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Original Research Article

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Socio-Economic Status of Dairy Farmers and its Correlation with Management of Reproductive Disorders in Eastern Plain Zone of Uttar Pradesh

Ashoo[1], H C Verma[2], R K Singh[3], Rajesh Kumar[4], Ramakant[5], R P Diwakar[4]

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Abstract

A study was conducted in Barabanki district of Uttar Pradesh to assess socio-economic status dairy farmers regarding the management of reproductive disorders in eastern plain zone of Uttar Pradesh .The information were generated from 120 dairy farmers, twenty dairy farmers from each of six selected villages, who has minimum at least one milking animal at the time of investigation. The information was generated regarding the management of reproductive disorder due to improper feeding, breeding, and healthcare management practices, and was analysed to reproductive disorders faced by dairy farmers in three categories of animals. Reproductive disorders like dystocia, prolapse, abortion and stillbirth were mostly treated by veterinarian; however, remaining reproductive disorders like anoestrus, repeat breeding, uterine infection etc were treated by dairy farmers and quacks through their own experiences by using different type of indigenous technical knowledge. Socioeconomic status like Age, education and more social participation compression to other socioeconomic status have good management of reproductive disorder in study area .There is need to create awareness regarding scientific animal husbandry practices among dairy farmers.

Keywords: Socioeconomic status; Dairy farmer; Management; Reproductive disorders.

Introduction

Animal husbandry and livestock production is one of the major sources of income of Indian farmers and it has an important role in the Indian agricultural economy. The large ruminants namely cattle and buffalo are integral part of livestock sector followed by other small ruminant species. More than 70% Indian rural people rear livestock and a majority of them are smallholders with less than 5 dairy animals (Birthal and Jha, 2005; Ghuman and Singh, 2009). Reproductive disorders are one of the major causes of poor productive performance in smallholder dairy farms (Dhami *et al*., 2018a,b; Kumar *et al*., 2020a; Kumar *et al*., 2020b; Husain et al., 2020). Among the major reproductive disorders that have a direct impact on economy of dairy farmers are abortion, dystocia, retained fetal membrane (RFM), pyometra, metritis, prolapse (uterine and vaginal), repeat breeder, anoestrus,

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suboestrus etc (Kumar *et al*., 2009; Kumar et al., 2011; Hadush *et al*., 2013; Haile *et al*., 2014; Parmar *et al*., 2016). The impaired function of the reproductive system results in failure of a cow to produce a calf yearly and regularly (Shiferaw *et al*., 2005; Lobago *et al*., 2006). Many production constraints, mainly reproductive health problems, form a bottleneck in the production process and productivity in the livestock sub-sector. Therefore, this study was planned to generate information regarding incidence of reproductive disorders in cattle and buffalo as well as to assess socio economic status of dairy farmers in Barabanki district (UP) to design the problem oriented management strategies.

Materials and Methods

A study was conducted in Barabanki district of Uttar Pradesh to assess socio economic status dairy farmers regarding the management of reproductive disorders in eastern plain zone of Uttar Pradesh. The information were generated from 120 dairy farmers, twenty dairy farmers from each of six selected villages, who has minimum at least one milking animal at the time of investigation. The information was generated regarding the management of reproductive disorder due to improper feeding, breeding, and healthcare management practices, and was analysed to reproductive disorders faced by dairy farmers in three categories of animals. Reproductive disorders like dystocia, prolapse, abortion and stillbirth were mostly treated by veterinarian; however, remaining reproductive disorders like anoestrus, repeat breeding, uterine infection etc were treated by dairy farmers and quacks through their own experiences by using different type of indigenous technical knowledge

Results and Discusion

Age

The Table 1: Study revealed that majority (58.33%) of the farmers belonged to middle age group (36-50 yrs) followed by the category of old age group ranging from (> 50 yrs) of age and young (<35 yrs) which accounts for 34.84 per cent and 5.83 per cent respectively

Education

Education of dairy farmers showed that 2.5 per cent of the respondents were illiterate, 15.83 per cent were functionally literate, 8.33 per cent were primary level, 10.00 per cent were middle level, 25.83 per cent were educated up to secondary level, 20.83 per cent up to Higher secondary level and 16.67 per cent were graduate and above.(Table1)

Family size

Table 1: showed that majority (59.67%) of the respondents were having low sized family size i.e. up to 8 members followed by the medium size family ranging from 8 to 13 members and high (>13) family size which were 29.67 per cent and 10.66 per cent respectively.

Family education status

Table 1: revealed that large number of the respondents (50.00%) belonged to low (<3.33) status of family education followed by the category of medium (3.33-3.99) and high (>3.99), which were account, 33.33 per cent and 16.67 per cent respectively.

Social participation

Participation of the dairy farmers in various social organization either as a member or office bearer has been analyzed. Among the dairy farmers revealed that 80.00 per cent of the respondents had participation in one organization and 13.33 per cent dairy farmers in more than one organization. But 6.67 per cent dairy farmers were not participation in organizations in the study area. (Table1)

Herd size

Rearing of cattle and buffalo has always remained as a symbol for honor in the farming community. The classification of respondents with respect to total herd size has been presented in table-1. It was clearly enunciated that majority of respondents i.e. 72.50 per cent belonged to small herd size category and were rearing small herd up to 6 animals where as 24.16 per cent farmers reared 6 to 8 animals, and 3.14 per cent farmers had more than 8 dairy animals in their herd. The average herd size was 6 animals but few farmers were rearing dairy animals up to 15 animals. (Table1)

Occupation

The Table1: revealed that 68.33 per cent farmers engaged in agriculture and dairy, 16.67 per cent in agriculture, dairy and service; 7.50 per cent in agriculture, dairy and business; 3.33 per cent in agriculture, dairy and service where as only 4.17 per cent in dairy, service and business.

Annual Income

The results presented in the (Table1) indicate that about 68.33 per cent of the respondents were in medium annual income (Rs. 226939-359420) category followed by low (Rs. <226939) and high (Rs. >359420) income category comprising of 20.00

per cent and 11.67 per cent respectively.

Socio-economic status of dairy farmers

Table 1: Socio-economic status of dairy farmers in eastern plain zone of Uttar Pradesh

Variables	Categories	Frequency	Percentage
Age (in years) Range(30-65) Mean(48.35)	Young (up to 35)	7	5.83
	Middle (36– 50)	70	58.33
	Old (>50)	43	35.84
Education	Illiterate	3	2.5
	Functionally Literate	19	15.83
	Primary	10	8.33
	Middle	12	10.00
	Secondary	31	25.83
	Higher Secondary	25	20.83
	Graduate & above	20	16.67
Family size (Numbers) (Range :4 – 35) (Mean:8.73)	Low (< 8)	72	59.67
	Medium(8–13)	35	29.67
	High (>13)	13	10.66
Family Education Status	Low (< 3.34)	60	50.00
	Medium (3.34-3.99)	40	33.33
	High (>3.99)	20	16.67
Social-Participation (Range : 0 – 2) (Mean:0.74)	No participation	8	6.67
	Participation in one organization	96	80.00
	Participation in more than one organization	16	13.33
Herd size (Animal Number) (Range : 3 – 8) (Mean:5.55)	Small (< 6)	87	72.50
	Medium (6-8)	29	24.16
	Large (>8)	4	3.34
Occupation	Agriculture + Dairy	82	68.33
	Agriculture + Dairy + Business	20	16.67
	Agriculture + Dairy + Service	9	7.50
	Agriculture + Dairy + Labor	4	3.33
	Dairy + Service + Business	5	4.17
Annual Income Rupees (Rs) (85600 to 3814000)	Low (<226939)	24	20.00
	Medium (226939-359420)	82	68.33
	High (>359420)	14	11.67

