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Artificial Insemination: A Tool For Poultry Breeders

THE DECISION OF breeding companies to reproduce their pure lines no longer in pedigree floor pens but in cages, involves the decision to change from natural mating to artificial insemination. In this article the extensive topic of AI-management can only be reviewed in a very general way.

What are the advantages of breeding in cages for a commercial poultry breeder?

Advantages of cage management for breeders:

- Better working conditions.
- Lower costs due to reduction of personnel needed for gathering eggs; reduced feed consumption; increased number of hatching eggs (no floor eggs) increased hatchability (hatching egg production under better hygienic conditions).
- More uniform feed restriction for broiler breeders.

Advantages of pedigree reproduction in single cages:

- Increased genetic improvement due to more accurate data recording (compared with trap nesting).
- Reproduction of selected hens without change of environment.
- Fertility test of breeder males by laboratory semen examination prior to mating.
- Reproduction of males with unsatisfactory "fertility" under conditions of natural mating, eg due to extreme differences in body weight, selective mating, female dominance over males, etc.
- Better control over actual parentage after exchange of males and possibly shortening of safety period between two successive matings involving different males.

Advantages of reproduction with pooled semen:

- Best possible utilisation of the very best males, by dilution of semen and by optimising the frequency of semen collection and inseminations for any particular line and age of flock.
- More flexible use of the same breeder males, eg as mates of selected pedigree females and at the same time as sires of grand parents or control flocks.

What are the problems with AI?

Of course there are not only advantages to AI, and a number of details have to be taken care of to make it work. Basically, three problems have to be solved:

- Design and organisation of a functioning AI system.
- Minimisation of AI costs per saleable chick, which of course includes satisfactory fertility.
- From a genetic standpoint: Safeguarding against pedigree errors and the possibility of undesirable changes in mating behaviour under natural conditions.

Apart from genetic considerations, the gain in efficiency resulting from a change from deep litter to cages depends mainly on a well functioning AI system.

People who make AI work

- Choice of personnel—
It is necessary to choose persons from the available farm workers who are especially interested, responsible and calm.

(Please turn to page 55)



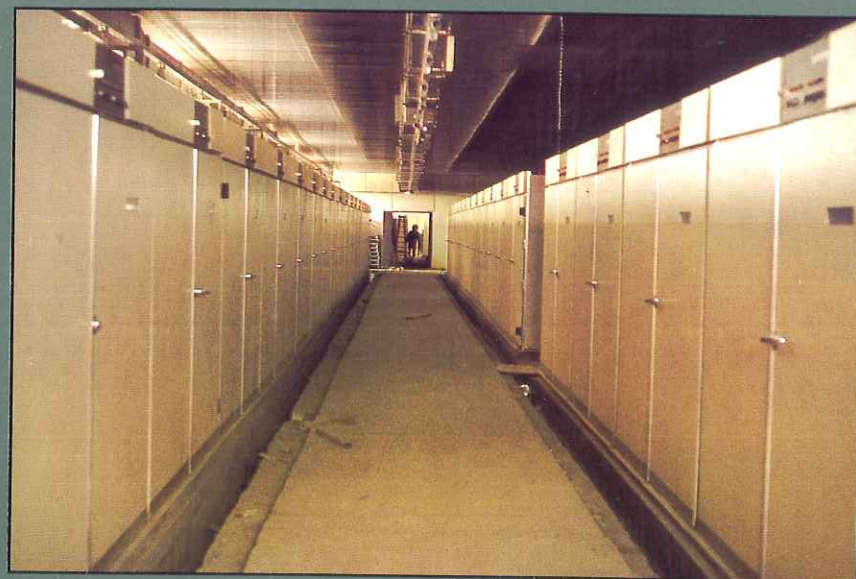
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Artificial Insemination

(Continued from page 50)

After this initial selection, it is advisable to find other assignments for persons, who have been trained in AI-techniques but obviously dislike their work or find it too demanding. To assure optimum fertility over a long period of time, it is essential that care, patience, spirit of involvement, and persistence of the team is maintained even after weeks of AI work.

