DR. B. V. RAO INSTITUTE OF POULTRY MANAGEMENT & TECHNOLOGY, Uruli Kanchan – 412 202, Pune, India

Welcomes

Participants from Bangla Desh

For the

HATCHERY MANAGEMENT COURSE

Conducted from

21st July to 9th August, 2003

Placed below are the Handouts of

Hatchery Management Course

INDEX

INTRODUCTION

DR. B. V. RAO INSTITUTE OF POULTRY MANAGEMENT & TECHNOLOGY
Uruli Kanchan- 412 202, Pune, India

Dr. B. V. Rao Institute of Poultry Management and Technology, Uruli Kanchan- 412202, Pune, India conducted a 3-weeks Special Programme in "Hatchery Management" at the request of Agro-based Industries and Technology Development Project-II, AMB Tower, Plot 8, Road 113/A, Gulshan-2, Dhaka-1212 of Bangla Desh.

The Course was conducted from 21st July to 9th August, 2003. A tentative programme for the Course was drawn up and sent to ATDP-II for their perusal and approval. It included all the relevant areas of Hatchery Management.

Copy of the Programme is at Page No. 5.

On arrival of the Team from Bangla Desh, number of modifications were done at the request of the Team, to include their revised requirements, like lectures/demonstrations, visits to large Layer/Broiler Parent Breeder farms, number of large-scale Hatcheries, Feed Mill, Hatchery equipment and Automatic Feeder/Waterer manufacturing factory, Large-scale commercial Broiler farm, Poultry Hatchery / Equipment Manufacturing Factory, Large Poultry Processing Plant, Small Poultry Processing Unit, Poultry Diagnostic and Research Centre etc.

In addition to the in-house Faculty of the Institute, number of Visiting faculty- Specialists having a Ph.D. and with 20-30 years of practical experience in their area of specialization, had taken Guest lectures, as well as practicals.

The Institute made all-out efforts to meet the requirements of the Team as indicated by them.

The Team also visited Mrs. Anuradha J. Desai, Chairperson, Venkateshwara Group of Companies and had a detailed discussion about the organization of the Programme. She also assured the participants full cooperation of the Venkateshwara Hatcheries Group for any assistance in development of Poultry industry in Bangla Desh.

We assure our total commitment to meet the future requirements of ATDP-II in any area of Poultry farming and look forward to the continued cooperation between the Institute and ATDP-II in future.

DR. B.V.RAO INSTITUTE OF POULTRY MANAGEMENT & TECHNOLOGY
Uruli Kanchan -412 202, Pune, India

COURSE SCHEDULE OF POULTRY HATCHERY MANAGEMENT COURSE

21st July to 9th August, 2003

DATE/DAY	1st Session	2nd Session	3rd Session	4th Session
Jul 21, 03 Monday	Registration of Participants	Introduction to IPMT **Dr. N. K. Praharaj**	Visit to VHL, Bhigwan Broiler Breeders Mgmt	
Jul 22, 03 Tuesday	Poultry Industry in India **Dr. A. L. Bhagwat**	Breeding Principle **Dr. A. L. Bhagwat**	IPMT Layer Breeders Mgmt **Dr. S. R. Rakhe**	
Jul 23, 03 Wed'day	Hatchery Design- Site Selection Power, Elec, Water, Ventilation **Dr. A. B. Chavan**		Visit to VIL, Naigaon Intro. to Naigaon Hatchery **Dr. A. M. Phutane**	
Jul 24, 03 Thursday	Hatchery Equipments/Types of Incubators **Mr. V. N. Chandorkar/Mr. S. S. Kulkarni**		Visit to VIL, Naigaon Design of Hatchery **Dr. A. M. Phutane**	
Jul 25, 03 Friday	Embryology- Growth of Embryo **Dr. A. L. Bhagwat**	Selec, Grading Storage, Setting of H. Eggs **Dr. A. M. Phutane**	Visit to VIL, Naigaon Demo of Selec, Grading Storage, Setting of eggs **Dr. A. M. Phutane**	
Jul 26, 03 Saturday	**H O L I D A Y**			
Jul 27, 03 Sunday	PRACTICAL- SELEC, GRADING, STORAGE,OF H. EGGS VIL HATCHERY, NAIGAON			
Jul 28, 03 Monday	Hatchery Principles- Temperature, Humidity, Turning & Ventilation **Dr. A. B. Chavan**		Visit to VIL, Naigaon Demo. of Hat. Principles **Dr. A. M. Phutane**	
Jul 29, 03 Tuesday	VISIT TO VENKY'S PROCESSING PLANT, BAUR & VJ/VR FACTORY, JAMBHUL **Dr. Panda / Mr. V. N. Chandorkar**			
Jul 30, 03 Wed'day	Hatch. Project and Budgeting **Mr. S. Kulkarni**	Record Keeping & Maint. of Hatchery **Dr. A. M. Phutane**	Visit to VIL, Naigaon Demo. Of Records, Maint. **Dr. A. M. Phutane**	
Jul 31, 03 Thursday	Hatch. Hygiene, Sanitation **Dr. R. K. Phatak**	Hygiene Monitoring and Quality control **Dr. Deepa Deshpande**	Visit to Sahyadri Hatchery Demo. Of Hygiene etc.	
Aug 1, 03 Friday	VISIT TO VHL HATCHERY, GIRINAGAR **Dr. K. G. Choudhary**			

Aug 2, 03 Saturday	PRACTICAL- CANDLING, GRADING, TRANSFER TO HATCHER VIL HATCHERY, NAIGAON	
Aug 3, 03 Sunday	**H O L I D A Y**	
Aug 4, 03 Monday	Role of Nutrition for Fert/Hatch Pointers for Good Nutrition of Breeders **Dr. R. D. Brahmakshatriya**	VISIT TO FEED MILL Demo. Feed Ingredients **Dr. S. V. Sawant**
Aug 5, 03 Tuesday	Diseases affecting Fert/Hatch Pointers for Disease Prevention **Dr. S. N. Kshirsagar**	VISIT TO PATH. LAB Slide Show- Diseases **Dr. N. S. More**
Aug 6, 03 Wed'day	Trouble shooting in Hatchery **Dr. S. N. Kshirsagar/**	Panel Discussion on Trouble shooting with experts **Dr. S. N. Kshirsagar/** **Dr. R. D. Brahmakshatriya/** **Dr. G. N. Kolte/ Dr. K. G. Choudhary**
Aug 7, 03 Thursday	PRACTICAL- PULL OUT, GRADING, AND DESPATCH	VACCINATION, PACKING
Aug 8, 03 Friday	Hatchery Waste Disposal **Dr. A. M. Phutane**	VISIT TO Poultry Diagnostic & Research Centre, Loni **Dr. M. M. Chawak**
Aug 9, 03 Saturday	Feed Back - Valedictory Function	Farewell to Trainees

Session- 1:

Introduction to Dr. B. V. Rao Institute of Poultry Management and Technology, Uruli Kanchan – 412 202, Pune

Presented By

Dr. N. K. PRAHARAJ

M. V. Sc, Ph. D. (USA)

Director, Dr. BVR IPMT, Uruli Kanchan.

DR. B. V. RAO INSTITUTE OF POULTRY MANAGEMENT & TECHNOLOGY

Uruli Kanchan- 412 202, Dist: Pune, India

Dr. B. V. Rao Institute of Poultry Management and Technology (BVR IPMT, Formerly known as Institute of Poultry Management of India), **Uruli Kanchan**, is a unique Institute in this part of the World, set up to impart sound theoretical and comprehensive practical training in Poultry Management on modern and scientific lines to the existing and prospective poultry farmers. The Institute gives more emphasis on practical, hands-on-the-job training. As such, trainees spend about 75 % of the time on farm/laboratories and about 25 % in class rooms on theory.

Set in a verdurous expanse of 46 acres of unbroken landscape, BVR IPMT lies near Uruli Kanchan, a tiny town, 33 Kms. away from Pune city, about 185 Kms from Mumbai.

The Institute was formally inaugurated on 16th May, 1987. At BVR IPMT, we have created excellent in-house facilities for imparting practical, all-round training, like:

- Layer farm with 45,000 layer birds capacity,
- Broiler farm with 36,000 broiler birds capacity,
  (With normal open sheds for tropical and sub-tropical climate and also Environment controlled shed - a High Tech poultry housing)
  These large farms are used for imparting practical training to trainees.
- Pathology, Nutrition and Microbiology Laboratories,
- Feed Mill - to impart training in feed technology,
- Well stocked Library, with Audio-visual section,
- Modern Computer Section.

Through Venkateshwara Hatcheries Group of companies, which is the Largest integrated Poultry Group in Asia and who are the sponsorers of the Institute, we have access to additional specialised facilities like large Hatchery, large scale Feed Mill, Diagnostic Laboratories, Vaccine and Animal Health Product Divisions, Egg and Poultry Processing Plants, Fast Food Industry etc. In addition to the In-house, Core-Faculty of the Institute, highly qualified and experienced Subject-matter Specialists of the VH Group visit the Institute as Visiting Faculty. This support of VH Group is the basic strength of the Institute.

The Institute primarily conducts three regular and four short-duration, specialised courses to meet the immediate requirements of the present and prospective poultry farmers.

BVR IPMT has facilities to impart training to ladies also. Lady candidates not only from many states of India, but from overseas also have undertaken training at BVR IPMT. Till date, *i.e*., in a span of about 16 years, the Institute has trained over 3500 trainees from India and abroad.

- The Institute has conducted special training programmes for **Government of India**, Ministry of Agriculture and Ministry of Food Processing Industries, New Delhi also.
- **The Food and Agriculture Organization of the United Nations (FAO of UN), Rome** had sponsored senior officers from developing countries like Bangla Desh and Vietnam, for training programmes of different durations in specialised areas of Poultry farming, depending on their individual needs, as tailor-made programmes.
- **Private candidates from overseas** like Bangla Desh, Malaysia, Middle East (Sultanate of Oman) and Nepal have also undergone different training programmes on their own.

Institute also organized a Special Training Programme for Faculty of Funtuna Poultry Training School in Nigeria, to train prospective poultry farmers in Nigeria.

To meet the requirements of International standards, for overseas candidates, as well as for Senior Executives from private and public sector organisations, the Institute has constructed a new Modern residential facility.

The Institute has also conducted special, tailor-made programmes as per the need of clients like **Director, Animal Husbandry, Andhra Pradesh, Hyderabad; National Bank for Agriculture and Rural Development, Mumbai; M/s. Godrej Agrovet Industries, Mumbai, M/s. Hoechst Roussel Vet Pvt.Ltd., Pune, etc.**

The Institute also undertakes experiments and Research in various areas of Poultry Science, *i.e*., Applied Research, which will reduce the cost of production and increase the margin of profit of poultry farmers.

The State Agricultural University has recognized the Institute as a Research facility for conducting research for M.V.Sc and Ph.D. students.

Government of India, Ministry of Science and Technology, New Delhi, has recognised the Institute as a *"Scientific and Industrial Research Organization (SIRO)".*

The Institute is engaged in conducting Scientific Field Trials for various organisations/ pharmaceutical companies etc. to test their products, to obtain the data under Indian Agro-climatic conditions, before releasing the product into market.

The Institute has been offering facilities for conducting field trials for different pharmaceutical products/ enzymes/ probiotics/ growth promoters etc. About 25 Indian as well as Multi National Companies have availed of this facility in last 2 years. The Institute has conducted trials for/ on behalf of large number of companies uptil now.

The Institute is also in a position to offer practical and relevant training to the Fellows and entrepreneurs in the region ranging from Africa, Middle-East to South-east Asian countries, - the tailor-made courses, as per their need and requirements.

We believe that we are in a position to be of greater assistance in meeting the training/ manpower development requirements of this region.

It will thus be seen that BVR IPMT has all the necessary physical facilities, highly qualified and experienced in-house, as well as visiting Faculty to take up any need-based, client oriented, tailor-made training programme, and to be of assistance, which can be specially relevant to this part of the World.

Dr. N. K. Praharaj, M.V.Sc, Ph.D. (USA) is the new Director of the Institute.

A Video CD giving information about the Institute is appended at Annexure-I. This CD was prepared during 1996 and is being revised. (Please double-click at Annexure-I for Institute Video)

Another Video CD giving information about **Venkateshwara Hatcheries Group, the largest integrated Poultry Group in Asia and sponsorer of the Institute is also appended at** Annexure-II**.** (Please double-click at Annexure-II for Venkateshwara Hatcheries Ltd. Video)

For any additional information, please feel free to contact:

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Session- 2:

POULTRY DEVELOPMENT

Presented by
DR.A.L.BHAGWAT
M.S., Ph. D (USA)
CHIEF ADVISOR, DR. BVR IPMT, URULIKANCHAN

INDIA - AGRICULTURAL COUNTRY

- **ANIMAL HUSBANDRY / LIVESTOCK SECTOR IMPORTANT COMPONENT OF AGRICULTURE**
- **WITH MODERN SCIENCE & TECHNOLOGY - POULTRY CAN PLAY A VITAL ROLE IN IMPROVING SOCIO-ECONOMIC CONDITIONS OF RURAL MASSES.**

ORGANISED POULTRY FARMING

- **DEVELOPED IN JUST 3 – 4 DACADES**
- **EARLIER BACKYARD VENTURE**
- **NOW STRONG AGRO- BASED INDUSTRY**

IT HAS ACHIEVED UNPRECEDENTED RATE OF GROWTH IN JUST 3 – 4 DECADES OF DEVELOPMENT.

POULTRY FARMING - ADVANTAGES

- **PROVIDES - PROTEIN-RICH FOOD IN FORM OF EGGS AND POULTRY MEAT.**
- **BRIDGES GAP BETWEEN REQUIREMENT AND AVAILABILITY OF PROTEIN – RICH FOOD. - ADAPTS TO ALL CLIMATIC CONDITIONS**
- **PROVIDES GAINFUL EMPLOYMENT TO SELF AND OTHERS, SPECIALLY IN RURAL AREAS.**
- **THUS, REDUCES UNEMPLOYMENT AND HELPS IN RURAL DEVELOPMENT.**

POULTRY FAMING – POPULAR DUE TO :

- **IT PROVIDES QUICK RETURNS**
- **CAN ADAPT ITSELF TO ALL CLIMATIC CONDITIONS**
- **REQUIRES LITTLE LAND, SMALLER CAPITAL, ORDINARY SKILLS OF MGMT.**
- **PROVIDES EMPLOYMENT, REDUCES UNEMPLOYMENT PROBLEM.**
- **CONVERTS AGRI- INDUSTRIAL BY-RRODUCTS INTO PROTEIN RICH FOODS – EGGS AND MEAT.**
- **USES NON-AGRICULTURAL LAND OF PRODUCTION**
- **REQUIRES LESS WATER THAN AGRICULTURE**

POULTRY BUSINESS

BREEDER FLOCK MGMT & HATCHERY (SPECIALISED SECTION)		**COMMERCIAL POULTRY**	
		LAYER (EGGS)	**BROILER (MEAT)**
LAYER BREEDERS 72 WEEKS	**BROILER BREEDERS 66 WEEKS**	**72 WEEKS 300 + EGGS**	**6 – 7 WEEKS 1.8 – 2.0 KGS**

CHICK - 0 TO 8 WEEKS
GROWER - 9 TO 20 WEEKS
LAYER - 21 TO 72 WEEKS

POULTRY FARMING

LAYERS AND BROIERS

ENTIRELY DIFFERENT GENETIC MATERIAL.

LAYERS - SMALL, THIN BODIED, LEAN, LOWER BODY WEIGHT LOWER FEED CONSUMPTION, HIGHER EGG PRDN.