Thus there is area specific study on cattle and buffalo rearing dairy farmers regarding management of reproductive disorder, Veterinarian involve to treat the animals on the basis general information given by dairy farmer and socioeconomic condition of dairy farmer like age, education, family education status, social participation family size & herd size of above information, dystocia, prolapse and stillbirth is major problems in buffaloes, and abortion, RFM and uterine infections in crossbred cattle. Thus, there is need to create awareness among the dairy farmers about various reproductive disorders, proper feeding, breeding and management system to enhance the reproductive efficiency and to reduce the of reproductive disorders in their animals. Socioeconomic status like age, education and more social participation compression to other socioeconomic status of dairy farmers have good management of reproductive disorder in study area.There is also need to develop problem oriented strategies in particular region to increase reproductive and productive performance of dairy animals and strengthen the agricultural economy of the farmers.

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Conflict of Interest: None

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Review Article

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A Variety of Oversight Strategies to Enhance the Productivity and Sustainability of Dairy Farming

Mala Singh[1], Ram Kumar Singh[2], Rajesh Kumar[3], Vinod Kumar Varun[4], Desh Deepak[5], Abhishek Kumar[6]

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Abstract

Scientific animal husbandry practices owing to the flourishing milk, meat and daily income generation of rural India. Efficient management of livestock by considering age, especially production status of animals, climatic conditions etc. determines the productivity through livestock rearing. Requirements and manage mental aspects of livestock vary as accordance with the production status and age of livestock. Livestock's requirements and disease susceptibility is directly linked with production status of animals. Proper area allocation, along with other clinical and manage mental interventions influences the productivity. Thus, aforesaid article developed to discuss key insight considerations to uplift the humane animal husbandry practices.

Keywords: Livestock; Age; Production; Management.

Introduction

Indian livestock sector is one of the largest and most potent sectors to enhance the productivity and self sustainability of country. Indian economy is largely contributed through agriculture sector which is mainly driven by our rural society. Agriculture sector provides economy, occupation to sustain the daily livelihood. Such sector is back-bone of rural survival. Agriculture sector is critically linked with livestock sector. Livestock sector helps to driven the agriculture sector in better way of proliferation such as, it provides physical means, direct currency return and overall complementary partner to driven the agriculture sustainability. Livestock sector may provide direct day to day return to run the livelihood of farmers and serve a real state to the marginal or landless farmers; those are primarily dependent on agriculture sector. Proliferation of livestock sector directly reflects the wealth and profitability of farmers (ILRI, 1995).

Thus, efficient management of livestock may help to enhance the development of agriculture sector through sustainability, better return and improved social value of farmers (Bettencour et al., 2015). In our country, various types of agro-climatic conditions (15 agro-climatic zones) exist. Such climatic variations directly or indirectly reflect

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the productivity and well being of our livestock population. This article is mainly focused on various critical manage mental aspects for efficient running of livestock/dairy in various seasons with various age group animals to extract more and more profitability.

Construction of modern dairy farm

Such type of lay out/design (Fig. 1) of modern dairy farm is able to manage different age group of livestock, generally exist in the dairy farm. Separate habitat/shed are providing for each age group so that they can be efficiently managed with lesser endeavour input and higher return. The farm should be well covered by boundary or may be through wire fencing. On the entry point (having broad sized gate), there must be any provision of disinfectant, so that dairy workers or visitors have to pass through such disinfectant. Such provision helps to decline the chances of disease proliferation and entry of any disease causative agents.

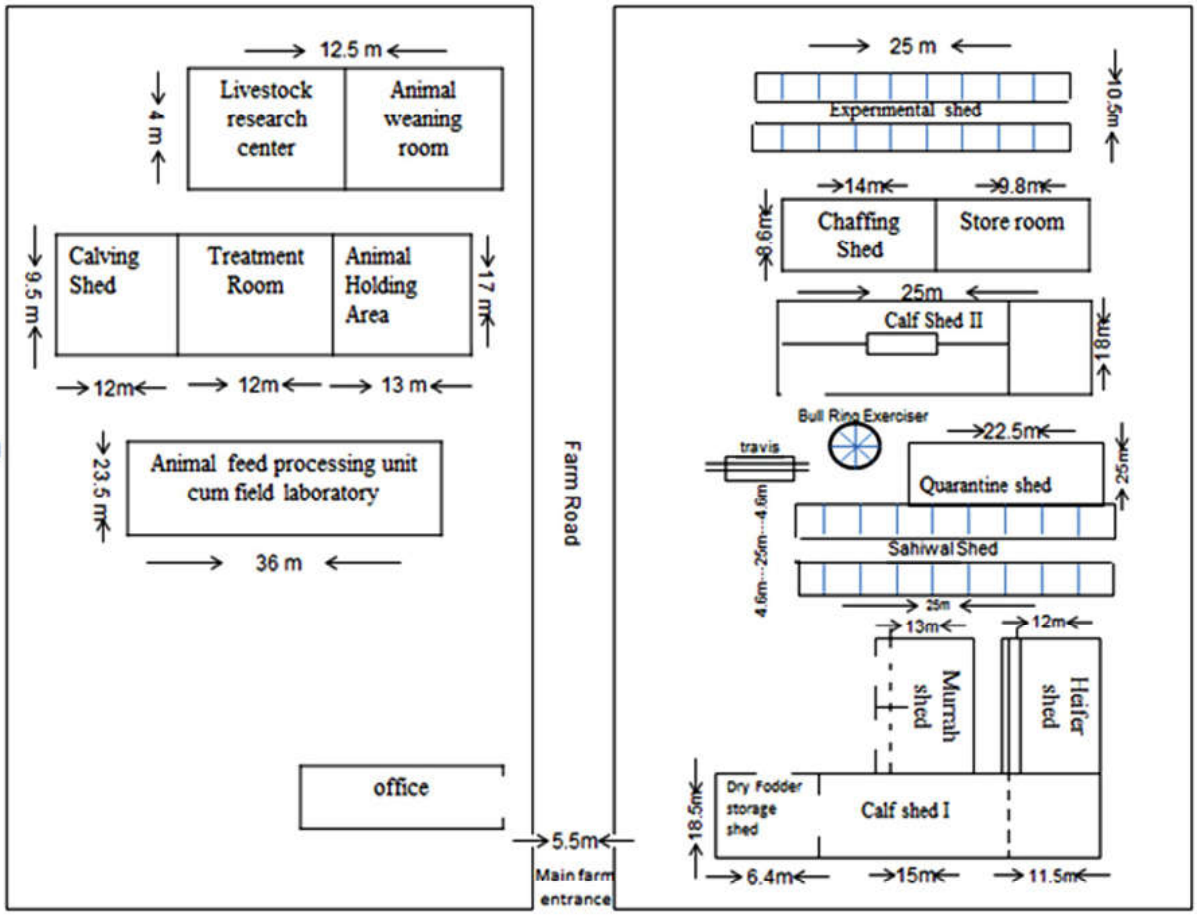

Fig.1 Schematic model of dairy farm.