Instruction and motivation

The training of a person for AI work includes three main parts:

- Brief explanation of basic aspects of anatomy, breeding, hygiene and economics, as related to AI;
- Practical demonstration of the three techniques of artificial insemination: collection of semen, everting the distal vagina and insemination;
- Period of practical experience, during which a new person, after exposure to the theoretical aspects and the techniques, works together with an experienced AI trainer who can point out specific problems and deepen an interest in this work.

Observation of the teams during their work, monitoring fertility and appreciation of good results:

As the success or failure of the AI generally shows up no earlier than four weeks after insemination, ie at transfer of the hatching eggs, three supporting measures should be carried out:

- Checking the AI work in a good humored and collegial atmosphere, to keep the hygiene and the accuracy of the AI techniques at a high level;
- Early candling of samples of hatching eggs, especially from new flocks or new AI teams;
- An appreciation of good AI results and special efforts to reach them, in order to maintain the ambition and interest of all people involved in AI.

It seems advisable to document all AI work in an efficient manner, so that all important aspects can be reconstructed in case problems show up and as a basis for studying longterm trends.

Design of Special AI Cages:

Cages for females should meet the following requirements:

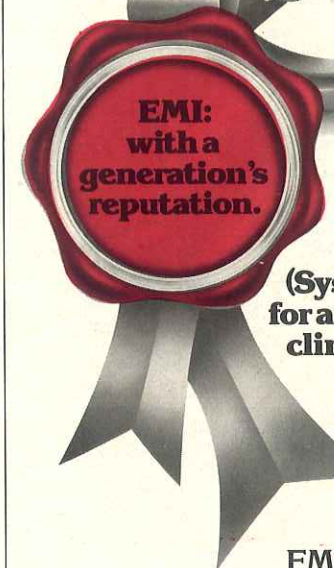
- Optimum height of the different tiers, to make AI work as comfortable as possible (including special carts for lower and upper tiers).
- Cage dimensions according to average body weight of each line: it must be possible to turn the hens around without any difficulties.
- A cage front which is easy to open and to close with one hand and suitable for in-cage insemination.
- For most strains of meat breeders, single cages are a must in view of the difficulties with restricted feeding.

Cages for males should meet the following requirements:

- Cage size according to the maximum body weight of the adult cocks, preferably single cages.
- Large cage doors, to be able to take the cocks gently out of their cages.
- Safe but quick and easy to open lock system, to avoid any stress before semen collection.
- Sufficient height, to enable the males to stand up and stretch without hurting their comb.
- Optimum cage floor to avoid any toe injuries or foot pad infections (different requirements for light and heavy lines).

Correct adjustment of feeding techniques and lighting
(Please turn to page 58)

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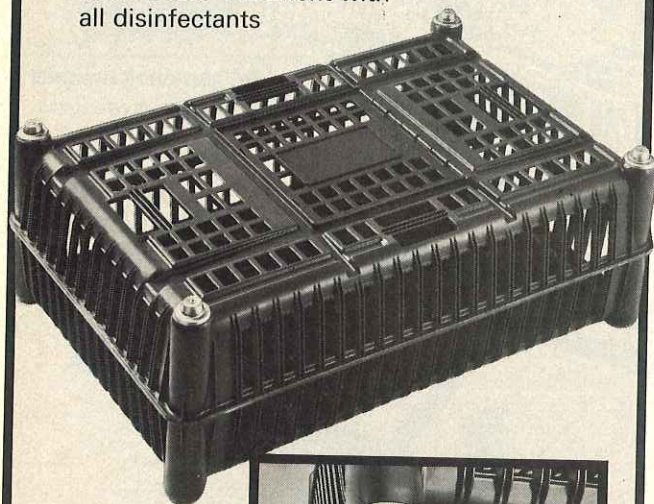
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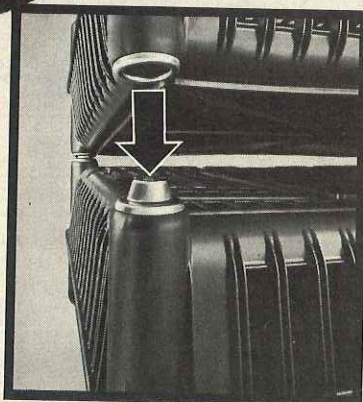
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Artificial Insemination

(Continued from page 55)

programmes to the specific requirements of the lines to be inseminated.