BROILERS - LARGE BODIED, PLUMP, FAST BODY GROWTH, HIGHER BODY WEIGHT, HIGHER FEED CONSUMPTION, LOWER EGG PRODUCTION , ALSO CALLED AS MIRACLE BIRDS

BROILERS

- **SPECIAL KIND OF BIRDS PRODUCED FOR MEAT PURPOSE**
- **PRODUCED BY GENETICIST/BREEDER WITH KNOWLEDGE OF GENETICS AND SELECTION AND BREEDING PRINCIPLES**
- **HIGH RATE OF GROWTH**

BROILERS

BODY WT.	BROILER CHICK		RATE OF GROWTH
DAY-OLD AGE	40 GMS	)	
		)	50 TIMES
6-7 WK.	2000 TO	)	WEIGHT
	2050 GM.	)	AT BIRTH

BROILERS

TO GIVE EXAMPLE, TO HAVE SAME RATE OF GROWTH LIKE BROILER, WHAT SHOULD BE THE WEIGHT OF HUMAN CHILD AT 6-7 WKS AGE?

BODY WT.	BROILER CHICK	HUMAN CHILD
DAY-OLD AGE	40 GMS	3 KG.
6-7 WK.	2000 TO 2050 GM.	150 KG.

POULTRY FARMING

WHICH ONE TO START?

LAYERS OR BROILERS?

1) TECHNICAL COMPETENCE/KNOWLEDGE

EXPERIENCE
PRACTICAL TRAINING

2) PROJECT PREPARATION

A) PRE-INVESTMENT PHASE
MARKET SURVEY IS EXTREMELY IMPORTANT BEFORE TAKING A DECISION ABOUT STARTING EITHER A LAYER OR BROILER FARM.

MARKET SURVEY – ADVANCE PLANNING

- **LOCATION OF MARKET**
- **DEMAND AND SUPPLY POSITION**
- **SCOPE OF SALE**
- **DEMAND- REGULAR OR SEASONAL**
- **PURCHASING HABITS/PREFERENCES OF CUNSUMER**
- **AVAILABILITY OF INPUTS/RAW MATERIAL**
- **MARKETING INFRASTRUCTURE**

  OUTLETS/SUPPORT

  CORPORATION/FEDERATION/COOP SOCIETY

  B) <u>PROJECT CAPACITY</u> -

- **DEMAND OF PRODUCT/SCOPE OF SALE**
- **INVESTMENT CAPACITY**
- **TYPE OF BUSINESS**

  OWNERSHIP

  PARTNERSHIP

  C) <u>TECHNICAL KNOWLEDGE</u> -

- **EXPERIENCE**
- **TRAINING -PRACTICAL**

<u>POULTRY FARMING</u>

IMPORTANT OPERATIONAL POINTS

<u>LAYERS</u>	<u>BROILERS</u>
CYCLE - 72 WEEKS **8 WEEKS BROODING**	**CYCLE - 6 - 7 WEEKS** **ALL TIME BROODING**
DEMAND FOR EGGS **GENERALLY REGULAR**	**DEMAND FOR BROILERS** **GENERALLY SEASONAL**
SHELF LIFE OF EGGS - **2 TO 3 WEEKS**	**SHELF LIFE – NO SHELF LIFE**

MARKETING- NOT VERY CRITICAL

MARKETING - CRITICAL

CAPITAL INVESTMENT- HIGHER

CAPITAL INVESTMENT- LOWER

FINANCIAL RATIOS RELATIVELY LOWER

FINANCIAL RATIOS RELATIVELY HIGHER

POULTRY FARMING

AS SUCH, DECISION ABOUT LAYERS OR BROILERS?

DECISION WILL HAVE TO BE TAKEN BY THE ENTREPRENEUR ON THE BASIS OF FOLLOWING :

1) DEMAND FOR THE PRODUCTION / SCOPE FOR SALE

2) POTENTIAL AND FACILITIES OF MARKETING

3) TECHNICAL COMPETENCE

4) INVESTMENT CAPACITY

RATIONAL APPROACH IS NECESSARY

POUTLRY FARMING

LAYER OPERATION

3 DIFFERENT AGE GROUPS - CHICKS,- GROWERS, LAYERS
CONVENTION - TO PURCHASE 4 FLOCKS, EACH 1/4TH OF TOTAL PLANNED CAPACITY

1+1+4 DESIGN

1 BROODER, 1 GROWER AND 4 LAYER HOUSES
(FOR OPTIMUM UTILISATION OF INFRASTRUCTURE)

SMALL SIZE OPERATION - ON FLOOR DEEP LITTER

FEEDERS - LINEAR, SEMI/FULLY AUTOMATIC
WATERERS - MANUAL OR AUTOMATIC.
EGG / NEST BOXES

LARGE SIZE OPERATION

IN CAGES - (HIGH RISE HOUSE)
FEEDERS - CAGE FEEDERS

WATERERS - CHANNEL OR NIPPLES
EGGS TRAY – WITH CAGE

BROILER OPERATION

GENERALLY ON DEEP LITTER SYSTEM
HOUSING - CONVENTIONAL OPEN SHEDS OR
ENVIRONMENT CONTROLLED HOUSE

PLACEMENT OF FLOCKS

WEEKLY - EVERY WEEK NEW FLOCK
FORTNIGHTLY - EVERY TWO WEEKS NEW FLOCK
MONTHLY - EVERY FOUR WEEKS NEW FLOCK
BI-MONTHLY - ALL-IN ALL-OUT SINGLE AGE

IDEALLY, ALL-IN ALL-OUT SYSTEM –
SINGLE AGE GROUP FLOCK SHOULD BE REARED

AS NUMBER OF AGE GROUPS INCREASE, INCIDENCE OF DISEASE(S) MAY INCREASE.

FEED

EXTREMELY IMPORTANT COMPONENT OF RECURRING EXPENDITURE ON THE FARM

READY-MADE -

- **GENERALLY RECOMMENDED FOR SMALLER OPERATIONS**
- **DESIRABLE INITIALLY EVEN FOR LARGER OPERATIONS**
- **SPECIALISED PREPARATIONS – CRUMBLES/PELLETS**
- **THOUGH SLIGHTLY COSTLIER-BETTER FEED EFFICIENCY**

OWN FEED

- **CAN START FOR LARGER OPERATIONS SUBSEQUENTLY**
- **HIGHER INFRASTRUCTURE, COMPETENCE, INVENTORY**

MATERIALS REQUIREMENT -

- **ELECTRICITY**
- **GOOD QUALITY AMPLE WATER SUPPLY**
- **HIGH QUALITY CHICKS**
- **FEED/FEED INGREDIENTS**
- **VACCINES, MEDICINES, DISINFECTANTS ETC.**

EQUIPMENTS REQUIREMENT-

- **DEPENDS METHODS OF MANAGEMENT**
  TYPE AND NUMBER OF SHEDS
  NUMBER OF BIRDS REARED
- **ADDITIONAL/ANCILLARY EQUIPMENTS**

STAFF/MANPOWER REQUIREMENT

BASED ON TYPE OF OPERATION
LAYERS - DEEP LITTER/CAGES
BROILERS - CONVENTIONAL SHED -
ENVIRONMENT CONTROLLED SHED

TYPE OF EQUIPMENT -
MANUAL, SEMI / FULLY AUTOMATIC

GENERAL INDUSTRY STANDARDS –

LAYERS – CAGES – 2500 LAYERS/PERSON
BROILERS – CONVENTIONAL SHED – 300 BIRDS/PERSON
E. C. HOUSE – PART-TIME LABOUR

POULTRY DEVELOPMENT – ACHIEVED PHENOMENAL RATE OF GROWTH

(IN MILLIONS)

ITEM	1960-61	70-71	2002	% INCREASE
NO OF EGGS	2340	5340	36,000	1538
NO OF BROILERS PRODUCED	NIL	4	1000	25000

TODAY, INDIA RANKS 4th IN WORLD EGG PRODUCTION AND 19th IN BROILER PRODUCTION.

POULTRY DEVELOPMENT

- **INSPITE OF SPECTCULAR DEVELOPMENT, PER CAPITA AVAILABILITY OF EGGS IS ABOUT 36 EGGS /PERSON /YEAR AND THAT OF POULTRY MEAT, ABOUT 1000 GMS /PERSON /YEAR**

- **FOR BALANCED DIET, REQUIREMENT IS ABOUT 180 EGGS /PERSON / YEAR AND 11 KGS. OF POULTRY MEAT /PERSON /YEAR**

GROWTH POTENTIAL

LAYER INDUSTRY – 500% (FIVE TIMES) AND
BROILER INDUSTRY - 1100 % (ELEVEN TIMES) GROWTH POTENTIAL, COMPARED TO PRESENT STRENGTH OF THE INDUSTRY

EMPLOYMENT POTENTIAL

IT IS ESTIMATED THAT THERE ARE 25,000 LAYER FARMERS AND ABOUT ONE LAKH BROILER FARMERS, DEPENDING ON POULTRY FARMING FOR THEIR LIVING.

IN ADDITION, MORE THAN 1 MILLION PERSON ARE DEPENDENT ON POULTRY E.G. RETAILERS SELLING EGGS AND CHICKEN IN ROAD SIDE SHOPS ETC.

THUS, 1.6 MILLION PERSONS ARE DEPENMDENT ON POULTRY FOR THEIR LIVELIHOOD.

IT IS ESTIMATED THAT AN INREASE OF JUST 1 EGG IN PER CAPITA CONSUMPTION WILL PROVIDE ADDITIONAL 26,000 JOBS.

SIMILARLY, A 50 GMS INCREASE IN POULTRY MEAT CONSUMPTION PER PERSON WILL YIELD ADDITIONAL 26,000 JOBS.

THUS, POULTRY INDUSTRY HAS A POTENTIAL TO PROVIDE EMPLOMENT TO ABOUT TOTAL 10.55 MILLION PERSONS.

IN CONCLUSION, IT WILL BE SEEN THAT POULTRY FARMING PROVIDES PROTEIN – RICH FOOD, EMPLOYMENT, HELPS IN RURAL DEVELOPMENT.

Session- 3:

POULTRY BUSINESS- BREEDING

BY
DR.A.L.BHAGWAT
M.S., Ph. D (USA)
CHIEF ADVISOR, DR. BVR IPMT, URULIKANCHAN

ECONOMIC TRAITS

COMMERCIAL LAYERS

- Higher Egg Production
- Good Egg Weight / Size
- Lower Feed Consumption
- Lower Feed Conversion Ratio
- Resistance to Diseases
- Sound Egg Shell
- Smaller Body Size
- Docile, Not Nervous / Flighty

COMMERCIAL BROILERS

- Fast Growth
- Higher Body Weight
- Bigger and Plump Body Size
- Lower Feed Consumption
- Lower Feed Conversion Ratio
- Resistance to Diseases
- Better Leg Strength
- Higher Dressing Percentage
- Higher Meat to Bone Ratio

ECONOMIC TRAITS

Under natural conditions, it is not possible to have all these characters in one single individual.

So, by Genetic selection and Breeding techniques, a Hybrid / Cross is produced which will have maximum Economic traits / characters on one single individual.

PURE LINES

- **Group / Flock of birds which are maintained / bred as a Closed flock.**
- **No new birds are added from outside in this flock.**
- **These birds when bred, produce Progeny / Offsprings which are similar to their parents.**

To get desired economic traits, these flocks are crossed in different combinations.

BREEDING

It has been observed in Agriculture, that when one crosses two different types of stocks, some crosses give better performance than both the parents. (There may also be some crosses, which are inferior in performance than parents. Such crosses are naturally rejected.)

Only those crosses, which surpass performance compared to either parents are selected for production.

Based on the performance of the crosses, stocks producing better hybrids are selected as parents for reproducing those crosses- *i.e.* Hybrids.

To maintain & improve performance of parent lines, individuals of parent lines are evaluated and the birds with top performance only are selected to breed further to maintain and improve performance.

In other words, parents are selected on the basis of performance of their crosses.

Once the cross with best production potential is identified, Parent lines are maintained and improved further as either parents or grandparents.

Depending upon the need of comml. chicks, crosses are produced as commercial layer or broilers for supply to poultry farmers.

While carrying out crosses, there are different types of crosses.

Depending upon the number and type of stocks involved in crosses, they are classified as:

Two-way crosses,

Three-way crosses or

Four-way crosses.

Generally a commercial layer or broiler chick is a four-way cross.

PURE LINES

FLOCKS

A B C D E ……..X Y Z

DIFFERENT CROSSES

Two Way Cross - ♂A x B ♀ = ♂AB ♀

Three Way Cross - ♂AB x C ♀ = ♂ABC ♀

Four Way Cross – ♂A x B ♀ = ♂AB ♀ ♂C x D ♀ = ♂CD ♀

♂AB x CD ♀

♂ABCD ♀

BREEDING PROGRAMME

Let us assume only 4 Basic flocks are used for producing crosses:

♂ A ♀ ♂ B ♀ ♂ C ♀ ♂ D ♀

Let us see that with only 4 Basic flocks, how many Two-way Crosses are possible.

Various Two-way Crosses

♂A x B ♀ = ♂AB ♀
x C ♀ = ♂AC ♀
x D ♀ = ♂AD ♀

♂C x A ♀ = ♂CA ♀
x B ♀ = ♂CB ♀
x D ♀ = ♂CD ♀

♂B x A ♀ = ♂BA ♀
x C ♀ = ♂BC ♀
x D ♀ = ♂BD ♀

♂D x A ♀ = ♂DA ♀
x B ♀ = ♂DB ♀
x C ♀ = ♂DC ♀

Thus, with only 4 flocks, total twelve two-way crosses are possible.

Number of Four-way Crosses :

♂AB x AC ♀ = ♂ABAC ♀
x AD ♀ = ♂ABAD ♀
x BA ♀ = ♂ABBA ♀
x BC ♀ = ♂ABBC ♀
x BD ♀ = ♂ABBD ♀
x CA ♀ = ♂ABCA ♀
x CB ♀ = ♂ABCB ♀
x CD ♀ = ♂ABCD ♀
x DA ♀ = ♂ABDA ♀
x DB ♀ = ♂ABDB ♀
x DC ♀ = ♂ABDC ♀

With just 4 flocks, total 12 Two-way Crosses are possible.

With various permutations and combinations, total 12 x 11 = 132 four-way combinations are possible.

Breeder actually carries out all these many crosses and tests performance of different parameters of all these combinations, that too at different climatic conditions and locations.

Average of each cross x location is calculated to identify Best Cross.

DIFFERENT PARAMETERS TO IDENTIFY BEST LAYER

- **Smaller Body Size**
- **Higher Egg Production**
- **Good Egg weight / size**
- **Lower Feed Consumption**
- **Lower Feed Conversion**
- **Resistance to diseases**
- **Sound Egg shell**

- **Docile, Not nervous / flighty**

DIFFERENT PARAMETERS TO IDENTIFY BEST BROILER

- **Rapid growth**
- **Higher Body weight**
- **Bigger / Plump Body size**
- **Lower Feed consumption**
- **Lower Feed Conversion Ratio**
- **Resistance to diseases**
- **Better leg strength**
- **Higher Dressing Percentage**
- **Higher Meat to Bone Ratio**

The combination which gives Best Results over all the locations is the Commercial cross, which is released in the market.

This is the "Secret Combination"/ "Trade Secret" of the Breeder.

For example, say "ABCD" - This Four-way Cross is Best.

Then the Commercial chicks are produced, at will, as follows:

Pure Lines - ♂A ♀ ♂B ♀ ♂C ♀ ♂D ♀
Grand Parents- ♂A x B ♀ ♂C x D ♀
Parents - ♂AB x CD ♀
Commercial - ♂ ABCD ♀

The Commercial Cross chicks are of both the sexes.

In case of Commercial Layer chicks, Day-old sexing is carried out to segregate the sexes. In Layers, only Females are sold as Day-old pullets. Males are either destroyed or sold as Cockerels for Tandoori chicken.