At the start of entry point of dairy farm, there must be a provision of quarantine room. Such provision helps to critically investigate and monitoring of out siders/ livestock, those have been purchased or going to mixed with the existing livestock population of dairy farm. At the entry point there must be a control room/ manager room should present. Such things will help to manage the entire farm in better efficient way. There must be a quit broader passage (bifurcating road) from entry point to last. Such thing will help to easy access the entire farm. Calves shed, heifer shed, dry animal shed, lactating animal shed, calving room, treatment room etc. must be present to manage various age groups livestock in accordance with their nutritional needs and lesser labour inputs as mentioned above in the dairy model. Calves shed and lactating animal shed should be in close vicinity, it help to nurse the calves efficiently and also helpful in milking of lactating animals. Each shed should have sufficient open and close area (Approx. 1/3rd close area and 2/3rd open area). Ample source of clean water tank and feeding mangers must be present to ensure the water and feed supply.

Table 1: Floor, feeding manger and watering spacew requirements of dairy animals.

Type of animals	Floor space per animal (m^2) Covered area	Open area	Feeding (manger) space per animals (cm)	Water tough space/ animals (cm)	Mode of housing
Adult buffaloes	4.0	8.0	60-75	60-75	Groups of below 25-30
Adult cows	3.5	7.0	60-75	45-60	Groups of below 25
Bullocks	3.5	7.0	60-75	60-75	Pairs
Bulls	12.0	120.0	60-75	60-75	Individual
Down calvers	12.0	20-25	60-75	60-75	Individual
Heifers	2.0	4.0-5.0	45-60	30-45	Groups of below 25
Older calves (>8 wks)	2.0	4.0	40-50	10-15	Groups of below 15
Young calves (< 8 wks)	1.0	2.0	40-50	10-15	Individual or in groups of below 5

Source, ISI standards for housing in India

Apart from it, Travis of optimum size, in accordance with the normal height of various age group livestock, must be installed in open area of each shed. Close area (Table 1) of each shed should be well covered in all dimensions and there must be provision of ventilation. Open area should covered with sufficient height, so that animals are not directly visible for out siders/visitors. Both open and covered area must have non slippery floor and not interrupted flow of waste liquid or semi solid excreta. Open area (Table 1) of all sheds should have provision of any shadow premises, either natural plant may be there or provision of any artificially shadow. Such provision helps to declines the summer stress. Height of mangers/ water tank should be installed in such a manner so that the animal may feed/drink easily. On the entry point of individual shed, there must be the provision of disinfectant. Apart from residential sheds of animals, there must be some other facilities such as, store room for feed must be there in the dairy farm and such things should be in the middle or most accessible place of dairy farm. For efficient running of dairy farm, there must be any feed processing unit present (if feed processing unit is not present, then the dairy owners have to rely on marketed commercial dairy feed) so that the nutritional requirements may be critically investigated. Purchasing of raw feed ingredients, its procurement and formulation of concentrate helps to minimize the feeding cost as well as will it helps to meet the scientific requirement of animals.

Management of calves

Calves are most disease susceptible, key dairy return decider and future investment of dairy farm. Due to least developed immune status, such initial stage of life (calf hood stage) is most susceptible for diseases or any type of natural or manmade stress. Efficient management of calves helps to replace the herd in more efficient with better productivity level.

Table.2 Feeding schedule of calves (0-6 months of age group)

Age (Day)	Colostrum (Lit.)	Milk (Lit.)	Calf starter	Green fodder
0-4	2-2.5 (1/10th of body weight)	-	-	-
4-30	(1/10th of body weight)	2.5-3.0	-	Ad lib, preferably of leguminous fodder (After 15 days)
30-60	-	3.0-4.0	50-100g	Ad lib
60-90	-	3.0-3.5 (Fat separated milk)	100-2w50g	Ad lib (Leguminous)
90-180	-		250-750g	Ad lib(Leguminous)

As mentioned above, that the calves are the key livestock, through which the dairy owners have to replace their geriatrics herds with young animals. Thus, such calf hood stage determines the future productivity of dairy farm. Once the calves born, its all round better management will help to declines the calf mortality and better productive herd would be available for the future sustainability of dairy farm.

Before parturition of pregnant animal, manage under isolated calving shed. Such provision helps the overall efficiently management of every aspects of advance gestational animals, it may be open-covered area allowance, vaccination requirements or nutritional requirements, extrinsic intrinsic stress factors. Once the parturition occurs, calf should be thoroughly clean, specially its natural orifices. Such provisions helps to mount the cutaneous respiration and proper exchange through natural orifices and parallel the mother should provide jaggery. Environmental temperature should be critically monitored. If the calving occurs during extreme cold weather, then the provision of any heating source may be fire or anything else should be in territory of calf and its mother should be placed. Such provision helps to maintain homeostasis of calf, as inefficient thermal regulation system during the earlier phage of life and its mother. Just after parturition, colostrum feeding (Table 2) should start to calf, as early as possible (within ½ hours of parturition). The dose should be 1/10th of body weight of calf. The dose should not be offered as a whole, even though, number of small packet feeding should implement. At the early beginning of life, colostrum can be efficiently absorbed and intrinsic constituents of colustrum i.e. immunoglobins (readymade antibody) provides the acquired passive immunity. After certain time of interval the intestinal wall permeability of newly born calves declines, hence exchange of immunoglobins declines very drastically. Colostrum is highly nutritive and having laxative action. Such colostrum feeding helps to provide efficient nutrition, immunity and evacuation of gastro-intestinal tract. Above mentioned dose regimen of colostrums feeding should continue till the let down of colostrum is over. After the colostrum let down, milk feeding should start with the same dose regimen and same feeding pattern, as mentioned in Table 1, upto three months of age. During 2nd week of age some quantity of fresh green should offer and such good quality green fodder helps for the development of rumen in gradual manner.

During the progression of one month of age, little quantity of calf starter (nutritionally dense gruel concentrate mixture, having >23% CP and >75%TDN) should offer. Along with calf starter, ad-lib good quality green and milk should also be offered. In gradual manner, the quantity of calf starter and green should enhance and quantity of milk offered should taper down, till 3-4 months. After 3-4 months of age, calve is gradually shifted toward composite ration of 2/3rd roughage and 1/3rd concentrate.

Management of heifer

After calf-hood stage, physically and sexually development stage before 1st calving, is termed as heifer. Such 2-2.5 year's duration is quiet important one for overall development of animal, especially reproductive development. To raise a calf from the beginning of life upto sexually mature stage may ranges 12000-15000 thousands rupees. Thus, early weight gain and declining age at 1st calving (AFC) are prerequisite things to enhance the farm profitability. AFC and average daily gain (ADG) are critically linked together. To achieve the earlier sexual maturity, higher ADG is directly associated as, on optimum weight the reproductive tract goes fully developed and able to conceive efficiently and animal's rearing cost declines. Finally results in more and more profit harvesting through dairy. Heifers should offer good quality green fodder, wheat straw and concentrate mixture, mineral mixture and along with feed additives (Heifers should provide 2.5% DM in the form of 2/3rd roughage, 1/3rd quantity of concentrate mixture and minor quantity of mineral mixture, feed additives). Growth rate of heifers should regularly monitored (ADG of >500g/day if cross breed 300-400g/day in deshi breed should insure). Climatic variable, shed dimensions must be under control to minimize the stress in heifers. Birth record of all animals should well document. Such provision helps to assume the expected sexual maturity age. To bred any heifer, either through natural or artificial insemination, the optimum balance between age and body weight is important task, as both age and weight insure the ability uterine tract to completely hold and nourish the developing fetus upto full gestational term. Apart from above mentioned strategies of heifer management, its treatment and vaccination schedule (Table 2) is also very important task to flourish the easy going life of heifer.