Management of AI Males:

- Training period
 - placing males into AI cages;
 - acclimatisation to the particular feeding and watering system;
 - clipping feathers around the cloaca;
 - resting period between clipping and first semen collection;
 - first semen collection, using a modified technique for training and getting accustomed to the personnel;
 - selection of males for AI-ability (test for sexual drive, subjective evaluation and laboratory examination of the semen).
- Reproduction period
 - determining the optimum frequency of semen collection for different lines and ages;
 - gradual change of the semen collection method used during the training period to a quicker technique which can be adapted to the specific requirements of different lines;
 - selection of a suitable diluent.

Management of AI Females:

- Development of an optimum insemination technique (quick, gentle and hygienic);
- Organisation of a safety system to avoid any pedigree errors during insemination;
- Determining the most suitable time of day for insemination, both from a physiological and work-flow standpoint;
- Testing the optimum frequency of insemination for different lines and ages (using persistence of fertility after a single insemination as a criterion);
- Optimum dilution of semen.

Selection Of Development Of Optimum AI Equipment

For mass application of AI, it is necessary to assemble a complete set of equipment and instruments under the aspects of minimum hygienic risk, easy handling and lowest possible cost per insemination.

At the present time, no company supplies a complete set of equipment that is suitable specifically for pedigree insemination of chickens. So, it takes some ingenuity to develop a system for this special purpose.

The Cost Of AI

The AI cost per saleable chick can be used as a criterion to measure the efficiency of any AI system:

$$\frac{L + E}{N \cdot F \cdot H} \quad \text{AI cost per saleable chick}$$

where L = labour costs per hen per week; E = cost of equipment per hen per week; N = number of hatching eggs per hen per week; F = percentage eggs transferred ("fertility"); H = percentage saleable chicks, relative to eggs transferred ("hatch of fertiles").

In order to find optimum solutions for specific situations, it is necessary to know not only the labour and equipment cost and the reproductive performance of individual flocks, but also the effects of modifications of the AI routine on fertility.

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we are averaging over 90% "fertility" (eggs transferred at 18 days) under normal conditions during pedigree reproductions of both broiler and layer stocks. The AI cost per grade A pedigree chick is down to 6.5 Dpf, the cost per saleable chick from pooled semen inseminations is about half as much.

While AI systems for mass application in a breeding company are no longer a technical problem, it will depend on the relative cost of cage depreciation versus feed savings, availability of qualified personnel, total labour cost including AI and other factors whether AI will be used on a larger scale in the future for grandparent and parent stock management in cages.

—Kathrin Stöve

(The author is on the genetic staff of Lohmann Tierzucht GmbH—Editor)

Hot Weather Management Tips

Egg producers can help head off summer heat-related production slumps now by planning ways to keep both pullets and layers comfortable on extremely hot days.

"There are several hot weather management practices that will help keep birds cooler," says Dr Stephen Hull, Master Mix poultry feeds director.

"The birds should have easy access to plenty of cool water.

Layers will consume up to 25% more water when temperatures hit 30°C or above. And protect water lines from direct sunlight," Hull says.

He points out that since poultry do not sweat and their feathers restrict heat transfer, adequate air movement must be provided. Additional fans should be added as needed. Reducing bird density will help reduce bird produced heat.

Hull also says that new types of evaporative cooling systems are effective in both low and high humidity areas.

"Ceiling insulation helps lower house temperature and roof sprinklers lower house temperatures without excessive water usage," he adds.

The poultry specialist explains the feed intake for both layers and pullets decreases as temperature increases. Adjustments must be made in feeding programmes to help maintain pullet weight gains and layer egg sizes and numbers.

Rations higher in non-calorie nutrient density must be fed to compensate for reduced consumption. "Know how much your hens are consuming and feed accordingly," Hull stresses.

He also recommends a representative sample of pullets be weighed to be sure the feeding programme is doing the job. "If pullet weight gains are running low, the non-calorie nutrient density must be increased either through mixing or changing to a more dense feed."

Künstliche Besamung: ein Werkzeug der Geflügelzucht

Zusammenfassung—Die Entscheidung einer Zuchtgesellschaft, das Vermehrungsprogramm für die reinen Linien in Käfige zu verlegen, beinhaltet auch die Entscheidung, von der natürlichen Paarung auf künstliche Besamung (KB) überzugehen.