In case of Broilers, chicks are sold Unsexed- as Straight-run chicks, as Broilers are raised for Table purpose and they are not raised for egg production. Life span of Commercial Broilers is just 6 - 7 weeks.

MULTIPLE-TRAIT SELECTION

$$I = a_1x_1 + a_2x_2 + a_3x_3 + \ldots + a_nx_n$$

where I = Index of an individual bird,
x_1 = Economic trait,
a_1 = Economic weightage of that trait.

Overall index of every individual, based on desired Economic traits is carried out and then selection of an individual is made from the given population.

There are various other Breeding methods which are used like Sire Family Index Selection, Reciprocal Recurrent Selection etc. to produce the Best Commercial cross. As the intention of this programme is not to study the Breeding programmes, only a brief introduction/ overview of breeding systems is given above.

Sessions- 4 and 8:

HATCHERY DESIGN and HATCHERY PRINCIPLES

BY
DR. A. B. CHAVAN
GENERAL MANAGER (PRODUCTION)
VENKATESHWARA HATCHERIES LTD., PUNE

- MARKET REQUIRMENT OF CHICKS -

  1) - PRESENT

  2) - FUTURE

- PARENT STOCK REQUIRMENT
- NUMBER OF MACHINES REQUIRED -

  1) - SINGLE STAGE

  2) - MULTI – STAGE

  DECIDING MACHINE CAPACITY

- NUMBER OF CHICKS REQUIRED PER WEEK / PER MONTH
- CHICKS REQUIRED PER WEEK / FORTHNIGHT / PER MONTH
- Example - 3.00 Lakh chicks per month (Twice a week)

  10 nos of Incubators of 27,000 Eggs Capacity

  05 Nos of Hatchers of 9,000 Eggs Capacity each

  5000 * 09 = 45000 * 2 = 90000 per week

- 90,000 * 85% = 76,500 Chicks Per Week
- 76,500 * 1% (Process Loss) * 04 = 3,02,940 Chicks Per Month.
- As the Requirement is Twice A week , we have opted for Multi-Stage Incubator
- If we need more number of chicks - of one age group at a time - we should go for Single Stage Incubator

  Example - we need 3.00 Lakh Chicks - Twice in a Month

  27000 * 06 Machines = 1.62 Lakh - Loading once in 15 Days

  We will require 18 Nos of Hatchers of 9000 Eggs Capacity.

- 9000 * 18 Hat. * 85% = 1.37 Lakh Chicks * 02 Hatches = 2.74 Lakh Chicks

- Here we will require - 12 Nos of Double Setters

  18 Nos of Hatchers

COMPARISON BETWEEN SINGLE AND MULTI STAGE INCUBATION

PARAMETERS	SINGLE	MULTISTAGE
CAPACITY	NEED MORE	NEED LESS
INVESTMENT	MORE	LESS
HYGINE	EXCELLENT	BETTER
HATCHABALITY	LITTLE LESS	MORE
HATCHERY MANAGEMENT	DIFFICULT	EASY
OPERATIONAL COST	LITTLE MORE	LESS
FLEXIBALITY	POSSIBLE	NOT POSSIBLE
PERFORMANCE OF CHICKS	EXECELLENT	BETTER

SOME COUNTRIES INSISTS ON SINGLE STAGE INCUBATION, BECAUSE OF HIGH DEGREE OF Hygiene

SITE SELECTION

- Closeness to Market
- Land / Site Selection
  1) Land Elevation - Ample Fresh Air & easy Drainage of Water
  2) Isolation for Human & Industrial Pollution
  3) Away from Poultry Farms
  4) Approach Road
  5) Avoid High Altitudes
- Electricity -
  1) Un-Interrupted 03 Phase - Good Quality Power Supply
  2) Standby Appropriate Capacity Generator set
- Water -
  1) Ample amount of water from Well / Bore-well / Dam
  2) Water Treatment Plant -
     A) Bore-well water is usually clean but has more hardness – needs De - M Plant
     B) River Water has more Impurities - needs Water Clarifier / Alum Doser / Chlorine Doser / Sand Filter
     C) Ample Quantity Water storage tanks
- Communication Facilities -

  Telephone / Fax / E – Mail
- Waste Disposal -

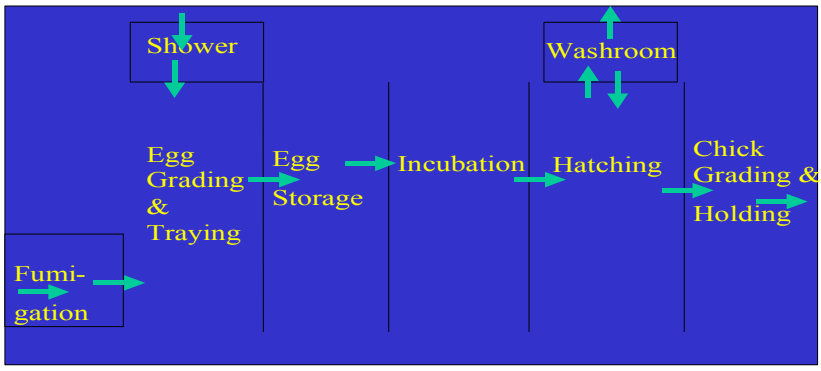
A) Disposal Pits

B) Incinerators

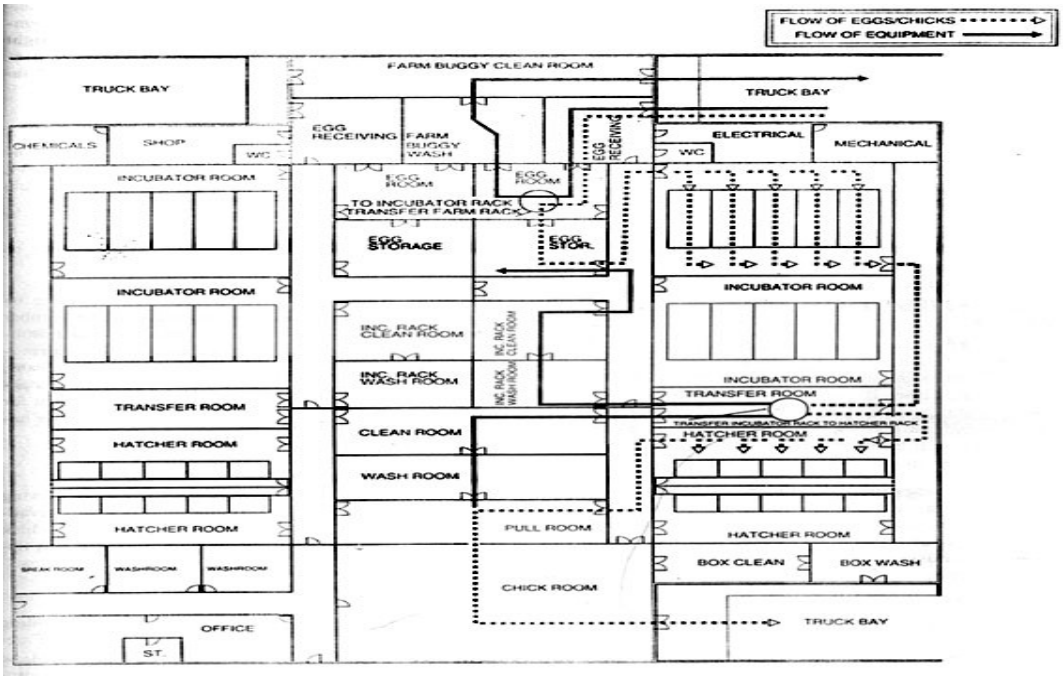
AREAS OF HATCHERY DESIGN

1) Fumigation Room
2) Egg Grading & Traying Room
3) Cold Room
4) Setter Room
5) Hatcher Room
6) Chick Room
7) Washing Area
8) Showers & Change Room
9) Utility Area

SAMPLE FLOOR PLAN



EGG-CHICK FLOW CHART



HATCHERY CONSTRUCTION- PARAMETERS

- Truss Design - Should be Inverted Column
- Roofing - RCC Flat Roofing from inside
- Roof Height - Average 10 - 12 ft depending upon type of machine height
- Air Inlet Duct - Above the Machine inlet area as per the m/c manufacture specifications
- Exhaust Duct - Above the Machine exhaust area as per the m/c manufacture specifications
- Roofing - Water proof with proper drainage
  - Should carry additional loads of A.C Units. Slab thickness 4-5 inches.
- Hatchery Width - Machine Width + Passage area
- Floor - RCC Flooring with proper water drainage facilities

1) Egg Room Floor - Desirable slope 1/8inch per 1ft Smooth flooring

2)Setter Room - It should be flat, smooth

No high & low spot - Spoil machine installation & slope should be 1inch from one end to other end

Provide drainage on side wall

3)Hatcher Floor - It should be flat, smooth, sloping 1inch per 10 feet towards drainage

4)Wash room - Smooth & sloping towards drainage

- Walls - Plain plaster with 2 ft Skirting at the bottom from all sides
- Windows - Big size closed windows for natural lighting in a A.C Hat.
  Or Windows behind m/c inlets with opening/closing facility in open hat.
- Doors - 7 ft Height - 04 ft Width
  - Water Proof with self closing facility
- Drainage - Closed type with sufficient slope for easy flow.
- Electric - Concealed wiring with additional spare Cabling capacity
- Water Pipeline - Galvanised Steel of appropriate size with proper colour coding

Enough light should be provided in setter hatcher & chick room. Use 50 ft candle or more .

All electrical lighting should be covered properly.

FLOOR SPACE FOR HATCHER ROOM

FLOOR SPACE	Per 1000 Eggs Incubator– Hatcher	Per 1000 Straight Run Chicks Hatched per Hatch
Egg Receiving Room	2.00 sq.ft	15.00 sq.ft
Egg Storage Room	0.33 sq.ft	2.47 sq.ft
Chick Holding Room	4.00 sq.ft	30.00 sq.ft
Wash Room	0.8 sq.ft	6.00 sq.ft
Storage Room	0.7 sq.ft	5.25 sq.ft
Setter – Hatcher Room	As per M/c Specification	

BASICS OF HATCHERY VENTILATION

- Addition of Oxygen – 20 to 22% O_2
- Removal of CO_2 gas
- Temperature- Addition -or-Cooling

- Addition of Humidity

AIR CONTENTS

AIR IS A MIXTURE OF GASES CONTAINING 78% NITROGEN, 21% OXYGEN, TRACES OF OTHER GASES, IMPURITIES AND **WATER VAPOUR**

INCUBATION PROCESS

IN ARTIFICIAL INCUBATION PROCESS A PHYSICAL ENVIRONMENT IS CREATED AND MAINTAINED TO FACILITATE THE DEVELOPMENT OF EMBRYO.

HATCHERY VENTILATION

- VENTILATION MEANS INTRODUCTION OF FRESH AIR AND TO REPLACE STALE AIR.
- ALL INCUBATORS NEED SOME FRESH OUTSIDE AIR.
- VJ TUNNEL MULTISTAGE USES FRESH AIR FOR COOLING AND CARBON DIOXIDE CONTROL.
- HEATING AND / OR COOLING MAY BE REQUIRED.
- VENTILATION MEANS INTRODUCTION OF FRESH AIR AND TO REPLACE STALE AIR.
- ALL INCUBATORS NEED SOME FRESH OUTSIDE AIR.
- VJ TUNNEL MULTISTAGE USES FRESH AIR FOR COOLING AND CARBON DIOXIDE CONTROL.
- HEATING AND / OR COOLING MAY BE REQUIRED.

EXISTING VENTILATION PRACTICES IN HATCHERY

- INTRODUCTION OF FRESH AIR WITHOUT ANY CONTROL.
- TEMP./ HUM. NOT CONTROLLED.
- ROOM AIR PRESSURE NOT CONTROLLED.
- SUMMER :- EVAPORATIVE COOLING IS USED.
- MONSOON :- NO CONTROL ON HUMIDITY.
- WINTER :- FRESH AIR INTAKE IS REDUCED OR TOTALLY STOPPED.

PARAMETERS REQIRED- EGG ROOM

Temperature Range:	16.7^0 – 18^0 C (62^0 – 64.4^0 F)
Relative Humidity Range:	75% TO 80%
Room Differential Pressure:	ZERO

- DOES NOT ALLOW EMBRYNIC DEVELOPMENT TO OCCUR
- DOES NOT DELAY HATCHING SCHEDULE
- DOES NOT PERMIT MOULD GROWTH
- DOES NOT ENCOURAGE DEHYDRATION

PARAMETERS REQIRED- SETTER ROOM

Temperature Range :	21.1^0 C to 29.4^0 C (70^0 F to 85^0 F)
Relative Humidity Range :	40 % to 60 %
Room Differential Pressure:	Positive
Fresh Air Supply Should be:	0.143m/min/1000 eggs 5cfm/1000 eggs

Air Supply Should be 50% relative humidity & 24^0 C / 75^0 F

Multi-stage requires constant fresh air & CO2 should not exceed .04%

MACHINE REQIREMENT

IDEAL CONDITIONS FOR SUPER-J MULTI-STAGE INCUBATORS

Temperature	:	25.5 ^{0}C (78 ^{0}F)
Relative Humidity	:	50 %
Room Differential Pressure:		1.25 Pascal (0.005 in. w. c.)
Maximum Outside air requirement:		177 Litre / second (375 CFM)

MACHINE REQIREMENT

IDEAL CONDITIONS FOR SUPER-J MULTI-STAGE INCUBATORS

Temperature	:	25.5^0 C (78^0 F)
Relative Humidity	:	50 %
Room Differential Pressure:		1.25 Pascal (0.005 in. w. c.)
Maximum Outside air requirement:		177 Litre / second (375 CFM)

HATCHER

IDEAL CONDITIONS FOR PX HATCHERS

Temperature :		25.5^0 C (78^0 F)
Relative Humidity :		50 %
Room Differential Pressure:		1.25 Pascal (0.005 in. w. c.)
Outside air requirements	:	177 Litres/second (375 CFM)

CHICK ROOM

Temperature Range :	21.1^0 C to 26.6^0 C (70^0 F to 80^0 F)
Relative Humidity Range :	70 % to 75 %
Room Differential Pressure:	1.25 Pascal (- 0.005"w.c.)
Outside air requirements:	130 Litres /second (275 CFM) per 10,000 chicks

HATCHERY VENTILATION DESIGN REQUIREMENTS

- SIZE OF THE HATCHERY
- TYPE OF INCUBATION MACHINES, NO OF MACHINES
- NO OF EGGS SET PER WEEK.
- NO OF HATCHES PER WEEK.
- OUTSIDE TEMPERATURE (DRY BULB AND WET BULB WHOLE YEARS DATA.
- ALTITUDE OF THE HATCHERY LOCATION.
- TYPE OF BUILDING (INSULATED / NON INSULATED).MATERIAL OF CONSTRUCTION.
- CALCULATE THE TOTAL FRESH AIR REQUIREMENT.
- CALCULATE THE MAXIMUM VARIATION IN THE DRY BULB AND WET BULB AT DIFFERENT TIME.
- CALCULATE THE CAPACITY OF THE EQUIPMENT CONSIDERING MAXIMUM VARIATION.
- DISTRIBUTE THE AIR EQUALLY INSIDE THE ROOM TO MAINTAIN UNIFORM TEMP/ HUM THROUGH OUT THE ROOM.
- PROVIDE ADEQUATE CONTROL AND SAFETY IN THE SYSTEM.