If owner is going to purchase the heifer/lactating animals, he or she must critically watch some key considerations of good milking capacity animals. Before purchase of any animal, must insure at least three consecutive in front milking and should consider the average of last two milking. Apart from it, triangular dorsal view, i.e. broader back and tapering front also indicate the good milking ability animals. Udder size, udder smoothness, enormous minor blood capillary supply around udder, prominent milk vein, and symmetrical cylindrical teats are important considerations while purchasing any animals. Animals gait, big alert eyes, skin turgidity also of minor considerations.

Management of pregnant animal

Pregnancy is one of the most sensitive stages of animal life. An excessive physiological, metabolic and bio chemical change occurs during pregnancy. Efficient progression of gestational period is prime important consideration, as it decides the productivity of dairy farm. Before going for natural insemination or AI, the owner must insure the quality of semen, like the inseminated semen (during AI), must of similar breed or breeds having similar body weight gain and during natural insemination, the average weight of both the partner must be comparable one. Pregnancy status of animal must insure by the help of recognized veterinarian through per rectal examination or USG etc. Early pregnancy determination depends upon skill and expertise of veterinarian. Once the status of animal determined, then one should go according to pregnant or non-pregnant manage mental aspects. If possible, the pregnant animal should insure comfortable isolated pen having sufficient open and cover area. Sufficient quantity of fresh drinking water must be insured. Good quality of green fodder (ad libitum), wheat straw (4-6 kg) and good quality concentrate (3.25 kg during early gestation and 3.75 kg during the advance stage of gestation) must be insured. Along with roughage-concentrate, feed additives and mineral mixture (negative DCAD diet) must insured in the ration of animals. As the pregnancy advances, the ability of animal to consume the required DM suppressed due to gradual increase in fetal size and accordingly compression the ruminal area. Thus, provision of by pass fat/ protein supplementation and feed additives helps to insure the dietary requirements of animals. During advanced stage of gestation the movement or any type of stressful condition must avoid and animal should try to maintain under best possible comfortable environmental conditions. During advance pregnancy, the stall feeding should prefer with moderate level of exercise.

At the time of parturition, provision of warm water, jaggery, sufficient bedding material and expert supervision must be insured. If the animal is progressing towards normal parturition, the above mentioned strategies must insured. Otherwise the expert advice/ treatment in case of various gynecological ailments like dystocia, retention of placenta, uterine torsion; metritis, endometritis etc. must be insured. Strictly avoid any innervations or advice of quacks.

Management of lactating animals

Lactation period is key output through dairy farming. Above mentioned input cost of around 12000-15000 before starting of lactation period may be harvested or more importantly better return through overall efficient management of lactating animals. Efficient management of PPP (Peri-parturient period, lies few weeks before, during and after parturition) is one of the important tasks as vigorous changes occur during such period. Excessive drainage of nutrient in the form of colostrum makes the animal most susceptible for various diseases. Thus efficient management is quite important one. During PPP animal should provide (-)ve DCAD before parturition and have to enhance the cation (especially Ca and P regulation) at the start of lactation. Just after parturition, animals should offer liquid jaggery to minimize negative energy balance. Total mixed ration in large number of feeding should provide so that the ruminal environment get constant one. Green fodder/ silage/ hay (5-7kg), wheat straw (4-6kg) should provide to meet the requirement of animals. Along with the green and dry roughage, sufficient concentrate (@500g/lt of milk in buffalo and 400g/lt of milk in cattle) allowance should meet. Apart from lactation requirement, 2.0kg concentrate should be offered to meet its maintenance requirement. Most simple method of concentrate mixture formulation for animals is 1/3rd maize or any other energy rich grain, 1/3rd GNC or any other protein rich supplement and 1/3rd bran. Apart from it 2-3% mineral mixture and salt resulted easy way to handmade concentrate mixture. Such concentrate mixture has around 16-18% CP and 60-65% TDN. Optimum combination of leguminous and non-leguminous fodder may reduce the concentrate allowance of low yielder animal and ultimately reduce the feeding cost. Green fodder availability does not sustain throughout the year. Thus, preservation of green fodder at the time of peak yield in the form of hay/silage may sustain the availability of year round green fodder availability. High yielders (>20 lt of milk production) may not sustain its milk production until or unless some form of rumen protected supplementation is offered. Otherwise, the body reserve may deplete. Low and medium yielders can be efficiently managed through optimum combination of roughage and concentrate. In case of non availability of green fodder, have to enhance the concentrate allowance. In case of non availability or lesser availability of green fodder, may rely on various physical/ chemical/biological or physio chemical methods of feed processing to enhance the nutritive value of available dry roughage and harvest more and

more nutrients (4 kg urea dissolved in 30 lt water is sufficient for 100 kg straw enrichment). Sudden changing in the body from non-lactating stage to lactating stage and simultaneously physiological and bio chemical changes in body leads to poor absorption of DMI. Thus, have to rely on good quality TMR or better meets through by pass supplementation. High producing animals should offer more than 10 meals TMR per day, if not relying on TMR then small-small packets of concentrate should provide to maintain the homeostasis of rumen. Good quality fresh feed should be available for more than 90% duration of the day. If hay feeding is practiced, offer it before concentrate. Protein source may offer mixed with energy source or may offer after energy source. Variety of green fodder feeding is advantageous, if available. Always avoid the abrupt changes in ration rather than a gradual change is advantageous.

Feeding cost is one of the major input costs of animal rearing. Thus, efficient scientific feeding may help to lower down the overall feeding cost. In contrast of entire lactation period which is around 275-285 days in cattle and >300 days in buffalo, quantity and quality of milk are highly variable. Thus, phage wise feeing exactly on the basis of quantity and quality may enhance the productivity and declines the feeding cost. Phase feeding guidelines (Table 3) were published by national research council-1989 & 2001 for the efficient feeding of dairy cows.