Für Zuchtunternehmen bietet die Käfighaltung eine Reihe von Vorteilen, u.a.: bessere Arbeitsbedingungen, Kostensenkung wegen Personalarbeit (weniger Personal für das Eierabsammeln), verringerter Futterverzehr, grössere Zahl einlegfähiger Bruteier, gesteigerte Schlupffähigkeit, einheitlichere Futterrestriktion bei den Broilerelternstieren.

Und die Vorteile der Hochzuchtvermehrung in Einzelkäfigen: gesteigert genetischer Verbesserungsgrad durch genauere Datenaufzeichnung; Fruchtbarkeitsprüfung der Elterntierhähne durch labormässige Spermauntersuchung vor der Besamung, keine Fortpflanzungstätigkeit von Hähnen mit unbefriedigenden Fruchtbarkeitsleistungen, wie bei natürlicher Paarung (selektives Paaren, weibliche Dominanz etc.); bessere Kontrolle über tatsächliche Vaterschaft nach Hahnaustausch und mögliche Verkürzung des Sicherheitszeitraums zwischen zwei aufeinanderfolgenden Paarungen mit zwei verschiedenen Hähnen.

Natürlich gibt es bei der KB nicht nur Vorteile, und man muss sich einer Reihe einzelner Details annehmen, um das System funktionsfähig zu machen. Grundsätzlich müssen drei Probleme gelöst werden. Aufbau und Durchorganisation eines funktionsfähigen KB-Systems, Minimierung der Kosten je verkaufsfähigem Küken (was natürlich befriedigende Fruchtbarkeitsraten einschliesst) und, aus der Sicht des Genetikers, Sicherungen gegen Fehler im Hochzuchtprogramm und gegen die Möglichkeit unerwünschter Paarungsverhalten unter natürlichen Bedingungen.

Insémination Artificielle: Outil Pour Les Sélectionneurs De Volailles.

Sommaire—La décision prise par les sociétés de sélection, de reproduire leurs lignes pures en cages implique le remplacement de l'accouplement naturel par l'insémination artificielle.

Avantages d'une exploitation en cages pour les sélectionneurs: meilleures conditions de travail, coûts inférieurs dus à une réduction du personnel nécessaire pour le ramassage des oeufs; consommation de nourriture réduite; nombre accru d'oeufs à incuber; meilleur taux d'éclosion; restriction alimentaire plus régulière pour les reproducteurs chair. Avantages de la reproduction pédigré dans des cages à une bête: meilleure amélioration génétique grâce à l'enregistrement de données plus précises. Test de fertilité des mâles reproducteurs par l'examen du sperme en laboratoire avant l'accouplement. Reproduction des mâles ayant une "fertilité" non satisfaisante dans le cas de l'accouplement naturel, par exemple à cause d'une différence importante de poids, d'un accouplement sélectif, d'une domination des femelles sur les mâles etc. Meilleur contrôle sur la parenté réelle après échange des mâles et diminution possible de la période de sécurité entre deux accouplements successifs impliquant des mâles différents.

L'IA ne présente évidemment pas que des avantages et il faut faire attention à un grand nombre de détails pour qu'elle donne satisfaction. Fondamentalement, trois problèmes doivent être résolus: conception et organisation d'un système d'IA qui fonctionne; minimisation des coûts d'IA par poussin vendable ce qui implique naturellement une fertilité satisfaisante; d'un point de vue génétique, protection contre les erreurs de pédigré et la possibilité de changements non désirés dans le comportement pendant l'accouplement dans des conditions normales d'exploitation.

Inseminación Artificial: Herramienta Para Recría Aviar

Resumen—La decisión de empresas de recría, de reproducir sus líneas puras en jaulas, comprende la resolución de pasar del apareo natural a la inseminación artificial.