VENTILATION PARAMETERS

DRY BULB TEMPERATURE

WET BULB TEMPERATURE

RELATIVE HUMIDITY

HUMIDITY RATIO

AIR ABILITY TO ABSORB THE MOISTURE

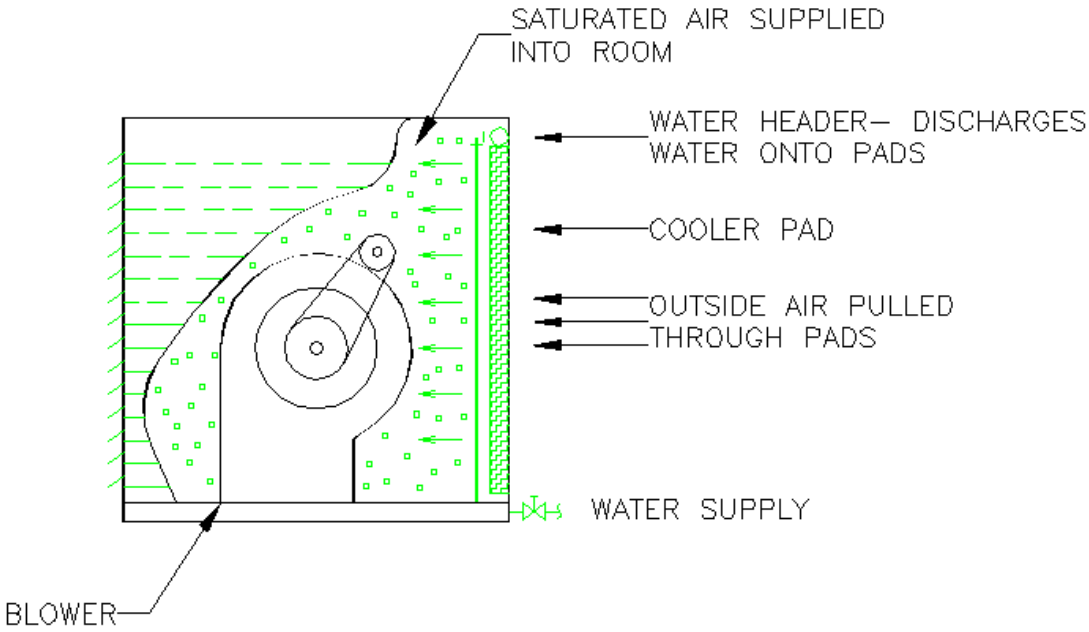
Because of the Moisture Absorbing Characteristics of air, it has 5 variable properties:

- **DRY BULB TEMPERATURE**
- **WET BULB TEMPERATURE**
- **DEWPOINT TEMPERATURE**
- **RELATIVE HUMIDITY**
- **HUMIDITY RATIO**

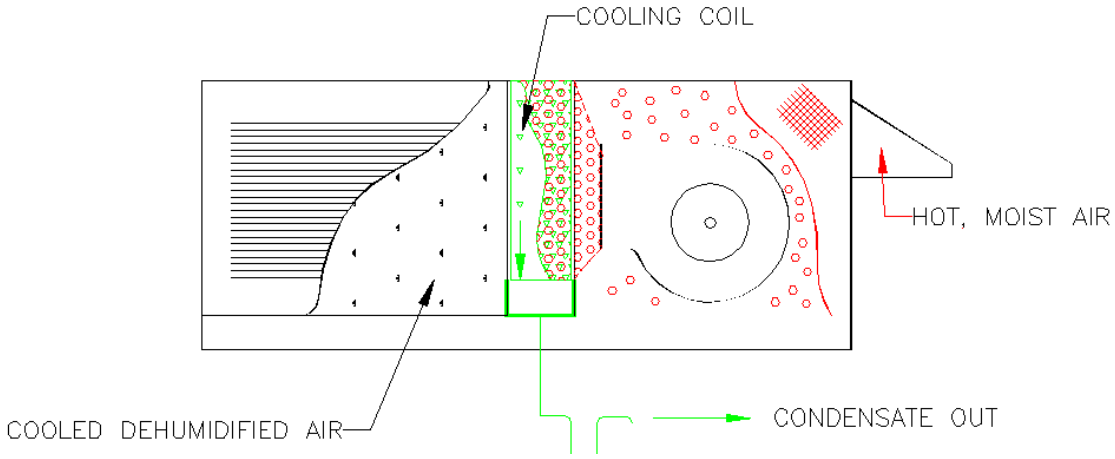
RELATIVE HUMIDITY

IT IS A COMPARISON OF THE AMOUNT OF MOISTURE WITHIN THE AIR TO THE AMOUNT OF MOISTURE THE SAME AIR COULD HOLD IF IT WERE SATURATED (AT THE SAME DRY BULB TEMPERATURE).

EVAPORATIVE COOLING



MECHANICAL REFRIGERATION



SEASONAL CLIMATIC VARIATIONS DURING THE YEAR

SEASON	OUTDOOR WEATHER CHARACTERISTICS			SYSTEM ACTION		
	TEMP	MOISTURE CONTENT	RH	TEMPERATURE		HUMIDITY
				INCR	DECR	INCR
SUMMER	High	High / Equal	Low	X	√	•
MONSOON	High / Equal	High	High	•	•	X
WINTER	Low	Low	High / Equal	√	X	√

X	Not Applicable
√	Applicable
•	May be Applicable

Hatchery Ventilation : Gain More

Case Study : V6 Girinagar

Basic Data & Assumptions

Hatchery Type	:	Layer
No of machines	:	6 Sets (Inc + Hat)
Max Capacity	:	90,720 per machine
Avg hatch 88%	:	80,000 x 6 every 21 da
Capital Cost	:	Rs.16.0Lakhs
Power Rate	:	Rs.4.00 perkwh
Inc in saleable chicks	:	2%
Sale Rate[female]	:	Rs.17.00 per chick
Sale Rate[male]	:	Rs.1.50 per chick
Existing Power Consm:		Average 4kw / m/c
Power Saving	:	30% of existing power
HV Annual Power	:	19 KW, 24hrs,All year

Costs v/s Benefits . .

Costs First !

Capital : Rs.16.00 LACS
Power[pa] Rs. 6.65 LACS
: Rs. 22.65 LACS

Benefits Next !

Incr Sale : Rs.15.45 LACS
Power[pa] Rs. 8.40 LACS
: Rs. 23.85 LACS

Obvious Conclusion !

Payback : 12 months

Gain Rs.17 Lacs from 2nd yea

Imagine The Gains If You Have A Broiler Hatchery . .

BENEFITS OF HATCHERY VENTILATION

- BETTER HATCHABILITY & CHICK QUALITY
- LOW ENERGY CONSUMPTION. ROOM CONDITIONS UNDER CONTROL. MACHINE LOAD HARDLY OPERATES.
- EARLY PAYBACK.. 1 % INCREASE IN SALEBALE CHICKS GIVES SUBSTANTIAL RETURNS.
- CONSISTENT RESULTS
- LESS MAINTENANCE. TOTALLY INTEGRATED AND USER FRIENDLY SYSTEM.

Session- 5:

Hatchery Equipments- I and II

Mr. V. N. Chandorkar and Mr. S. S. Kulkarni

Both Speakers have given full sets of Presentations to individual participants. Hence not added in this List.

Session- 6:

EMBRYOLOGY

Presented By
DR.A.L.BHAGWAT
M.S., Ph. D (USA)
CHIEF ADVISOR, DR. BVR IPMT, URULIKANCHAN

Unlike mammalian embryos, the chicken embryo develops from the food supply present in the egg rather than relying upon nutrients obtained through the blood supply of the mother.

The following explains what happens during this fascinating process.

Embryology, term includes anatomical, physiological and chemical changes that occur between the moment of fertilization and the hatching of the chick.

Egg shell permits exchange of moisture and gases at the correct rate and it contains all the essential nutrients in correct proportion and balance.

First step in embryonic development is the fusion of the female germ cell (blastodisc) with one of the several male cells (sperms) that penetrate the vitelline membrane almost as soon as the (blastodisc and yolk combined) enters the oviduct.

This fusion renders the egg fertile and blastodisc then proceeds to develop into the blastoderm.

At first Cell differentiation occurs as a result of repeated simple division of the cells, giving rise of 2, 4, 8, 16, 32 etc, cells; but soon the limit of this simple cell division is reached, then Cell Differentiation begins and special types of cell that go to form various tissues of the body appear for first time in their appropriate regions of the embryo.

At first the blastoderm consists of only one layer of cells, but very soon it differentiates into two distinct layers: This differentiation is known as Gastulation- The two layers are known as Ectoderm and Endoderm.

By the fourth day of incubation, the blastoderm further differentiates to produce another layer, known as Mesoderm, between Ecto and Endoderm.

From Ectoderm, arise cells that originate the skin, feathers, beak, claws, nervous system, eye and linings of mouth and vent cavities.

Endoderm gives rise to respiratory and secretory organs and linings of the various parts of digestive tract.

Mesoderm gives rise to bones, blood, excretory system and the organs of reproduction.

Table-1: Three groups of cells from which future body functions develop

Ectoderm	Mesoderm	Endoderm
Nervous system	Skeleton	Respiratory system
Lens Retina of eye	Muscles	Secretory organs
Feathers	Blood system	Digestive tract
Beak	Excretory system	
Claws and Skin		

During first 24 hours of growth, cells will divide at different rates resulting in a thickening of the blastoderm in certain areas.

This creates 'Primitive streak'- structure which defines the long axis of the embryo.

For example, thickening of ectoderm along axis of Primitive streak produces 'Primitive groove' which ultimately becomes spinal cord.

Further growth at the anterior end of primitive streak produces the head fold and later the tail fold at the posterior end.

Spots of blood become visible at 24 hours of development and at around 40 hours, the rudimentary heart is formed and starts to beat. The vascular system develops simultaneously. By the 5th day of incubation, the heart is completely formed.

EXTRA EMBRYONIC MEMBRANES

Four membranes develop to carry out the various functions necessary to sustain embryonic growth. They are shown in next Table.

The yolk sac grows to enclose the yolk. The cells of the membrane secrete enzyme which liquefies the yolk enabling it to be carried to the developing embryo.
The amnion or amniotic sac is a fluid-filled sac in which the embryo floats during the movement. This fluid acts as buffer, protecting the embryo from external forces.

The allantois develops a highly vascular blood system, which fuses with the chorion on the 7th day to form a membrane: chorioallantois.

Digestive nutrients from albumen and calcium from the shell are absorbed by the blood capillary network of the chorioallantois and transported to the developing embryo.

This membrane has two other functions- excretory and respiratory. Waste products are collected from kidney and deposited into the egg cavity.

Embryonic respiration takes place where the membrane is fused with the inner shell membrane - exchanging gases which pass through the shell pores to the outside world.

DEVELOPMENT OF THE EMBRYO

By end of first 24 hours of development the embryo has progressed from an undifferentiated ball of cells to become a complex structure with a rudimentary heart and blood vessels, an alimentary tract, a vertebral column and beginning of a head and eyes. Development of embryo then progresses and on 21st day, a chick hatches out of an egg ready to face world.

Table-2: MEMBRANES THAT CARRY OUT THE VARIOUS FUNCTIONS TO SUSTAIN GROWTH

MEMBRANES	MAIN FUNCTION
Yolk sac	Yolk transport
Amnion	Protection
Allantois	Respiration, Digestion Excretion
Chorion	Metabolic and Chorioallantois formed

Session 7:

Selection & Grading of Hatching Eggs

Presented By
Dr. A. M. Phutane
Operations Manager
Venky's India Ltd., Hatchery
Naigaum, Pune

Quality Hatching Eggs means the condition outside the shell, condition of shell itself & the of the contents. Obvious physical differences are as below.

1. **Eggs Size :** Mature broiler weight is associated wit eggs size. Chicks size is related to eggs as well as relative humidity of the air surrounding the eggs prior to and during incubation.

2. **Eggs shell imperfections** like ridges pointed ends do not hatch well, some of these imperfections are inherited. Excessively long, thin or completely round eggs do not hatch well. Rough shelled (pimpled), miss shape (slight deviation due to ridges), wrinkled, dark top (rough area) do not hatch well.

3. **Shell colour & thickness :** Previously it was assumed that density of the pigment in brown shelled eggs often correlated with hatchability but as hatchability is a genetic factor strains of chicken are now developed that produce high hatchability irrespective of eggs shell colour. Diets low in calcium & Vitamin – D and temp. above 32-34 degree cent. in the houses will cause the females to produce the eggs with inferior shells. Also the deterioration in shell quality. This deterioration occurs because of the daily production of calcium carbonate by the uterus for eggs shell formation remains about the same & as eggs get larger & longer a bird lays, the calcium carbonate spreads over the eggs in a thinner layer. Eggs shell thickness is important for best results eggs shell should be between 0.33 to 0.35 mm in thickens. Few eggs with a hell thickness less than 0.27 mm will hatch. Many people candle eggs prior to setting in order to remove the chicks & cracks. If this procedure is used, cool the eggs overnight before examining them. Twice as many cracks will be observed after cooling.

4. **Interior quality:** Some eggs are laid with tremulous air cells, other & incur them later through trying / jarring & improper handling. This air cells present one of the greatest depressors of hatchability, so hatching eggs should be handled carefully.

   The higher the reading of Haugh units for albumen quality, the better the hatchability of the eggs. (best hatches for fresh eggs where Haugh units are 80 or over). The reading decreases as eggs are held prior to incubation because of lower albumen viscosity & hatchability will be reduced.

The loss of viscosity is accompanied by a decrease in ovomucin, a protein essential for embryonic growth. There for eggs with high Haugh Units readings hatch better than those with low readings.

Haugh Units : Albumen is measured by its ability to remain viscous. The age of the egg also influences the quality of egg albumen. Prof. R.R. Haugh developed the correction factor, noted that "observed" albumen quality in the broken out egg as a logarithmic rather than a linear function of albumen height.

Storage of hatching Eggs

Suggestion for managing eggs storage in commercial hatcheries to best meet the requirement of the embryo and maximise hatchability. –

By Dr.D.C.Deeming

Only in few bird species dose the incubation of the eggs start soon after egg is laid. In most species the hen builds up a clutch which is completed prior to incubation being initiated. The natural consequence of this is that the birds have had to evolve mechanisms which allow the embryo inside the egg to survive a period of storage. The first laid eggs in a clutch have to survive several days exposed to the prevailing environment with the newest eggs being warmed for incubation within perhaps a few hours after laying.

This adaptation to remain viable for a considerable period of time has been exploited by man in two ways. Chicken eggs are a valuable food sources which remain fresh for a considerable length of time. For production of birds, the ability of eggs to withstand storage is exploited in hatcheries where the eggs can be kept until there are sufficient numbers so as to maximise the incubation capacity of the incubators. Here I explore the storage needs of commercial hatcheries in light of the requirements of the embryo and, based on recent work in Israel, provide some suggestions for managing eggs in storage so as to optimise embryo survival and hence maximise hatchability.

Commercial Storage

There are many management reasons and strategies for egg storage. Most broiler operations have large through-plus of eggs and so there is a minimal need for storage. Most egg stores, both on the farm and at the hatchery, are kept around 15-18^{o}C with a relative humidity (RH) of approximately 75%. Under such conditions, embryonic survival appears to be largely unaffected and hatchability is not significantly influenced by storage. Unfortunately, longer storage periods have a progressively important effect on embryonic survival and so to counteract the reduction in hatchability the storage temperature is often decreased to around 12^{o}C (again with high humidity). Despite this treatment, storage over 14 days has a significant negative influence on the number of chicks produced .

Unfortunately, it is the more expensive eggs, for example those from layer breeders and particularly from grandparent and elite lines, which are produced in fewer numbers and so require to be stored for longer. Storage of such eggs leads to expensive losses of hatchability.

On the whole, eggs are stored on the setter trays with the air space upwards. In this way the eggs can be simply set into the machines after the storage period. Several techniques have been investigated on order to improve survival after prolonged storage. Storing eggs upside done, in plastic bags, in bags containing gases other than air (e.g. Nitrogen) have all been shown to have valuable beneficial effects on hatchability but these are often expensive options in a commercial operation because of the cost of handling the eggs and the supply of materials. As a consequence, the techniques for egg storage have mainly relied on maintaining a low temperature and relatively high humidity.