Management of dry animals

Table. 3: Nutrient guidelines for lactating dairy cows

Variables	Early Lactation	Mid Lactation	Late Lactation
Average milk yield (kg/day)	40	30	20
Dry matter intake (kg/d)	24-26	21-23	11-12
Crude protein (%DM)	17-19	15-16	13-15
Rumen undegradable protein (%CP)	35-40	30-35	25
Soluble protein (%CP)	25-33	25-36	25-40
Neutral detergent fiber (%DM)	30-34	30-38	33-43
Acid detergent fiber (%DM)	19-21	19-23	22-26
Effective fiber (%NDF)	25	25	25
Net energy for lactation (Mcal/kg)	1.64	1.57	1.5
Non-fiber carbohydrates (%DM)	30-42	30-44	30-45
Total digestible nutrients (%DM)	72-74	69-71	66-68
Fat (maximum in DM)	5-6	4-6	3-5
Ca (%DM)	0.8-1.1	0.8-1.0	0.7-0.9
P (%DM)	0.5-0.9	0.4-0.8	0.4-0.7
K (%DM)	0.9-1.4	0.9-1.3	0.9-1.3
Na (%DM)	0.2-0.45	0.2-0.45	0.18-0.45
Cl (%DM)	0.25-0.30	0.25-0.30	0.25-0.30
S (%DM)	0.22-0.24	0.20-0.24	0.20-0.22
CO (mg/kgDM)	0.2-0.3	0.2-0.3	0.2-0.3
Cu (mg/kgDM)	15-30	15-30	12-30
Mn (mg/kgDM)	60	60	50
Zn (mg/kgDM)	80	80	70
I2 (mg/kgDM)	0.8-1.4	0.6-1.4	0.6-1.2
Fe (mg/kgDM)	100	75-100	50-100
Se (mg/kgDM)	0.3	0.3	0.3
Vitamin A (1000 IU/day)	100-200	100-200	100-200
Vitamin D (1000 IU/day)	20-30	20-30	20-30
Vitamin E (IU/day)	600-800	400-600	400-600

Source NRC, 1989, 2001

Animals supposed to have 1.5-2.0 months non-productive period between the cessation of lactation and next conceive is termed as dry period. And such dry period is determined through the date of calving. During dry period and extreme last lactation period, the animal tries to re-condition the body conditions and especially uterine conditioning. During such period, body weight is conditioned (enhancing or declining) through optimum roughage concentrate allowance in total mixed ration, through enhancing concentrate allowance in thin animals and vice-versa. Dry animals may keep in isolated shed or with heifer shed. There must be the provision of ample exercise for dry animals, which enhance uterine motility and ultimately evacuation of uterine debris. Body condition score based feeding strategies should apply on dry animal feeding. Generally dairy owners compromise feed quality and quantity during dry period. Even though, such phage is important preparatory phage for the next term of pregnancy. Thus, such 1.5-2.0 months period must be nutritionally adequate so that the chances of next term may enhance.

Conservation of feed resources and processing to enhance the feeding sustainability of dairy farm

Conservation and processing of feed resources is one of the important tasks behind the sustainability of any dairy farm. Two possible outcomes through the implementation of such strategies are the year round availability of green fodder and other thing is, extracting more and more nutrients from the available feed resources. Green fodder availability is not consistent throughout the year. Even though, surplus quantity of green fodder is available during Rabi season (between October - February). However, scarcity occurs during the Khareef season (July-September) Zayad season (March-June). Thus, the year round balanced is tough task and without conservation of green fodder, such things impossible one. To make sure year round availability of green fodder, hay preparation, silage preparation is easy and commercially implementing methods.

Silage is, preserved anaerobic fermented succulent form of green fodder. Pastoral community may precisely understand the silage preparation is more or less similar to pickles or murabba preparation of fresh fruits. Excellent quality silage may be manufactured by maize, sorghum, pearl-millet, oats, perennial grasses (hybrid napier grass, guinea grass, para grass, sudan grass, rhode grass), leguminous fodder are not efficient for silage preparation. Even though, suitable combinations of leguminous fodder with non leguminous fodder may be utilized for silage preparation. For silage preparation, neither immature nor over matured crop is considered. However, crop having maximum nutrient content and comparable dry matter (30-35%) is considered for silage preparation. In maize, jowar, oats, flowering to milk stage is considered as the best stage of crop for silage preparation. Bajra, teosinte is best harvested at blooming stage. Hybrid napier, guinea grass best harvested at 1.25mt height stage. Silage is prepared through, chaffed fodder tightly packed in "Silos". Silos may be pit silo, tower silo, trench type silos. Pit silos is most common form of silos used for silage preparation and (3.0×2.5×2.0) meters dimensions of pit may be sufficient one for five dairy animals @ 20 kg silage per head per day for three months. Pit, preferably of circular type is plastered inner side and crops are chaffed in small pieces (>4 cm size). If the leguminous crops is available for silage preparation, mixed with non-leguminous crops, such as maize, jowar (@ 80-100 kg per ton of ensiled material) or molasses (@ 40-50 kg per ton of ensiled material) for the availability of measurable quantity of soluble carbohydrates. If the immature crop is available for silage preparation, wilted it before packing in pit. Some preservatives like, common salt (18-20 kg per ton), sodium metabisulphite (5 kg per ton), dilute acetic acid (10 kg per ton) or phosphoric acid (6 kg per ton) are added to enhance the fermentation mode and enriched the quality of silage. After filling the ensiled material with preservatives, the next step is thoroughly packing of pit through its entire dimensions by plastic sheet and layering of cow dung. Completely air tight conditioned should insure up to the complete preparation of silage (around 45 days). Prepared silage is rich in Vitamin A, better palatability then hay or dry roughage and highly reduced anti nutritional factors. Initially silage feeding not preferred by animals due to its taste, but gradual replacement of 10-15% fodder with silage may adopt the animal for silage feeding. After full adaptation for silage feeding, 20-30 kg silage with other traditional fodder may be implemented for feeding of animals.

Likewise silage, hay is one alternative fodder conservation method for lean period. Hay is made mainly by the sun drying of grass and other forage crops. After the crops has been cut, its treatment in the field is intended to minimize the losses of valuable nutrients caused by the action of plant respiration, by microorganism, by oxidation, by leaching and may be by mechanical means. The nutritive value of hay is determined by the growth

state and plant species of the parent crop, by field losses of nutrients and by changes taking place during storage (which can be reduced by the use of chemical preservatives). Even under good conditions overall losses of dry matter may be about 20%. Artificial dried forages are higher in nutritive value than hays. But they are expensive to procure and may be given to non ruminant livestock as source of mineral and vitamins. Berseem, Lucerne is cut in pre blossom stage for conservation, as it insure maximum protein and energy for hay. Fresh fodder is chopped (5-8 cm cuts) for hay preparation. Chopped fodder is spread (not more than 15cm height) on the ground for direct sun light exposure. Regular turning of drying material enhances the rate of hay preparation. Extent/speed of hay preparation depends upon frequency of turning, intensity of sun light, air movement, nature of fodder used for hay making etc. prepared hay has comparable nutritive value as green fodder and able to year round feeding of animals. Thus may help to enhance the productivity and sustainability of dairy farm.

Animal's ration consists of roughage, concentrate and feed additives. Former provides the bulk to the ration. However, its available nutrient contents are sub-normal. Thus, by using various physical, chemical, physic chemical and biological methods owners may extract maximum nutrients through available inferior nutritive value roughage feed stuffs. By any physical means, such as soaking, chopping, grinding, pelleting, wafering, steam under pressure etc may adopted to enhance the nutritive value of roughage type feed stuffs. Using various alkali chemicals such as, NaOH, $Ca(OH)_2$, KOH, NH_4OH, NH_3, NH_3 Urea etc. may enhance the available nutrient content in roughage. Some acid chemicals such as, H_2SO_4, HNO_3 may also use for enrichment. Some Na salt and oxidizing agents like H_2O_2, O_3 may also useful for improving the nutritive value of feed stuffs. Combinations of above mentioned physical and chemical methods such as, use of NaOH with pelleting or steam treatment may also implement for quality enrichment of roughage. Some rot fungus, mushrooms may also useful for quality enrichment of inferior quality of roughage.

