing procedures: INSERT PICTURES

- **Vaccinating**
- **Toe-trimming**
- **Beak conditioning**
- **Sexing**
- **Company and bird-use dependent**

Chick Holding

Chicks counted and placed in boxes

100 chicks/box

Moved to heated storage area to await delivery to grow-out farms

PICTURES OF CHICK BUSES ETC

Climate controlled vehicles used to transport chicks to farms

Chick busses

Hatchery Quality Control

True fertility – refers to the number of eggs that are fertile at the point of oviposition

- **Used for evaluating breeder flock performance or inseminating crew efficiency**

True fertility is evaluated between 10 and 12 days of incubation

- **Eggs candled; developing embryo will be evident**
- **Early dead is the term used to describe eggs that don't appear to be developing at this point in incubation**
- **Clear eggs must be broken open to distinguish between early dead and infertile**

INSERT PICTURE – Fertile/infertile/early dead

True fertility = # of fertile eggs/# of eggs set *100
Should ideally be 96%

Hatchery Quality Control – True Fertility Calculation

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Hatchery Quality Control

Hatchability is the measure of most importance to the hatchery

- **Direct measurement of hatchery performance**
- **Can be effected by many factors**
- **Most fertile eggs brought to the hatchery should hatch**
- **Low hatchability can indicate problems with incubator, hatcher conditions**

Hatchability can be expressed as a percentage of total eggs set OR fertile eggs set

Hatch of fertile = # of eggs that hatched / # of fertile eggs set

Hatchability = # of eggs hatched / # of eggs set

Ideal hatchability – 86%

Hatchery Quality Control – Hatchability Calculation

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Hatchery Quality Control

Other factors affecting hatchability

- **Extended egg storage time – beyond 5 d**
- **Breeder hen age – shell thickness, timing of oviposition**