What remains unclear is to the degree to which modern storage techniques match the needs of the embryo and hence maximise its viability before incubation starts. Afterall, the egg has always to be considered as a living entity even at low storage temperature and our aim should be to ensure that an optimal environment for embryo survival is maintained within the egg.

Effects of storage within an egg

Storage has such profound effects on embryonic survival because the conditions within the egg begin to change soon after the eggs are laid. In general, there are four main areas where problems occur; mechanical damage; dehydration; changes in pH; and exposure to exigent. As the period of storage increases the significance of these different factors gets larger and there is a considerable degree of interaction between them. Most mortality of embryos occurs in the first week of development although there are some longer term effects of prolonged storage.

The embryo is located on top of the yolk and is surrounded by a variety of tissues which aim to protect it from mechanical damage before incubation starts. Contrary to textbook illustrations the yolk itself does not normally lie centrally in the egg but lies lying more closely to the upper surface of the egg which brings it into proximity to the inner shell membrane. The yolk is a big mass which helps to stabiles embryonic temperature.

The albumen and perivitelline membrane overlying the embryonic tissues is the initial line of defence against mechanical damage. Problems occur when the perivitelline membrane comes into contact with (and in dehydrated eggs even adheres to) the inner shell membrane. The albumen capsule around the yolk can alter in consistency and the protective layer is diminished allowing direct contact.

This is particularly pronounced with progressive dehydration and any movement of egg can lead to mechanical damage to cells or to the whole blastoderm.

Dehydration of the embryo can occur because the egg begins to lose water vapor immediately after lay. As storage periods lengthen the albumen layer around the yolk begins to change in composition and thickness due to loss of water vapour and changes in acidity due to loss of CO2. In particular, the capsule of thick albumen proteins around the yolk loses its consistency and becomes much thinner. In this way the environment around embryo can become more concentrated and the buffering nature of the albumen is lost. The loss of water in the albumen can concentrate the proteins and cause osmotic gradients which may draw from embryonic cells and cause damage.

Carbon dioxide, (CO_2) is Important in egg storage. Within the oviduct there is a high level of dissolved CO2 in the egg and this begins to diminish after the egg is laid. The lower level of dissolved CO2 affects the acidity (pH) of the albumen and yolk and the environment within the egg becomes very alkaline (around pH of well over 9.0). This changes in the pH of the albumen, dehydration and the location of the embryo in relation to the shell membranes also certainly increases the exposure of the embryo to gaseous oxygen. In eggs stored with the air cell upwards the distance between the embryo and the inner shell membrane adjacent to the air space certainly decreases rapidly as the egg loses water vapour (which dries out the albumen and increases the size of the air space). Exposure to oxygen gas can cause problems with non-specific oxidation which can injure or kill cells.

The combined effects of these biochemical and physical changes in the egg can lead to problems in cell survival within the embryo. The overall viability of the embryo can be drastically reduced because cell damage can prevent normal development of key elements of organ differentiation. At laying, the embryo consists of a thin layer of only around 60,000 cells which are destined to differentiate into different tissue types. Extensive damage to cells may prevent the full compliment of cell types to development leading to developmental asynchrony and death.

The main effect of this is that as periods of storage lengthen, there is a progressive increase in early embryonic mortality, usually observed in hatcheries as an increase in early embryonic mortality, usually observed in hatcheries as an increase in % candling clears. It is easy to appreciate that important aspects of early development may be restricted in stored eggs but in general, storage lowers the quality of eggs and this can be reflected in increased mortality at all stages of development. Dehydration during storage in particular can influence the overall water budget of the embryo during development from laying the pipping leading to excessive water vapour loss from laying through to the end of incubation, which prevents normal hatching or reduces chicks quality.

Recent advances in egg storage techniques

The conventional techniques for maintaining hatchability of stored eggs are primarily based on the need to keep the embryo dormant before incubation can start properly. Therefore, longer storage periods have lower ambient temperatures.

Such changes do little to improve the quality of the biochemical environment within the egg and so it is almost certainly likely that a simple change in temperature is not sufficient to maintain hatchability at high levels. Additional techniques employed during storage can allow us to manipulate the environment in the egg so as to maximise embryonic survival.

Such additional treatments can be very simple. Holding eggs with the sharp end upwards ensures that there is always albumen over the yolk and prevents the embryo in coming in contact with the shell membrane delimiting the air space. Storage in plastic bags prevents excessive loss of water vapour and CO2 because this generates a micro-environment high in humidity and CO2 which slows the rate of change within the egg. A disadvantage of this system is that the high humidity can encourage the growth of bacteria and fungi on the eggshell surface. Storage in containers where the air is replaced with inert gases reduces exposure to oxygen and restricts random oxidation. As stated above these techniques, although valuable in reducing mortality, tend to be expensive and time consuming to apply in commercial operation.

There are alternative techniques which may be simpler to operate within hatcheries. Turning during storage i.e. Tilting the eggs through 45^0 twice or three time a day, is relatively common practice in some hatcheries, particularly with duck eggs. Trolleys from incubators can be installed in the storage room and linked to a turning control system.

The advantage of this technique is probably lies in the maintenance of the environment within the egg to which the embryo is exposed to. The biochemical changes in the egg are unlikely to be uniform and so the embryo can find itself in a poor environment if the egg is held in one position for a long period. After all, during storage the embryo is still alive and is still consuming oxygen and nutrients albeit at a slow rate. Within time consumption of these key elements by the embryo will become limited by the rate of which these chemicals can diffuse the embryos. By turning the egg, the yolk moves position within the albumen and so the embryo is regularly exposed to a fresh environment.

Other techniques employ procedure which change the biochemical environment within the egg prior to setting. The simplest technique involves holding stored eggs in a high CO2 environment. In Israel, researches stored eggs for 36 days in air and two days before incubation started the eggs were either :

- Exposed to 95% N2/5% CO2
- *100% N2; or
- left in air as a control.

Hatchability (of eggs set) of the three group was 55%, 42% and 32% respectively (fresh eggs hatched at 84%) with the embryos exposed to the N2 / CO2 mix had lower early embryonic mortality than those only exposed to nitrogen alone.

The high levels of CO2 mean that this gas diffuses into the egg and by dissolving in the albumen, lowers the pH of the environment (from 9.6 to. 7.9-8-1) making it more suitable for early development . Obviously the egg needs to be stored at low temperatures and high humidity in order to minimise other effects.

The most radical technique to date actually involves periodic, short increases of temperature during storage which allow the embryos to initiate near normal metabolism. Workers in Israel warmed eggs to 37.8oC for 4 hour periods during any time between 2-14 days of storage and then kept the eggs for up to a month. After 30 days of storage the hatchability of warmed eggs was 43.8% of eggs set compared 11.9% of non-warmed eggs.

Significantly, the percentage of eggs hatched after transfer to the hatcher was largely unaffected by the warming treatment.

This technique is contrary to all accepted dogma regarding storage temperature which requires that the embryo should be prevented from developing before normal incubation is initiated. Any development of the embryo prior to proper incubation is considered deleterious to its survival. It is interesting to note that pre-warming of eggs to incubation temperature also improves any storage at low temperature also improves hatchability because it allows the embyros to achieve a relatively well advanced stage of early development. Furthermore, in wild nests the parent bird may spend some time warming eggs for a short period during building the complete clutch.

The exact mechanism behind the improvement in embryonic survival is not know but it is believed that pre-warming at any time during storage may be useful because having the short period of incubation temperature reactivates the metabolism of the cells and allowing them to initiate cell repair mechanisms which act to enable the embryo to better survive during the long period of storage. To date commercial scale trials have yet to be carried out for this technique but it could prove to be very useful procedure.

In conclusion

Conventional storage conditions almost certainly suit broiler eggs well because the short period of egg holding has little significant effect on the environment in the egg and on the quality of the embryo. The need for prolonged storage is rare in this group of eggs. By contrast, for layer birds where the breeding population may be lower and the eggs are relatively more expensive, prolonged storage can be quite common. Short increases in temperature may be useful option for hatcheries where the exact length of the storage period cannot the predicted.

Within breeding programmes pedigree hatching is the norm and long periods of storage should be avoided. It is usually the case, however, that numbers of eggs laid necessitate often quite prolonged storage periods. For these particularly valuable eggs additional heating and manipulation of the pH environment (via CO2) in the egg may reap significant rewards.

Session 8:

HATCHERY PRINCIPLES

By

DR. A. B. CHAVAN

GM (Production), VHL, Pune

Already included with the Handouts for Session No. 4- Hatchery Design Pages 23 to 33.

Session- 9:

Hatchery Project & Budgeting

Presented By

Mr. Sudhir Kulkarni

Speaker has given full sets of Presentations (Four different Projects- 10,000 Layer Breeders, 10,000 Broiler Breeders, Broiler Hatchery, Layer Hatchery) to individual participants. Hence not added in this List.

Session 10:

Record Keeping and Maintenance of Hatchery

Presented By

Dr. A. M. Phutane

Operations Manager

Venky's India Ltd., Hatchery

Naigaum, Pune

Speaker has given full sets of Presentations- Various Formats maintained in Hatchery - to individual participants. Hence not added in this List.

Session 11:

IMPORTANCE OF HATCHERY SANITATION

Presented By
DR. R. K. PHATAK
General Manager(Tech. Services)
Venkateshwara Hatcheries Ltd., Pune

Anything that comes into contact with your birds has the potential to contaminate them or their environment with transmissible infectious agents.

Sanitation

- Run base line studies
- Use reliable products
- Monitor hatcheries
- Fumigate inside of machines
- Keep a good air flow through the hatchery

FACTORS INFLUENCING HATCHERY PRODUCTION

BREEDING FARM

- Improper brooding
- Feed and water
- Contaminated litter
- Noxious agents
  - ammonia
  - carbon monoxide

CONTROL POINTS ON THE FARM

Health of the parent flock
- terminal clean out and disinfection between flocks
- Biosecurity of the existing flock

Nest Box
Egg collection and fumigation
Egg transport to hatchery

What Sanitation Programme is required at nest box level?

- A weekly physical clean-up of all nest boxes
- spray with good and safe disinfectant that acts on bacteria, moulds and viruses
- spray with good and safe disinfectant on to the litter material to be used in the nest box, dry and use
- Collect the eggs 4-6 times per day
- Do not use soiled eggs, keep them separately.

- Do not wipe the egg with wet cloth

Fumigate the eggs using 3X strength of potassium permanganate and formalin (1X = 20gm of KMnO4 + 40ml of formalin)

Ensure clean egg trays and trolleys

Shift the eggs to cold room as early as possible and maintain at 65-68^0_F. Clean the egg transport carts and vehicles. On the event of transport of eggs for long distance handle the eggs carefully. The workers should wash their hands before packing and forwarding to avoid surface contamination.

TRANSPORT TO HATCHERY

- Wrong temperature
- Rough handling
- Contamination
- Egg sweating

FARM EGG ROOM

- Wrong temperature/humidity
- Dirty/contaminated
- Contaminated cooler
- Improper cooling
- Wetting eggs

EGG ROOMS AND COOLERS

- Clean and disinfect egg rooms with BioSentry 904 at the end of each day
- Start with equipment then walls and floors
- Take extra care not to wet egg cases
- Squeegee excess into drain and let dry
- Clean and disinfect egg cooler rooms after egg pick up-minimally once a week

HATCHERY EGG ROOM

- Wrong temperature/humidity
- Egg sweating
- Contamination
- Wetting eggs

METHODS TO SANITIZE HATCHING EGGS

- Fumigation
- Hatching egg spray
- Application through a foamer

- Flushing solution over eggs
- Basket washing

HATCHING EGG SPRAYS

- BioSentry®904 – Quat/TBTO 4-8 ml/L
- BioQuat 20™ – Quat 8-12 ml/L
- Bio-Phene® – Phenolic 4 ml/L

FOAMING EGGS

- BioSentry 904 (4-8 ml/L)
- BioQuat 20 (8-12 ml/L)

FLUSHING SOLUTION OVER EGGS

BioSentry 904 (4-6 ml/L)
BioQuat 20 (8-12 ml/L)
Bio-Phene (4 ml/L)

EGG HANDLING TIPS

- Set only nest clean eggs
- Segregate and wash dirty eggs
- Spray or flush clean eggs only
- Keep egg wash waters 10-15° F warmer than the egg
- Do not set cracks, checks
- Dry eggs before cooling
- Be sure eggs can drain dry
- Keep nests clean and dry
- Collect eggs frequently
- Handle eggs with clean hands
- Never allow eggs to sweat
- Apply residual disinfectant to the egg before incubation

SETTER

- Wrong temperature/humidity
- Turning
- Contamination
- air
- humidity system
- exploders

AT SETTER

Workers should use disposable gloves for handling eggs to load in the setter. After loading use 1X fumigation for 30 minutes

Burst eggs create the problem of contamination

A regular cleanup is essential using a good disinfectant

Mop the setter floors and room floor with good disinfectant

When setters are emptied either at the end of each set, periodically clean and disinfect all the accessible parts of the setter.

Clean up setter room, walls, floor, ceilings, windows, fans and other interior parts.

Spray with good disinfectant.

BURST EGGS

Green rot	:	Pseudomonas
White rot	:	Corynebacterium
Black rot	:	Aspergillus

PROCESSING

- Rough handling
- Contamination
  - vaccinator
  - air source
  - surfaces

DISINFECTANTS CAN NOT SOLVE ALL YOUR PROBLEMS WITHOUT QUALITY MANAGEMENT.

WE MUST DO THE BASICS WELL.

HATCHER

- Wet surfaces
- Transfer damage
- Wrong temperature/humidity
- Contamination
- Late Pull
- Early Pull

HATCHER SANITATION

- Squeegee and remove excess water from the floor
- Disinfect with BioSentry 904 by spraying.
- Be sure to wet all surfaces
- Let dry before setting
- Use Acid-a-Foam 1 week every 6-8 weeks in place of high pH cleaner

TRUCK ,VAN AND BUS SANITATION

- Clean BioSentry Universal Barn Cleaner
- Disinfect with BioSentry 904
- Spray to wet all surfaces inside and out, let stand 10 minutes then rinse with water

BIOSENTRY 904

- EPA Registered Label with complete hatchery fogging directions
- Gives clear solutions in hard water
- Kills gram + and gram - bacteria, molds and viruses.
- Improved mold control giving 2x mold control power

BIOSENTRY UNIVERSAL BARN CLEANER

- Contains amphoteric detergents
- Compatible in use with phenolic, quaternary, chlorinated, peroxide and iodine disinfectants
- Rinses free without streaking
- Use for foam, high pressure or manual cleaning
- Works in hot or cold water
- Safe for all wet table surfaces

SOIL INACTIVATES ALL DISINFECTANTS SOONER OR LATER.

SOIL ALSO SHIELDS THE MICROORGANISMS FROM CONTACT WITH THE DISINFECTANT.

YOU MUST PHYSICALLY REMOVE MANY MICROORGANISMS DURING THE CLEANING STEP TO INSURE THE RESULTS OF YOUR DISINFECTANT.