Immunization at dairy farm

Like human being, animals are also susceptible for various diseases. Thus, to sustain the farm productivity, vaccination (Table 4) is quite important and frequently using strategy. Before doing individual or mass vaccination, following points should considered

Health status: Before starting of individual or mass vaccination program, have to insure the health status of animal, as the readymade immunogens may create deleterious effects on animal's well-being.

Stress: Any kind of stressful conditions (either due to intrinsic stressors or external stressors), suppress the immune status of animal and vaccination on immune-suppressed animal create negative impact on health status of animal.

Deworming: Before starting of vaccination, deworming should performed 1-2 weeks prior.

Vaccination schedule: Dairy owners should strictly follow the vaccination schedule of animal, starting from birth by any veterinary expert.

Record keeping: date of birth of animal and its entire ancestry record should be maintained for better implementation of vaccination/ deworming protocol. Apart from it, the vaccine specifications such as manufacturing company, batch no of vaccine, expiry date of vaccine, dose and route of vaccine. Thus, dairy owners must appoint eligible employee to maintain such type of dairy record.

Cold chain: to maintain the potency of vaccine, its cold chain should be strictly maintained. Thus, dairy owners must have the provision of refrigeration.

Influences of heat stress on dairy farming and its

Table. 4: Vaccination protocol at dairy farm Table.4 Vaccination protocol at dairy farm

Name of Disease	Age at first dose	Booster dose	Subsequent dose
Foot and Mouth	–	–	–
Disease (FMD)	4 months and above	1 month after first dose	Six monthly
Haemorrhagic Septicaemia (HS)	6 months and above	–	Annually in endemic areas.
Black Quarter (BQ)	6 months and above	–	Annually in endemic areas.
Brucellosis	4-8 months of age	–	–
(Only female calves)	–	Once in a lifetime	–
Theileriosis	3 months of age and above	–	Once in a lifetime. Only required for crossbred and exotic cattle.

Anthrax	4 months and above	-	Annually in endemic areas.
IBR	3 months and above	1 month after first dose	Six monthly (vaccine presently not produced in India)
Rabies (Post bite therapy only)	Immediately after suspected bite.	4th day	7, 14, 28 and 90 (optional) days after first dose

Source : NDDB Handbook of Good Dairy Husbandry Practices

mitigation

To achieve a good productive response from dairy farming, owners should critically monitor the reproductive and physiological health status of animals. In dairy farming, heat abatement is burning issue. Heat effect influences various ill-effects such as, decrease dry matter intake, mount negative energy balance and increase calving-conception interval. Such type of reproductive disorders may deleteriously affect the productivity of dairy animals as well as on economic profit. Various experimentations have been suggested negative impacts of heat stress on dairy animal's productivity. Various others negative impacts of heat stress on reproductive performance of animal have been studied such as, poor oocyte, poor follicular diameter, and poor expression of estrous sign etc.

For the sustainability and profitability of dairy farm, various manage-mental, biotechnological and physiological practices may be applied to enhance the reproductive performance such as lower age at first calving, good oocyte quality, good sperm quality excellent libido of male bulls, good estrous expression, good ovarian activity etc. these conditions may be more improved if we reduced the heat stress conditions in dairy farm.

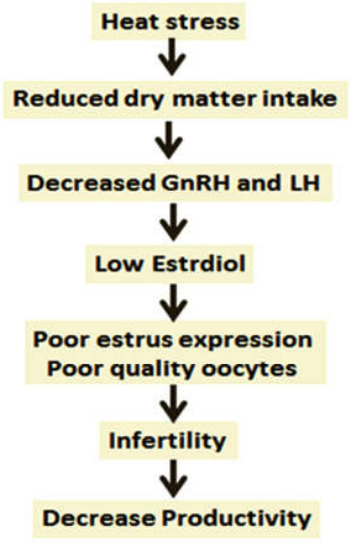

Fig. 2: Flow chart showing the effect of heat stress on productivity.

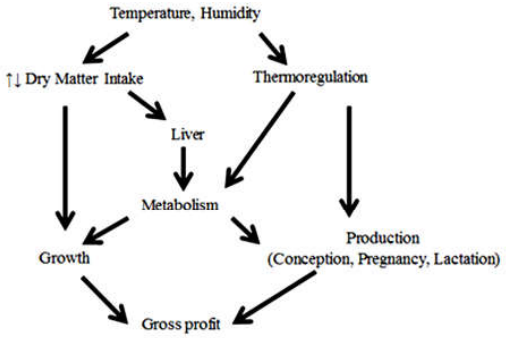

Fig. 3: Inter-relationship of factors affecting gross profit of dairy farm.

Strategies to prevail over heat stress

Many studies have shown the deleterious effects of stressors on productivity of dairy farm mainly due to impaired or mis management of environmental conditions such as impaired humidity, improper ventilation of housing, direct exposure of animal to sunlight for a longer time of the day. Controlled environmental temperature and humidity prevent or avoid the heat or cold stress and heat exchange between dairy animals (Amaral *et al*., 2009). Evaporation (through sprinkling) is the best method for cooling and wetting the dairy animals and enhances the convection heat transfer (Renaudeau *et al*., 2012). Housing management is the key factor to get rid of heat stress condition during longer day time. Feed and water should be kept under shade and this is cost effective management for heat abatement (Kamal *et al*., 2018). Material used for shedding should be waterproof, good heat conductor, moisture leak proof etc. (Kamal *et al*., 2018).

Various experiments suggested that elevated temperature restricts the embryonic growth due to some deleterious free radicals enter in the blood during longer time exposure to heat. Hence, some dietary supplementation like vitamins, minerals, feed additives are used to lower down the deleterious effect of free radicals in the body. A study reported that supplementation of vitamins and mineral to the transition animals enhance the milk production (Khorsandi *et al*., 2016). Zinc supplementation has inverse effect on heat shock

protein correspondingly also enhance the immunity of animal against heat shock (Sheikh *et al*., 2017).

To enhance the fertility in Dairy animals

To enhance the fertility of dairy cows first we should have to decrease any disease impact. A good metabolic health of a dairy cow helps to minimizing the clinical and subclinical diseases occurs during calving (Santos and Ribeiro, 2014). Thus, after calving some metabolic disorder creates negative energy balance in dairy animal. A very common condition Such as ketosis during pre partum and post-partum due to lipid breakdown into non esterified fatty acids then after these fatty acids breakdown into intermediate products in the form of ketone bodies and accumulates in the blood that progressively rises results in energy deficiency (Dyk and Emery, 1996). This high concentration of fatty acids circulating in the blood plasma occurs mainly during the initiation of lactation which may create another metabolic condition such as hepatic lipidosis.

Therefore to reduce such conditions and well-being of productive performance metabolic controlled actions required for the impaired concentrations of fatty acid and b-hydroxybutyrate in the blood (Raboisson *et al*., 2014). Dry matter intake decreased after post partum. So increased the dry matter intake of feeding modulation after post-partum have an inverse effect on negative energy balance which promotes the plasma concentration of glucose, insulin, growth factor like IGF-1, growth hormone etc. these promoted concentrations have direct favoring effect on hypothalamic-pituitary axis and the ovaries even after calving (De Rensis and Scaramuzzi, 2003).