Ventajas del manejo en jaula, para los criadores: Mejores condiciones de trabajo, costos más bajos por la reducción en el personal necesario para recoger huevos; menor consumo de pienso; mayor número de huevos incubables; mayor índice de empolladura; restricción más uniforme del pienso entre aves de recría de pollos de asar. Ventajas de la reproducción de pedigree en jaulas individuales: Perfeccionamiento genético mejorado a causa de registros de datos más precisos. Prueba de fertilidad de machos reproductores por el examen del semen en laboratorio, antes del apareo. Reproducción de machos con "fertilidad" poca satisfactoria bajo condiciones de apareo natural, por ejemplo, debido a diferencias extremas en el peso físico, apareo selectivo, dominación de las hembras sobre los machos, etc. Mejor control de las aves parentales después del intercambio de machos y posiblemente de acortar el período de seguridad entre dos aparos sucesivos que comprenden machos diferentes.

Naturalmente, no solo hay ventajas para la IA, y es necesario atender un número de detalles para que tenga éxito. Básicamente, es necesario resolver tres problemas: Diseño y organización de un sistema de IA funcional; reducción al mínimo de costos de IA por pollito vendible, lo cual naturalmente incluye fertilidad satisfactoria; desde el punto de vista genético; protección contra errores en pedigree y la posibilidad de cambios inconvenientes en la conducta en el apareo bajo condiciones naturales.

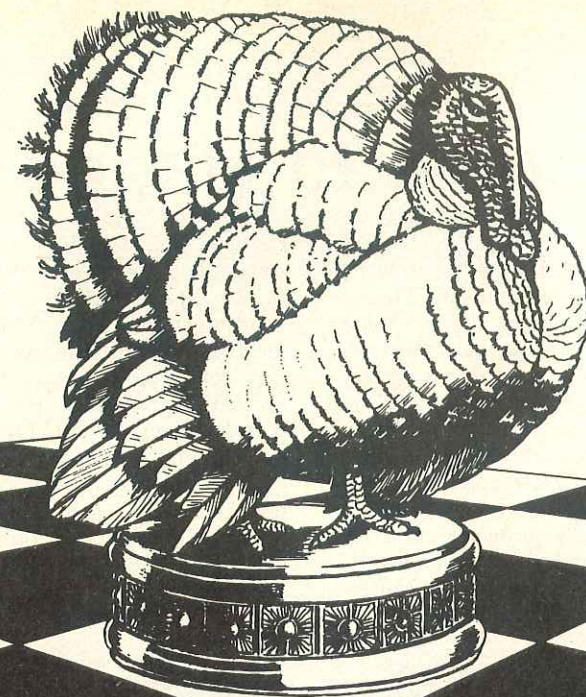
Fecondazione artificiale: uno strumento per gli allevatori avicoli

Riassunto—La decisione di aziende di selezione di riprodurre in gabbia le proprie linee pure, comprende anche quella di cambiare il sistema dell'accoppiamento naturale per la fecondazione artificiale.

I vantaggi per gli allevatori dell'allevamento in gabbia sono: condizioni di lavoro migliorate, spese diminuite dovute a—riduzione del personale necessario per la raccolta delle uova; riduzione del consumo alimentare; aumento del numero di uova incubabili; schiusabilità aumentata; restrizione alimentare più uniforme per i riproduttori da carne.

I vantaggi della riproduzione di pedigree in gabbia singola sono: miglioramento genetico aumentato, dovuto ad una più accurata registrazione dei dati. Un test di fertilità per i riproduttori maschi tramite un esame clinico del seme prima dell'accoppiamento. Riproduzione di maschi con "fertilità" non soddisfacente durante l'accoppiamento naturale, per es. dovuta a grandi differenze nel peso corporeo, accoppiamento selettivo, dominazione delle femmine sui maschi ecc. Miglior controllo del lignaggio attuale dopo lo scambio di maschi e un'eventuale abbreviazione del periodo sicuro tra due accoppiamenti successivi con maschi diversi.

Certo, non ci sono solo vantaggi nella fecondazione artificiale e bisogna tener conto di un certo numero di dettagli per farla riuscire. Infatti bisogna risolvere tre problemi: la creazione e l'organizzazione di un sistema per la fecondazione artificiale ben funzionante; ridurre al minimo i costi per la fecondazione artificiale per pulcino vendibile, che comprende naturalmente una buona fertilità; da un punto di vista genetico bisogna raggiungere una protezione contro errori di genealogia ed evitare eventuali cambi non desiderati nella condotta durante l'accoppiamento sotto condizioni naturali.



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