IN THE HATCHERY MICROORGANISMS ENTER THE CHICK VIA:

- Navel
- Respiratory
- Injection

HATCHERY SANITATION TESTS

- Introduction
- Importance of Hygiene and Sanitation Programme
- Frequency of Monitoring
- Need of Sanitation, disinfection and isolation.
- Microorganism – Nutrients and Moisture Control – cleanliness and dry

- Dust and Biofilms

HATCHERY PROGRAMS

- Quality Assurance
- Set-transfer-pull
- Sanitation
- Preventative Maintenance

SET, TRANSFER AND PULL TIMES

- Know your incubation time
- Set consistently (same time every day)
- Transfer consistently (same time every day)
- Keep flock age consistent (segregate)
- Check hatcher chamber time

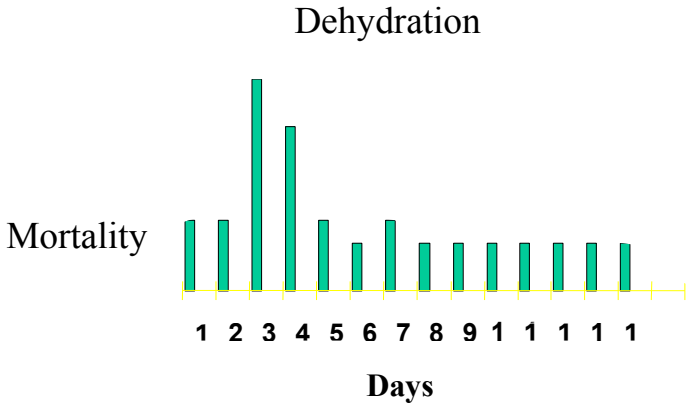
QUALITY ASSURANCE

- Egg Assessment
  SIZE, DIRTY, CRACKED, DEFORMED,
  DOUBLE YOLK AND INVERTED
- Candle And Residue Breakout
  INFERTILE, EARLY-MIDDLE-LATE DEAD, PIPS,
  CRACKS CONTAMINATION AND INVERTED
- Chick Assessment
  DEHYDRATED, NAVALS, RED HOCKS, CULLS

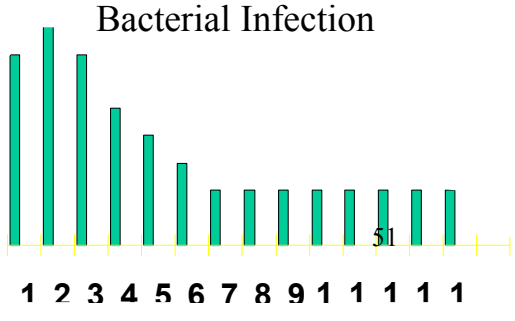
CHECK MOISTURE LOSS

- Weigh before set & again at 18 days
- Candle at 18 days
- Check pipping between 19-20 days

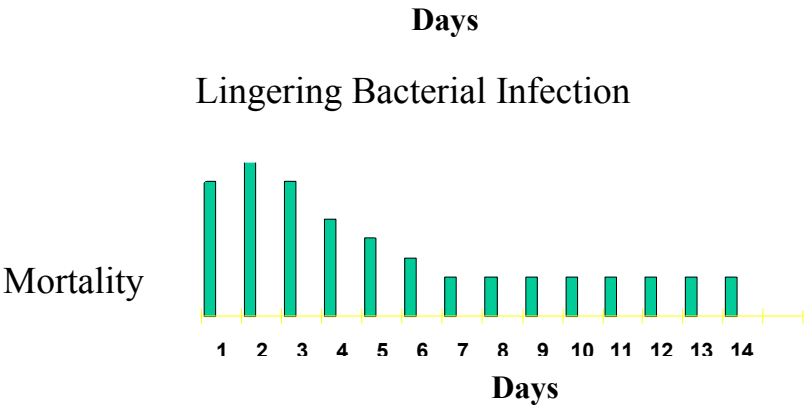
CHICK QUALITY



CHICK QUALITY



Mortality



CHICK BOX

- One of the culprits for fungi aspergillus sp. Is the wood wool or the paper cuttings used for chick box bedding
- Fumigate the wood wool or coil carefully
- Avoid storing the wood wool in moist and humid areas
- Periodical checkup for microbes at critical points at hatchery is essential
- Samples need to be drawn at egg storage room, setters, hatchers and other equipments used at the hatchery.
- Hatchery workers hands, dress and equipment used by them

CONTROL POINTS AT THE HATCHERY

- Working personnel hygiene
- Egg reception and fumigation
- Egg storage
- Setters
- Setter room
- Candling and transfer area
- Hatchers
- Chick Holding and vaccination
- Sexing and Vaccination
- Wash room
- Water tanks and storage

EARLY CHICK MORTALITY

- Bad handling of chicks at hatchery
- Unhealed navels
- Unabsorbed yolk (Mushy chick)
- Infections such as colibacillosis, Salmonella, Pseudomonas, Klebsiella.

- Corynebacteria, proteus, staphylococcus and streptococcus.
- Water deprivation
- Heavy dose of antibiotics
- Improper brooder temperature
- over crowding

HATCHERY DISINFECTION PROTOCOL

SR.NO.	Area	Procedure of disinfection
1	Egg cleaning	Cleaning of eggs with B-904 @ 2ml of water - clean eggs @ 2 ml / ltr - dirty eggs @ 4 ml / ltr
2	Egg Grader hand	Cleaning and dipping of both hands in B-904 solution @ 4 ml/ltr of water after one hour interval.
3	Fumigation room	Washing of floor daily with UBC at the end of the day
4	Working area	After every operation or daily grooming of area to remove dust and dirt, mopping with clean and wet mopper, after this spray attack @ 40 ml / ltr of water, Spray of Biophene @ 4 ml / ltr of water twice a week followed by mopping.
5	Cold room	Spray of safeguard solution @ 8ml / ltr of water twice in a day followed by mopping. Spray of Biophene @ 4 ml/ltr of water twice in a week followed by mopping.
6	Setter & Setter Hall	Inside Setter : Mopping with Biophene solution @ 4 ml/ltr once in In every shift mopping of floor with plain water then attach @ 40 ml/ltr of water. Once in a day during lunch hour or when minimum manpower is present spray of formaline 2%. Once in a day spray of copper sulphate @ 1 gm/ltr of water
7	Humidifier tank	Sanitize the water Bioquat-20 @ 1 ml/20 ltr of water. It will be btter to sanitize the volume of water which is supposed to be consumed in 24 hours.
8	Floor washing	Once in a week washing of floor of entire hatchery building with UBC @ 1ltr / 300 ltr of water. Walls upto 4 ft. of height should also be washed.
9	Hatcher & Hatcher area	After pullout gromming of floor to remove dirt and debris then wettening of surce with UBC 1:300 dilution for 5 to 10 minutes then wash with plain water, after this spray of attach @ 40 ml/ ltr of water.
10	Pullout room	After pullout gromming of floor to remove dirt and debris then wettening of surce with UBC 1:300 dilution for 5 to 10 minutes then wash with plain water, after this spray of attach @ 40 ml/ ltr of water.

11	Hatcher tray cleaning	After cleaning of trays - Tray should be dipped in following solutions: - Orthophosphoric acid (pure) 1% dilution - 1st week of month. - Caustic soda - 100 gm / 100 ltr of water - rest three weeks.
12	Chicks room	Same as hatcher room and pullout.
13	Packing material room	Daily fumigation with bleaching powder and formaline @ 20 gm bleaching powder plus 40 ml formaline per 100 c.ft. but one should ensure that no air from outside.
14	Washing area	After completion of washing, operation area should be washed with caustic soda, then it should be maintained dry atleast for 12 hours in a day.
15	Surrounding of hatchery	We should use disinfectant on rotation basis outside or surrounding of hatchery in prescribed concentration. - Attack @ 40 ml / ltr. - Biophene @ 4 ml / ltr. - Safeguard @ 8 nk / ltr. - Copper Sulphate @ 1 gm / ltr. - Formaline - 5% solution.
16	Foot dipping	After every shift footwear used by staff and workers shall be dipped in 1:500 solution of UBC then these footwear shall be disinfected in Safeguard solution @ 8 ml / ltr of water.
17	Hand wash	With safeguard solution @ 8 ml / ltr of water.

EGG WASHING MACHINES

- Program 1 - (High chlorine, low pH)

  BioSentry DBC-B - Initial chlorine levels as high as 600 ppm may be used. Discard solution when chlorine reaches 100 ppm or less. After washing apply BioSentry 904 or BioQuat 20 for residual action.

- Program 2 - (High pH, low chlorine)

  Liquid Egg Wash 101 - Use 2-8 ml/L. Will strip cuticle. Good commerce egg wash. Maintain chlorine above 50 ppm. Apply BioQuat 20 to commercial eggs after washing. Use either BioSentry 904 or BioQuat 20 on hatching eggs.

EGG WASHING

EGGS BECOME CONTAMINATED

- By the hen
- From the hen
- After the hen

3 POINTS TO EGG WASHING

Use recommended detergent
Change water often
105^0 -110º F

QUALITY CHICK SHOULD HAVE:

1) A Good uniformity
2) Lively active
3) Bright eyes
4) Good plumage
5) Plumpy body
6) Good body weight
7) No unhealed navels
8) No flabby abdomen
9) No deformity

Session 12:

Hatchery Hygiene Monitoring and Quality Control

By,
Dr. Deepa Deshpande, M.V.Sc.(Micro)
Veterinary Officer
Poultry Diagnostic and Research Center of Venkateshwara Hatcheries Pvt. Ltd. , Pune

- Introduction
- Importance of Hygiene Monitoring
- Frequency of Monitoring
- Probable sites of microbial contamination
  - Egg Surface
  - Setter
  - Hatcher
  - Setter & Hatcher Air Inlets
  - Setter & Hatcher humidifier water reservoir
  - Sexing Tables
  - Vaccination

Tips For Maintaining The Hatchery Under Sanitary Conditions

- Hatchery Premises
- Setter & Hatchers
- Egg Surface
- Pull Out/Sexing/Hatch Room
- Vaccination
- Chicks Packing
- Hatchery Disposals
- Chicks packing boxes & Packing Material

REQUIREMENTS FOR HATCHERY MICROBIAL MONITORING

- A small bacteriological Incubator
- A small hot air oven and autoclave
- Petridishes for cultural media

- Cotton Swabs, Pipettes
- Tongue blades and dissecting box
- Colony counter
- Marker pen
- Caps and Masks (Disposable)
- Record book / Report Sheet
- Various dehydrated bacteriological cultural media. e.g. nutrient
- Agar, Mac. Agar, Sabouraud's Dextrose Agar etc.
- Ethyl Alcohol For time to time hand sterilization while monitoring

SUGGESTED AREAS TO MONITOR

Most Probable Sites of Microbial Contamination

- Hatchery Premises
- Fumigation Room
- Egg holding Room
- Setter and setter rooms
- Egg Surfaces
- Hatcher and Hatcher Room
- Setter / Hatcher Air inlets
- Pull out, Sexing / Hatching Room
- Hand impressions of egg Sorter, pull out persons, sexer,
- vaccinators along with impressions of their dresses

SUGGESTED AREAS TO MONITOR

Most Probable Sites of Microbial Contamination

- Sexing table
- Vaccination and Vaccine preparation
- Surfaces of take off tables, hatching trays, machine trays, lamp shades etc.
- Chick Holding Room
- Wood wool / Coir Storage Room
- Hatchery Disposal
- Washing Room

SAMPLING PROCEDURE

Proper Hatchery Monitoring certain tips are required as below:

- Air Sampling
- Surface Sampling
- Collection of Hatchery Samples, e.g. Fluff, Pooled, meconium, Dead in shell etc.
- Water sample collection
- General Observations

Method For Evaluating The Organism

- Exposure Plates
- Agar Slide Impressions
- Swabs In TPB
- Water Sample
- Fluff Sample
- Pooled Meconium
- Dead in Shells/Cull chicks
- Coconut Coir/Wood Wool

Differential Result Reading

- NA –Nutrient Agar
- MA- Mackonkey Agar
- SA- Sabouraud's Dextrose Agar
- White Cottony Fungus-Saprophytic fungus
- Yellowish green fungus-Aspergillus flatus *
- Green Fungus –Aspergillus fumigates*
- Black Fungus-Aspergillus Niger *
- Bluish Green Fungus –Penicillium spp.*
- Pathogenic Fungi

BASIS FOR INTERPRETATION

Air rating ,as laid down by Sadler for a Ten Minutes exposure using Nutrient Agar / Tryptic Soya Agar cultural Media plate is judged as shown in Table Below :

Location	Excellent	Good	Average	Poor	Worst	Miserable
All Areas	0	1-3	4-6	7-10	10-12	13+
Rooms	0-15	16-36	37-57	58-76	77-96	97+
Setters	0-10	11-25	26-46	47-66	67-86	87+

The Results however, depend on disinfection, Air circulation and exhaust system and atmospheric condition of the location since dry dusty conditions or much air turbulence would lead to a higher count.

RATING FOR EVALUATION OF PLATE COUNTS FOLLOWING TEN MINUTES AIR EXPOSURE BY SADLER - 1975

Score	Colony Count (Setters)	Colony Count (Rooms)	Mould Count
Excellent	0-10	0-15	0

Good	11-25	16-36	1-3
Average	26-46	37-57	4-6
Worse than Poor	67-86	77-96	10-12
Miserable	87 or More	97 or More	13 or More

Count also vary with conditions as when Hatch is in progress and after clean up.

RATING CRITERIA

The following shall be rating for evaluation of Microbial count from different agar media plates (85 mm Diameter) and impression slides

	Result Reading	TPC on NA (CFU/plate)		TPC on MA (CFU/plate)						TPC on SA (CFU/plate)			
Sr. No.	Remark Score			Commensals		Oppo. patho.		Patho.		Sapro. fungus		Patho. fungus	
		R	(A)	R	(A)	R	(A)	R	(A)	R	(A)	R	(A)
1.	Excellent – a - Nil	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
	b - Nil+	1-4	(2)	1-2	(1)	0-1	(0)	0	(0)	1-2	(1)	0	(0)
2.	Good +1	5-24	(20)	3-10	(8)	1-6	(4)	1-2	(1)	3-8	(5)	1-2	(1)
3.	Average +2	25-44	(35)	11-20	(15)	7-12	(9)	3-8	(5)	9-18	(12)	3-8	(5)
4.	Poor +3	45-70	(60)	21-35	(30)	13-20	(8)	9-15	(10)	19-30	(25)	9-15	(10)
5.	Miserable +4	71& above	(100)	36 & abvoe	(50)	21 & abvoe	(25)	16 & abvoe	(17)	31 & abvoe	(45)	16 & abvoe	(18)

Abbreviations Used :
TPC = Total Plate Count
CFU = Colony Forming Unit (I.e. No. of Bacterial colonies per plate)
MA = MacConkey's Agar
NA = Nutrient Agar
SA = Sabouraud's Dextrose Agar
Sapro = Saprophytic
Patho = Pathogenic
Oppo. Patho = Opportunistic Pathogens
R = Range
A = Average

Note : Given criteria is not applicable for pathogens like Salmonella, Arizona, etc. Hatchery should be completely free from these Pathogens.

Expected Results From An Ideal Hatchery

1. Colony count on MA should be minimum specially for *E. Coli* Proteus & Pseudomonas & absolutely negative for Salmonella & Arizona.
2. Colony count on sabouraud's dextrose agar should be least scored and is better to
   keep free from aspergillus species
3. Bacterial count in hatchery use water should be zero

4. Meconium, dead in shell infertile eggs, cull chicks, fluff and wood wool should be free from pathogenic organisms such as salmonella, Arizona, compylobacter etc.

POINTS TO NOTE :

Based on our experience, following points may be taken into consideration while carrying our Hatchery Monitoring.

- Bacterial load will vary as per season, location of area under investigation, no standard norms available, as this will depend upon the person inanimate movements, quality of chicks, experience of the technicians who carry out monitoring etc.
- We recommend selective media such as Tetrathionate broth / Selenite F Broth in place of TPB for longer transportation time / period.
- Different criterions need to be used particularly for Hatcher, Setting Room, Washing Room, Cold Storage, and Chick Rooms etc., as these values will not be same for different places.