Synchronization protocol

Management of reproductive cycle of dairy animal to short out the problem of estrous detection error by applying herd estrous synchronization at a permitted time. Different Researchers has been conducted different estrous synchronization protocols such as progesterone injections or a Progesterone Releasing Intra-vaginal Device PRID [Progesterone Release Internal Device] (Walsh *et al*., 2008), CIDR (Control Internal Drug Release) etc.. CIDR is a 'T' shape synthetic progesterone device, this CIDR protocol is one of the most reliable, successful protocol for estrous synchronization. These estrous synchronization protocols also enhance the health of reproductive tract, decrease the calving interval, increase new born, and milk production of the farm. Sometimes these protocols are also helpful in diagnosis and treatment of genital diseases.

Some products used for synchronization and their commercial name i.e. GnRH- Factrel, Fertagyl, OvaCyst Prostaglandin In-Synch, Lutalyse, Lutalyse HighCon, ProstaMate, Progestin CIDR (progesterone) etc. these protocols are used in the field, research area by many reproductive researcher, veterinarians, and experts in organizations.

(i) CIDR-PG protocol.

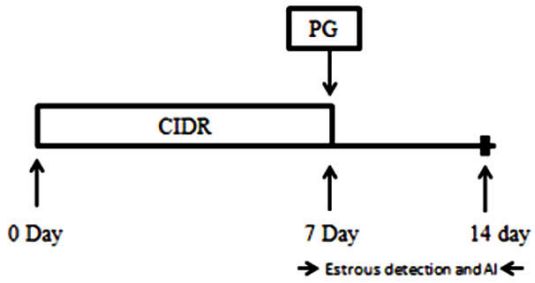

Fig. 4: CIDR and PG synchronization protocol

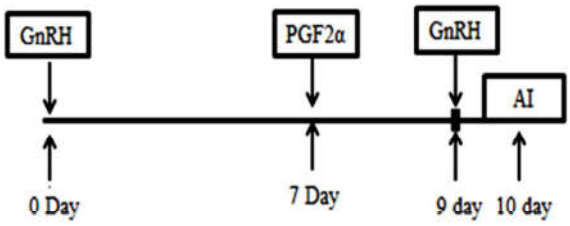

Fig. 5: GnRH and PGF2α synchronization protocol.

Timely AI and pregnancy diagnosis

Artificial insemination technique is most commonly, cost effective and bearable to farmers to short out the poor genetic problems and decrease transferable venereal diseases from dairy animal. Use of this technique becomes more easy and possible when researchers, extension officer, veterinarians, and AI organizations cooperate with each other and pool their skill in this area to evaluate a successful scheme in the dairy sector to improve the economy. Physiologically proper hormonal balance during estrous cycle may control timed artificial insemination (TAI) in dairy animal. The most important thing is that correct Estrus detection for actual Artificial insemination. Some of estrous synchronization Protocols are suggested by many researchers to recognize and enhance the follicle growth, corpus luteum regression and ovulation to

permitting Timed Artificial Insemination.

Pregnancy diagnosis

Pregnancy is one of the most critical phases of animal's life. An accurate and early pregnancy diagnosis is more important as it helps in identification of non-pregnant animals which can be treated or rebred at the earliest part, reduce waste in a breeding programme by using expensive hormonal techniques, prevent lapse of one season for breeding in seasonal breeders etc. Pregnancy status of animals can be assessed by two ways i.e. direct methods and indirect methods. Direct assessment of pregnancy can be performed by per-rectal palpation and ultrasonography (USG). However, indirect assessment of pregnancy can be performed by progesterone assay, early conception factors, estrone sulphate, interferon tau and pregnancy associated glycoproteins (Balhara et al., 2013).

Per-rectal palpation of pregnancy diagnosis may be performed beyond 30days of geastation by palpation of amniotic vesicles and slipping of chorioallantoic membranes (Wisnicky and Cassida, 1948). However, accurate diagnosis may be achieved from 45days onwards (Arthur, 1966). Ultrasonography gives accurate, documentable and ultra-rapid technique for pregnancy diagnosis. Pregnancy diagnosis can be beyond 21 day of pregnancy through heartbeat of developing fetus (Sharma et al., 2011). But it requires experience and high cost of technology. Using such technique is very important to detect the pregnancy days in pictorial record (day 28 of pregnancy) and also to determine developmental stage and defective condition of early growing fetus in pregnant uterus (Crowe et al., 2018). This technique is also useful in male dairy animal to detect testicular function and any abnormality.

Indirect method Progesterone can be detected in milk and plasma, its assay confirms non-pregnant status of animals by determination of its concentration after 21days of insemination (Perera et al., 1980). Early conception factors are proteins, those can be detected in serum in between 6-12 hrs of fertilization and it can be determine by rosette inhibition test. Even though it is very early pregnancy diagnosis tool, but early test may still remain low due to high incidence of losses during 1st 15days of conception (Ayalon, 1978). Estrone sulphate is a conjugated steroid product of estrone, which is present in bovine placentome (Eley et al., 1979) and diagnoses the pregnancy beyond 52 day and up-to end of gestation. It is not an ideal bio-marker of pregnancy as its concentration may provoke by some other factors such as, genetic and environment factor (Lobago et al., 2009).

Biotechnological methods

To enhance the herd performance of a well organized dairy farm, some biotechnological methods are very helpful. These techniques are frequently in use since last century to improve herd reproductive quality (Roche *et al*., 2018). In an organized herd the main problem are human error and lack of diagnostic knowledge of reproductive conditions such as service, calving interval, lactation period and gestation period. A study shown that use of these bio-technological methods, such conditions fixed time artificial insemination (FTAI) can be minimized without going through estrous detection (Colazo and Mapletoft, 2014).

Various reproductive bio-techniques are emerging all over the world to overcome the reproductive problems and human error through manual methods. From last four decade a fruitful technique is progressed that is In Vitro fertilization (IVF) to treat the infertile animals, sexed semen technology (to achieve more female calves). In this In Vitro fertilization (IVF), a genomic selection of super donor and super recipient animals done for the collection of egg from super donor female and sperm from duper male. After selection and collection of gametes from both male and female, gametes are fertilized in the well-organized In Vitro fertilization laboratory to develop embryos. Then these embryos combined with sexing technologies. After fertilization, the 8 cell stage of embryo transfer to super recipient female for rest developmental stage of embryo in the uterus called (In Vivo). Transfer of embryo from In vitro stages to super female by technique called embryo transfer technique. This is a developed nonsurgical breeding technique for transferring embryos (Foote and Onuma, 1971).

Conclusion

For successful dairy entrepreneur, sustainable productivity/profitability are most important considerations. Dairy needs lots of investment either small level establishment or leading dairy. Animal's age wise requirements and year round availability of feed ingredients varies drastically. Thus, scientifically meeting the requirements and utilization of available feed resources in more efficient ways may influence the sustainability of dairy enterprise. Sufficient eco-friendly infrastructure of dairy farm, efficient and dedicated

dairy staff for running the farm, various records keeping of farm, consultancy of expert veterinarian for treatment/ prevention and control of diseases strengthens the dairy farm.