TO ASSESS CHICK QUALITY

- Observe chick behaviour
- Check mortality patterns
- Characteristics of good quality chicks
- A good uniformity
- Lively active
- Bright eyes
- Legs must be yellow & fully fleshed
- Good body weight
- Navels must be healed
- One week mortality less than 0.9%

Characteristics of good quality chicks

- Two week mortality less than 1.6%
- Absence of mechanical trauma

Types of poor chick quality

- Yolk sac infection
- Dehydration
- Aspergillosis
- Trauma or deformed
- Ascites, hydropericardium
- Pasty vents

Session 13:

Role of Nutrition for Fertility & Hatchability

Presented By
DR. R. D. BRAHMAKSHATRIYA
Ph. D. (USA)
ADVISOR (NUTRITION), VHL, PUNE

Main problems causes

- **Environmental factors** affecting egg size are climatic, nutritional and physiological. Nutritional factors that play a major role are the levels of fatty acid and amino acid. Often this is not regulated during hot weather and the amino acids involved are mainly lysine, cystine and methionine. In some cases poor quality oil is used and the required levels of linoleic acid are not met to give the required egg size.

- More farms are mixing their own feed and there is not much quality control. Also feed formulation being followed by rule of thumb such as assuming the weight of feed ingredients in bags and the nutrient levels to be constant at all times, when in fact this can vary from supplier to supplier. Too many formulation changes are being made from time to time such as substitution of feed ingredients when one is in short supply, without balancing the final formula.

- Hot weather plays an important role. During this time, nutrient manipulation must be executed and consideration must be taken for the reduced feed intake, which can affect consumption of important nutrients such as calcium, phosphorus, vitamins, proteins, and amino acids. Their absence can have detrimental effects on eggshell quality, egg size and daily production.

- Problems related to Avian Lecocytozoonosis are present on many farms on an irregular basis. This has some relation to thin shells, pale shells, eggs without shells and on production parameters as well.

- Excess use of sulphur drugs and other forms of broad-spectrum antibiotics pose a serious threat to a variety of eggshell quality problems.

- Limestone grit, which is used as a source of calcium, often contains levels of dolomite as high as 10% or more this has a serious effect on inducing problems related to thin shells when other nutrients such as phosphorus and vitamin D are in the lower range.

- Problems of Mycotoxins from corn. Often the corn is improperly treated or not treated at all and not many assays are being carried out to check the levels present. Though various toxin binders are used, especially various forms of bentonites, zeolites and other silicates, they don't provide good results as they also bind some of the minerals in the feed. Better and more efficient types of toxin binders are available but many farms avoid then due to cost constraints.

- The use of efficient and good quality antioxidants is another cause for concern. Many farmers feel that the feed is consumed faster and therefore avoid using it. Under these circumstances, with the oil usage and feed being stored in bulk bins under high temperatures and high humidity the stability and rancidity of all vitamins is questionable.

- Many farms have stared using various forms of phytase enzymes. They follow rule of thumb by reducing 30-40% of P in the feed without knowing the levels of phytate P present in the feed ingredients. The problem is activated when various sources of Ca and P are used such as DCP / MCP / MDCP / TCP where availability of Ca and P< and the presence of such minerals are not being properly monitored.

- Heat stress is another area of concern during egg production. The problem is related to the birds not consuming enough feed at this time. During heat periods there are also subtle changes in the birds' metabolism that affect both production and shell quality. During heat stress it is probable that not much manipulation is done to in crease dietary energy specifications and stimulate feed intake.

- When egg prices increase, farmers want to produce larger eggs. But many, when home- mixing feed, fail to take into account that in order to produce a larger egg size, the intake levels of balanced proteins must be increased. Aside from protein levels, energy levels are also neglected.

- Many farmers use locally manufactured pre-mixes of vitamins and minerals whose quality and contents are questionable. Assays conducted reveal that major vitamins are below 10-15% of the normal

requirements and minerals by 5- 10%. Local manufacturers maintain constant levels, as it is more economical.

- Disease is another important factor - especially ND challenges and insolated cases of IB that influence egg and eggshell quality and production parameters. EDS also plays a major role due to faulty vaccination.

- Salmonella control, especially Se, was a major problem. This has been brought under control to a certain extent by various good animal husbandry practices and HACCP application on farms as well as employment of veterinarians.

- Water supply and consumption is another area of concern. Though water is treated, routine checks for E. Coil and other toxic minerals are neglected unless a problem occurs. Some other abnormalities affecting egg quality and their causes are shown in following Table.

Problems	Causes
1. Drop in egg production	Severe stress - any from of infection - cessation of ovulation -management problems and hysteria.
2. Double yolked eggs	Two yolks released from ovary at the same time - passes down oviduct same time - absorbed into one shell.
3. Watery albumen	Stress - viral infections - high levels of Aflatoxin deficiency of amino acids.
4. Blood spots in albumen	Rupture of small blood vessels when yolk is released from ovary –Haemorrhages as yolk passes down oviduct.
5. Meat spots	Piece of tissue from oviduct wall
6. Double shelled egg	Egg after having a shell formed in the 4th portion of the oviduct -drawn back into the third part again due to irritation returns to shell forming glands treated as soft shelled eggs and give another shell.
7. Poor quality shell	Stress - viral infections cessation of calcification results in poor quality eggshell. High levels of Zearalenone produced by fusarium moulds tie up with Vit, D3.
8. Mis-shaped eggs	Abnormal pressure on the egg in the oviduct
9. Pale eggs	Reduced pigmentation due to stress or certain viral infection
10. Salmonella contamination in eggs	Contamination of the egg by faecal material in the final stages reaches the oviduct or in the cloaca during oviposition.
11. Dwarf eggs	Irritation of a oviduct discharge of albumen membrane and shell
12. Pale yolks	Constitutional anaemia incorrect feeding - lack of Xanthophylls in ration
13. Thin shelled eggs	Inability of hen to manufacture enough shell forming material -insufficient levels of oyster shells -limestone grit in feed.

Problems	Causes
14. Worms in eggs	Found in fully formed eggs –Works their way into oviduct.
15. Soft shelled eggs	Insufficient shell forming material -Ca / P / Vit, D. Abortion of egg before eggshell is formed -caused by fright or inflammation and irritation of lower part of the oviduct
16. Reduced egg size	Climatic - Nutritional Physiological
	Climatic Changes in the body of chicken Body temperature rises respiration increases - feed consumption - blood calcium level decrease. Intake of protein, carbohydrates - facts - amino acids drops AE reduced egg size.
	Nutritional Levels of fat and amino acids -fat levels high increase in egg size as effect is due to more levels of linoleic acid reduced levels of intake of protein – amino acids – lysine-cysteine - methionine
	Physiological 22-25% of total weight of eggs produced at the beginning of laying cycle in yolk. Liver is responsible for producing yolk size material - size of liver direct bearing on the formation of yolk material. Smaller birds in flocks-small livers - less yolk-reduces yolk size. Age of birds, fumigants in grains, drugs used, etc.
17. Dull shelled eggs	Lack of Vitamins mainly Vit. A, heat stress and Lack of Pigmentation.
18. Rough and abnormal shapes	Related more to cases of I B in flocks
19. Deposits in eggs	Stress - infections and excess calcification results in deposits of shells around the egg.
20. Small eggs	Due to reduce feed intake and intake of other nutrients. Such as protein, amino acids in hot weather.
21. Eggshells with chalky deposits and rough ends	Feeding too much Calcium to Laying hens.
22. Unusual shell structure	Vanadium contamination of Phosphate - and certain weed seeds - lathyrus species cause major disruptions in shell gland.
23. Slow increase in egg size	Diets suboptimal in energy – and high in protein - Hen will utilize protein to meet the energy requirements.
24. Egg yolk too pale	Selection of proper ingredients with Xanthophylls - or poor synthetic pigments - not maintaining the required amount of 7-8 g of Xanthophyll per tonne of feed. Ingredients which are potential sources of oxidizing agents such as minerals -Aflatoxin contamination in feed.
25. Egg without shells	Abortion of eggs before eggshell is formed - suspected cases of EDS
26. Pimpled eggs/Pink eggs	Often associated with mineral metabolism deficiency, stress factors and B-Complex Vitamins
27.Eggs brown	Lack of pigment -and commonly seen in EDS

Problems	Causes
and tinted chalky in appearance	
28. Eggshells ridged and have concretions on their surface shells misshapen	More due to infectious Bronchitis
29. No internal ring of albumen	Associated with infectious Bronchitis
30. Abnormally shaped eggs irregularly shaped and thin shells – and shell less eggs accompanied by severe drop in egg Production.	
31. Broken shelled egg in shell gland	Associated with sudden death syndrome in laying fowl
32. Internal layer	Constriction of magnum and no Passage of eggs through oviduct. Either soft to hard-shelled eggs is occasionally found within the abdominal cavity of laying fowl that possess patent oviducts.

Sessions 13 and 14:

DISEASES AFFECTING FERTILITY
and
TROUBLE SHOOTING IN HATCHERY

Presented By

DR. S. N. KSHIRSAGAR

GENERAL MANAGER (MARKETING), VHL, PUNE

Goals to be achieved

- **Expectation**
- **Maximum production of healthy chicks.**
- **Problem – Lower hatch than the expected**
  - **Unhealthy chicks or % high.**
- **Reasons for low hatchability**
- **Symptoms in break out analysis**
- **Possible reasons for unhealthy chicks**

SYMPTOMS OBSERVED

In break out analysis

Clear Eggs – No embryonic development
infertile
Just a blood ring – Early embryonic death
Many dead embryos at early stage of incubation.
Chicks are fully developed but dead without peeping.
Chicks are fully developed, but dead without pipping
Peeped Eggs but died without hatching
Early hatch
Late hatch – non uniform hatch
Sticky embryos or adhering to shell
Crippled or mal formed chicks
Abnormal, weak or small chicks
Chicks with gasping
Unhealed Navels
Excessive Yellow colour
Report from the field of early chick mortality indicating hatchery or breeding flock problem

DEFICIENCIES & ABNORMALITIES

Deficiency	Abnormality
Vitamin A	Early embryonic death Abnormal development of blood system
Vitamin D	Stunted chicks, soft bones
Pantothenic Acid	Abnormal feathering, S/C haemorrhages in unhatched eggs
Biotin	Shortening of long bones Twisted toes, Parrot beak Mortality 1 to 7 & 18 to 21
Vitamin B12	Oedema of head, short toes, curled toes, poor muscles, deaths 8 to 14 days
Vitamin K	Haemorrhages in embryo
Vitamin E	Oedema, mortality 1 to 3 days
Calcium	Reduced hatch, short thick legs, bulging of forehead, oedema, protruding abdomen
Phosphorus	Mort. 14 to 18 days, Soft beak and legs Less Hatchability
Zinc	Skeletal abnormalities Wings & legs may absent
Manganese	High mortality 18-21 days short wings & legs, abnormal head, Parrot beak, retarded growth, oedema
Selenium	Low hatchability, fluid under skin & oedema

ANALYSING POOR HATCHABILITY

Symptoms : Eggs Exploding
Probable cause : Bact. contamination of eggs,dirty eggs, incubator infection, unhygienic washing of eggs.
Corrective measures : Keep the nests clean, avoid dirty & crack eggs, disinfect incubators, dry clean the eggs.

Symptom : Infertile Eggs (no embryonic development)
Probable cause : Breeder males number, ratio, quality, age, disease, season, crowding, artificial insemination technique, over diluted semen . Egg storage, too long , incorrectly or damaged. Males not mating
Corrective Measures : Males number, ratio, area, quality, body weights, diseases like foot pad, age of the males to be checked and corrective actions to be taken. Semen quality, insemination time and depth. Disease control programme, nutritionally balance diet. Vigour of the males, social dominance of the females over males, Cold storage temp.

Symptoms : Fertile No Development

Probable cause : Eggs stored at too low temperatures, too long, washed at high temperatures.
Corrective Measures : Stored at 55 deg f to 58 deg f. see other details. 5 to 7 days. Dry clean the eggs, eliminate dirties, produce clean eggs.

Symptom : Positive Development
Probable Causes : Improper collection scheduled during hot and cold weather.
Corrective Measures: Temperature more than 80 deg f increase frequency of egg collection.

Symptom : Early embryonic deaths
Probable causes : Improper storage temperatures, unknown power failures, improper turnings, poor Hatchery and incubator ventilation ,disease flocks like salmonella, improper nutrition of breeders.
Corrective Measures : Check thermometer for accuracy, if power fails, open machines till power is restored, turn eggs manually if problem. Provide proper air exchanged, use eggs from disease free flocks. Test the breeding flocks for salmonella infection, remove the reactors, treat the flocks, disinfect the incubators and repeat the procedure of blood testing till the flock becomes totally clean.

Symptom : Many early embryonic deaths
Probable cause : Improper incubation temperatures usually too high, improper egg turning, improper ventilation, Salmonellosis, improper nutrition of breeders
Corrective Measures : Follow recommended temperature and humidity and other norms for the incubators. Make breeder flock disease free. Check breeder nutrient levels and correct.

Symptom : Chicks fully formed but dead before pipping
Probable cause : Low average humidity, improper incubation temperatures, improper turning, chilling of eggs, disease or poor condition breeder flock.
Corrective Measures : Monitor incubation norms of temperature, humidity, 99.5 deg f dry bulb and 85 deg f wet bulbs, ventilation & turning eggs etc. check for the health of the breeder flock especially for he salmonellosis & careful disinfection of incubators and hatchers check for the nutrient levels and toxins if any.

Symptom : Embryos weak and fell to pip
Probable cause : Vitamin E deficiency.
Corrective Measures : Use fresh feed and supplement vitamin E levels.

Symptom : Pipped eggs but died without hatching

Probable cause : High incubation temperature , Improper egg storage , insufficient moisture , improper setting of eggs causing malposition. Corrective Measures : Increase Humidity , set eggs with small end down, monitor proper turning of eggs within three days of hatching, increase ventilation rate of incubator and / or room but avoid draft.

Symptom : Early Hatching
Probable cause : High incubation temperatures, improper egg storage,
Corrective Measure : Follow recommended norms for incubation, check equipments for proper functions, guard against high incubator room temperatures.

Symptom : Late Hatching or not hatching uniformly
Probable cause : Low incubation temperatures , warm and cool spot in incubator due to faulty design, old or improperly stored eggs. Corrective measures : Follow incubation norms, check equipments, if there is variation in temperatures contact incubator company or obtain a different incubator design, gather eggs frequently, cool immediately. Check the storage, do not store more than seven days.

Symptom : Sticky embryos (smeared with egg content)
Probable cause : High average incubation humidity, low incubation temperature, inadequate ventilation, improper fumigation of eggs Corrective Measures : Follow & check incubation norms for ventilation , temperature, humidity etc. check the fumigation procedure and do it carefully.

Symptom : Embryo sticking & adhering to shell
Probable cause : Low incubation humidity especially during hatching, excessive ventilation rate
Corrective Measures : Increase incubation humidity by increasing water evaporation. Embryos dried too much , reduce the ventilation rate but maintain minimum air Exchange to prevent suffocation of embryos

Symptom : Chicks pipped and dead
Probable causes : Disease over heating in hatcher or low hatchery humidity. Nutritional deficiency
Corrective Measure : Use eggs from disease free flocks, check machine and its norms, check the feed quality for nutrients & correct.

Symptom : Crippled and malformed chicks.

Probable cause : Improper incubation temperature (high) , Low incubation humidity, improper egg setting position or turning during incubation, improper nutrition of breeding flock, slick hatching trays

Corrective Measures : Check for high incubation temperatures, low humidity, embryos dried too much, set eggs with small end down, do not turn eggs during hatching process, check for the slippery floor for hatching surface, provide well balanced feed.

Symptom : Malposition

Probable cause : Egg set small end up.

Corrective Measures : Set with large end up.

Symptom: Abnormal weak or small chicks.

Probable Cause: High incubation or hatching temperatures, small eggs, hatch small chicks, insufficient incubation humidity, improper ventilation in hatcher, disease or poorly condition flocks, improper nutrition, excessive fumigation of hatcher

Corrective Measures : follow incubation temperature and other norms, set only large sized eggs, increase ventilation rate but avoid draft, use eggs from disease free sources, check for salmonellosis, provide well balanced nutrition diet to breeders especially vitamins, fumigate scientifically.

Symptom : Chicks with laboured breathing.

Probable cause : Excessive use of fumigant , respiratory diseases

Corrective Measures : Follow recommended fumigation procedures, check disease status of breeder flock, conduct disinfection of incubators and hatching facilities.

Symptom : Large, soft body chicks died in trays with bad odour

Probable cause : Low average incubation temperature, poor ventilation, navel infection (omphalitis)

Corrective Measures : Follow recommended incubation temperature, increase ventilation but avoid draft, clean and disinfectant incubator and hatcher between settings of eggs. Maintain dry hatching trays, Proper store and fumigate eggs. Check dirty eggs and egg hygiene and other biosecurity norms.

Symptom : chicks hatch late, soft and lethargic

Probable cause : Temperature too low, Humidity too high during incubation. Old egg setting

Corrective Measures : 1 deg below 99.5 deg.f will cause late hatch, old eggs should be set earlier to cover extra time.

Symptom : Unhealed navels

Probable cause : improper incubation temperatures, high hatching humidity, navel infection(omphalitis)

Corrective Measures : Maintain recommended incubation temperature & hatcher humidity. Clean and disinfect incubator and hatching units between setting of eggs, maintain dry hatching trays, avoid dirty egg setting, collect clean eggs from the breeder flocks, Fumigate and store the eggs properly.

Symptom : Excessive Dried Chicks (short down)

Probable cause : High incubation temperature, low hatcher humidity, excessive ventilation, holding chicks in hatcher too long after hatching. Corrective Measures: Follow recommended temperature ,correct humidity , maintain adequate air exchange, remove all chicks at appropriate time when there fluffy.

Symptom : Excessive yellow coloured chicks

Probable cause : Excessive fumigation in hatcher

Corrective Measures: Follow recommended fumigation procedures.

Diseases & Prevention

Breeder Flock Problems

- **Nutritional**
- **Bacterial or Mycotic**
- **Viral (Stunting syndrome IB,ND etc)**
- **Toxins**
- **Genetic**

Hatchery

- **Contamination man & material**
- **Toxicity due to disinfectants, fumigants, pesticides & other toxins**
- **Contamination of hatching eggs at breeder flock level or in hatchery**

INFECTIOUS DISEASES

- **Bacterial & viral diseases which affects shell quality, porosity & malabsorption due to enteritis etc. resulting in deficiencies**
- **Some of these factors may result in reduction in interior egg quality also & therefore may affect**
- **Fertility, Hatchability**
- **May often develop mal formed embryos &may result in abnormal chicks.**
- **Mycotic infections(Aspergillosis)**

CONTAMINATION OF HATCHING EGGS

Anti-Microbial Defences :

- **Cuticle : Covers some of the pore openings to minimize bacterial penetration.**
- **Shell : Normal shell prevents entry of the dirt. Broken shell may allow bacterial contamination.**
- **Pores : Abnormal pores may allow penetration of infectious agents.**
- **Shell Membrane : Two membranes presents inside works like a filter and prevents penetration.**
- **Albumen : It contains natural compounds which can kill any bacteria.**
- **Bacterial count : is very high, natural differences can not prevent invasion.**

Preventing contamination :

- **Keep the egg laying nests and material clean, prevent exposure to infection.**
- **Collect eggs frequently**
- **Remove eggs to fumigation room , fumigate & store it at the earliest.**
- **Prevent moisture accumulating on shell,avoid handling till it becomes dry.**
- **Do not set crack and broken eggs.**
- **Follow scientific cleaning procedures only**
- **Avoid setting of old aged breeding flock eggs as the porosity increases.**

FUMIGATION

- **Potassium Paramagnet - 0.6 gms**
- **Formalin(37.5%) - 1.2 cc**
- **For each cub. ft. of space**
- **Use earthen pot or enamel ware having capacity 10 times the total volume.**
- **Time : 20 minutes, Temp- More than 70 deg f. with the proper humidity**

BREEDER FLOCK & HATCHERY

- **Biosecurity ,Vaccination programme, man and material movements and quality controls on feed, Breeder diseases like salmonellosis and other, their prevention programmes**

- **Salmonellosis : Transmission, vertical and horizontal Early chick mortality , Hatchability problems and heavy economic losses. Brings bad name to hatchability. Biosecurity norms, control on feed, water quality, restricting movements of man material, wild birds, rats etc. Monitoring flock health, blood testing by coloured antigen, removing reactors immediately. Treatment of the flocks and observing control and eradication programme for all the time to keep the flock " CLEAN".**

- **Viral and bacterial problems which influence egg shape and porosity (for e.g. IB, ND etc), Low hatchability because of excessive loss of moisture during the incubation.**

- **Mycotic problems like Aspergillosis may cause hatchability and early chick mortality problem.**

- **To prevent these problems, regular cleaning of incubators, hatchers, hatchery building and following proper disinfection procedures to keep the microbial count under control is of great importance.'**

- **Adopt proper disinfection procedures, biosecurity norms, feed quality controls, maintain proper heath of breeding flocks & correct hatchery management practices to get " healthy chicks".**

MESSAGE

Production of high quality healthy chicks &persistent hatchability is no accident

Session 15:

SCIENTIFIC DISPOSAL OF DEAD BIRDS AND HATCHERY WASTE

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Paper By
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ONE of the cardinal principles of the prevention and control of the current and emerging disease problems of poultry is scientific disposal of the dead birds and hatchery waste. Usually mortality is expected in every poultry farm. The average annual mortality of poultry is about 10-20%. On a poultry farm with 5,000 layer type of birds, therefore, one may expect to lose about 500 to 1,000 birds, during the year. When birds die due to diseases, carcasses remain as source of infection for pen mates and other poultry on the same or other farms. All birds that die as a result of serious clinical infection or just the usual expected mortality should be disposed scientifically to prevent dissemination of diseases. Also diseased birds or chronically and incurably ill birds discharge infectious material into the environment and act as living reservoirs of disease. It is good to get rid of such ailing birds from the flock rather than to jeopardize the health of the remainder of the flock.

In any type of commercial hatchery operation, there has always been the problem of disposing of what was left after the chicks are removed from the trays. This includes all the egg shells, unhatched embryos, infertile eggs and culled chicks. This hatchery waste is the potential source of hatchery borne or egg borne diseases like Salmonellosis, Colibacillosis, Pseudomonas

infection, mycoplasmosis, avian encephalomyelitis; Reovirus infection, lymphoid leucosis and brooder pneumonia. Hence, hatchery waste, if not disposed scientifically, may become a constant danger from health point of view. The in contact flocks may suffer from number of diseases by potential spread of germs inborn in hatchery waste.

The habit of throwing dead birds and hatchery waste on the nearest manure pile or into an open field is the dangerous and unscientific way of disposal of dead birds because :

1. The smell of carcass and hatchery waste attract the dogs and cats, they consume the infected carcass and hatchery waste and harbour enteric organisms infectious for poultry. Because of their free movement these animals are capable of tracking contaminated material or a portion of carcass to neighbouring farms which disastrous results to neighbouring flocks.

2. Vultures and other wild birds invade the carcass and act as potential carriers of the disease causing agents from one farm to other even from one country to another (migratory birds).

3. The carcass invites insects and flies, which acts as transmitters of infectious agents.

4. The disease agents are carried through rain water and contaminate other water sources.

5. Some of the disease causing agents are carried through air (M.D. Virus in feather follicular epithelium) from one place to another.

6. The surroundings are contaminated with feathers and bones (soil pollution).

7. On decomposition, the carcass may emit foul smell and cause air pollution.

Hence, the disposal of carcasses of birds, whether dying from known or unknown causes, should be carefully attended to. There are many methods of disposal of carcasses and hatchery waste followed in the farms and hatcheries.

1. BURYING :

This is the suitable method of disposal for small farms which may not afford to construct an incinerator. This method is also used for severe losses creating a serious disposal problem. The dead birds should be buried deeply, so that they cannot be dug up by dogs, skunks or foxes, and so that worms may not carry infection from the carcass to the surface of the ground. The best and easiest way is to dig a deep narrow trench. Each day's collection of dead

birds can be deposited and covered until the trench is filled. Small farmers use plastic bags and keep the mortality in this bag and bury them deep. Chances are minimum to spread the infection by use of such plastic bags.

2. PIT DISPOSAL :

The pit disposal is an effective convenient means for disposal of hatchery waste and dead birds, that is within the means of all poultry raisers. The location of the pit should be selected with care. Some points to consider in selecting the location are as follows :

1. The pit should be kept at a reasonable distance (150 feet) from the poultry houses and the well that provides the water supply.

2. The area selected should have reasonably good drainage. Any area that might flood and fill the pit with water should be avoided.

3. The bottom of the pit must be above the level of water table.

4. It should be located where the walls will not cave in.

5. The pit should be in the near vicinity of post-mortem room.

The success of pit will depend on its careful and tight construction. This can be made of any size depending upon the flock size and hatchery waste generation. The most practical size is about 6 feef square by 8 feet deep. A pit of this size should provide suitable disposal facility for dead birds and hatchery waste for several years on the average poultry farm or hatchery. (**Fig.1**)

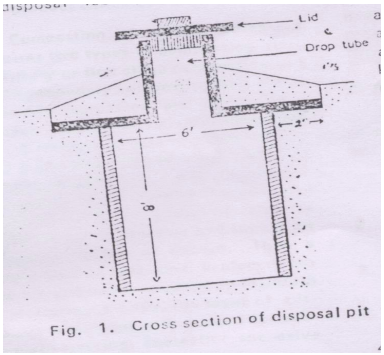

Fig. 1. Cross section of disposal pit

For constructing the pit the first foot of earth should removed over an area of 10 feet long and 10 feet wide. A pit of 6' x 6' x 8' is dug in the centre thus leaving a 2 foot shelf on each side on which to lay concrete roof for covering the pit. In the centre of the roof, 1 foot square by 3 feet height drop tube is made through which the dead birds may be dropped into the pit. A tight fitting lid should be made for the upper end of the tube to prevent the escape of odours and the entrance of flies. The tube should extend 2 feet above the ground and atleast 1 foot of earth should be filled in over the roof and banked around the tube so that water will drain away from the tube. If the soil is firm

and well bound together, casting to keep the edge of the pit from crumbling may not be necessary. However, the surest procedure is to provide retaining casting to keep the earth walls from crumbling.

The dead birds and hatchery waste in the pit are destroyed by decaying. The rate of decaying is slow and as the birds decay, there will again be more room. Eventually, the pit becomes full and it should be sealed by filling the drop tube with earth. As the decaying is slow, it is better to construct two such pits so that shift is made from one pit to another, when one is full.

3. INCINERATION:

Incineration is the burning of carcasses and hatchery waste. Incinerator is a furnace used for burning. Incineration is the preferred method of disposal, provided the carcasses are completely burnt in this process, electricity fuel oil and fire wood are used as fuel. Design of incinerators depend upon the fuel used for an operation.

Electrical or oil fired incineration is the best available technology for efficient and immediate disposal of carcasses and hatchery waste. The major advantages of this method are -

1) Rapidly destroys disease producing agents leaving only a small amount of ash that is acceptable for land disposal

2) Smokeless and odourless burning with minimum pollution

3) Negligible operation cost. Many models or designs of incinerators are available commonly in the market with the capacity ranging from 10 kgs. to 125 kgs. The approximate cost of an electric and oil fired incinerator is Rs.1,00,000/- and Rs.1,20,000/- respectively.

Various types of home made incinerators operated by fire wood have also been used successfully for disposal of dead birds. This type of incinerator is inexpensive but consume more fire wood and may create unconsiderable soil and air pollution by producing more ash and fume. A model of incinerator using the wood as fuel is given in **(Fig. 2)**

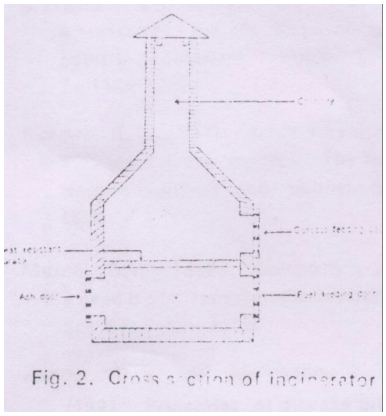

Fig. 2. Cross section of incinerator

4. SEPTIC TANK DISPOSAL:

This method of disposal consist of digesting the carcasses and waste products in the electrically heated septic tank by the action of mesophilia bacteria. These bacteria multiply best at 90-100°F. Hence the heat is applied at 100°F to maintain this temperature. Two weeks time is needed for destruction of carcass except bones. The bacterial action and speed of decomposition can be accelerated by adding lime and hot water at intervals. Roughly, a tank of 2000 ltrs capacity is necessary for a flock of 10,000 birds.

5. RENDERING :

In this method, the dead birds and hatchery waste are converted into fertilizers and other products. In some large centres rendering plants are available for industrial utilization of dead birds. These plants collect freshly dead birds, fried cut for its fat and bones.
The fat is being utilized in the manufacturing of soap and the bones are use for manufacturing of fertilizers and bone meal. One of the major disadvantage with this method is the spread of pathogenic micro-organisms during routine pickup and transportation to a rendering facility.

6. COMPOSTING :

Composting is a controlled, natural process in which beneficial organisms (bacteria and fungi) reduce and transform organic wastes into a useful end-product called compost.

Composting of poultry carcasses requires two type of composting bins, a primary or first stage composting and a secondary composting bin. Daily mortality carcasses are sequentially layered into the primary bin with used or caked litter, wheat or paddy straw, and water at a ratio of 1:2:0, 1:025 by weight respectively. A one feet layer of litter is first placed on the concrete floor of the bin. A layer of straw is added to aid in aeration and supply an adequate source of carbon. Then a single layer of carcasses is placed into the bin and water is added to maintain a moisture. Finally, the layer of carcasses is covered with manure for subsequent layering. Thereafter, successive layers of litter, straw, carcass and water are layered into the primary bin, once full, a final cover of litter is placed over the carcasses.

Temperature of the compost increases rapidly as bacterial action progresses, rising to 60-70°C within 10 days. The increase in temperature has two important effects

1) It hastens decomposition and

2) It kills micro-organisms, weed seed and fly larvae.

Temperature begins to decrease in the primary bin 14 to 21 days later. At this point, material is moved to the secondary bins, aerated in the process, and

allowed to proceed through a second temperature rise. After the second heating cycle, composted material can be safely stored, until need for land application. When properly managed, composting is a biosecure, relatively inexpensive and environmentally sound method for the disposal of poultry carcasses.

In general, the following points should be considered while disposing the carcasses and hatchery waste :

1. Remove the dead birds from the flock as soon as possible.
2. Don't deposit carcasses in or near flowing stream.
3. Don't use carcasses for animal feed.
4. Take necessary precaution to prevent spilling of infectious material from the carcasses or hatchery waste during transportation from the farm, postmortem room or from hatchery to disposal site.
5. Clean and disinfect the vehicle used for transport of dead birds and hatchery waste.
6. Sound biosecurity at disposal sites is essential to prevent disease transmission.

As the poultry industry expands, the amount of on-farm wastes increases. If poultry farmer follow any one of the methods described above for disposal of dead birds, it will save them much loss from diseases among their flocks. But with present concerns for the environment, the poultry industry needs to pursue efforts to protect the environment. Therefore, all methods that allow for the environmentally safe and biosecure disposal of poultry carcasses should be considered.

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