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Swine Flu and Its Impact on Public Health

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Abstract

Swine influenza has been recognized as a respiratory disease in swine. Swine influenza viruses belong to the family Orthomyxoviridae, including three genera, Influenza A, B and C. All influenza viruses of significance in swine are type A, subtype H1N1, H1N2, or H3N2 viruses. Influenza A causes moderate to severe illness and affects all age groups of swine and produces a symptom like fever, lethargy, sneezing, coughing and breathing difficulty. The virus infects humans and other animals in addition to pigs. It targets and damages the lining of the respiratory tract, leading to swelling and inflammation. It has also major public health importance by causing numerous respiratory symptoms in both adults and children. Diagnosis of the disease is based on clinical symptoms while confirmation is done via laboratory tests using PCR (polymerase chain reaction) based kits. Antiviral treatment associated with either *zanamivir* alone or in a combination with *rimantadine*, *Oseltamivir* or *amantadine* is considerably important. Control of the virus can be achieved through vaccination, biosecurity measures, decontamination and dietary management. Therefore, appropriate prevention methods should be chosen and employed according to the specific regional context.

Keywords: Control H1N1 Influenza Public Health and Swine.

Introduction

Swine influenza is an acute respiratory viral disease caused by influenza A virus (IAV) of the Orthomyxovirus family that decreases the health and welfare of pigs and results in a significant economic loss for the swine industry worldwide.[1] Etiology of Swine Influenza is complex according to the high genetic variation of the causative viruses, mainly on two glycoproteins: heamagglutin (H) and neuramidase (N). The known Swine Influenza virus strains include influenza C and the subtypes of influenza A virus (IAV) known as H1N1, H1N2, H3N1, H3N2 and H2N3.[2] Clinical signs of influenza illness in pigs can display a range of severity but often occurs as mild respiratory disease with high morbidity and rapid recovery, with rare fatal cases in pigs. However, the disease has a substantial economic burden as a result of weight loss, reduced weight gain and, in some cases, reproductive failure in infected sows due to high fevers. Further, when associated with other respiratory pathogens,

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as part of the porcine respiratory disease complex, it can lead to complicated pneumonia and severe clinical signs.[3] In addition, swine influenza poses a threat to public health. Influenza viruses can transmit between pigs and humans, as observed during the 2009 pandemic, when a virus generated by reassortment between two established lineages of swine viruses became globally widespread and reached a pandemic level in humans. The virus then quickly transmitted from humans to swine. Since pigs are susceptible to both avian and human influenza viruses.[4,5] they have been referred to as the ''mixing vessel'' of IAV with the potential to generate novel viruses.[6] This can occur when infection with two or more strains leads to the development of swine, avian and human reassortant viruses that can then be transmitted between pigs and to other species.[7] However, humans and other mammals can also be directly infected with avian and swine viruses, thus can potentially serve as mixing vessel hosts as well.[5, 8] Swine influenza was described for the first time in the Midwestern US in 1918; this description coincided with the human influenza pandemic.[9] It was not until 1930 that the first SIV, belonging to the H1N1 lineage, was isolated from North American pigs, which also happened to be the first IAV ever to be isolated.[10] The clinical signs of swine influenza resemble those also observed for humans and are characterized by an acute onset of the disease, fever, inactivity, inappetence, respiratory distress, coughing, sneezing, conjunctivitis and nasal discharge.[11]

The morbidity rate is usually high and the case fatality rate is low, but more severe outbreaks may be seen and reduced growth rates in young pigs can cause economic losses. In people, clinical cases have tended to resemble human influenza. Most of these cases were not life-threatening, although serious and fatal illnesses do occur.[9,10] Swine flu can be diagnosed by its clinical sign and in the laboratory through serological tests, detection of the virus by culture, necropsy finding etc. Even though there are various means to control the SI virus such as vaccination, biosecurity measures, decontamination and dietary management, there is no available specific treatment for SI in pgs. However, antibiotic treatment is given to minimized secondary bacterial complications.[13]

History of Swine Flu Virus: The Greeks were familiar with human influenza and the first epidemic was recorded by Hippocrates in 412 B.C. The viruses are now classified in the family of the Orthomyxoviridae, which has a Greek etymology: orthos meaning "standard, correct" and myxo "mucus".[15] The name influenza comes from the Italian "influenza dellestelle" because in the middle ages people believed that there was an astrological influence on the disease. Several pandemics stroke the world with the "Spanish flu" of 1918 being the most famous.[16] Although the disease in pigs was described during the following years.[17, 18]

It was first proposed to be a disease related to human flu pandemic, when pigs became sick at the same time as humans.[21] The first identification of an influenza virus as a cause of disease in pigs occurred about ten years in 1930.[22] Those who first noticed the disease in pigs, recognized similarities between the porcine and human disease and suggested they had a common etiology. Later, retrospective serological investigations confirmed that the disease in humans and pigs had been caused by closely related influenza A viruses in both cases. The causative agent was an H1N1 influenza A virus that had possibly derived from a common ancestor.[23-25] Until 1997 swine influenza strains were almost exclusively H1N1. Then, between 1997 and 2002, new strains of three different subtypes and five different genotypes emerged as causes of influenza among pigs in North America. In 1997-1998, H3N2 strains emerged.

These strains, which include genes derived by reassortment from human, swine and avian viruses, have become a major cause of swine influenza in North America. In 1999 in Canada, a strain of H4N6 crossed the species barrier from birds to pigs, but was contained on a single farm.[26] The H1N1 form of swine flu is one of the descendants of the strain that caused the 1918 flu pandemic. As well as persisting in pigs, the descendants of the 1918 virus have also circulated in humans through the 20th century, contributing to the normal seasonal epidemics of influenza.[27] However, direct transmission from pigs to humans is rare, with only 12 cases in the U.S. since 2005.[28] In 2009 a new pandemic H1N1 virus (H1N1pdm09) occurred which differed from the earlier known H1N1 viruses.[8] and since then, this IAV has gradually replaced the seasonal H1N1 virus and began co-circulating with H3N2 causing seasonal influenza epidemics in humans.[29]

Etiology, Taxonomy and Characteristics: Etiology of Swine Influenza is complex according to the high genetic variation of the causative viruses, mainly on two glycoproteins: hemagglutinin and neuramidase. This swine influenza virus belongs to the family. Orthomyxoviridae, including three genera, Influenza A, B and C.[30] SIAVs have been isolated from a wide range of species, including humans, swine, birds, seals, cats, horses and dogs, but aquatic birds are considered the natural

reservoir of IAV.[31] Swine influenza is caused by influenza A subtypes H1N1, H1N2, H2N3, H3N1 and H3N2. In pigs, four influenza A virus subtypes (H1N1, H1N2, H3N2 and H7N9) are the most common strains worldwide.[32] Humans and seals and influenza C viruses have been isolated from humans and swine and usually only causes mild disease in the upper respiratory tract, but do not infect bird. Transmission between pigs and humans have occurred in the past. For example, influenza C caused small outbreaks of a mild form of influenza amongst children in Japan and California. Because of its limited host range and the lack of genetic diversity in influenza C, this form of influenza does not cause pandemics in humans.[33] Influenza B viruses can cause a wide variety of disease, but generally clinical symptoms are similar to those of IAV.[34]

The swine influenza, genome consists of a total of 13588 nucleotides and virions are enveloped and spherical or pleomorphic with a size ranging from 50-120 nm in diameter.[35] The outer layer is a lipid membrane which is taken from the host cell in which the virus multiplies. Inserted into the lipid membrane are "spikes", which are proteins-actually glycoproteins, because they consist of protein linked to sugars known as HA and NA. These are the proteins that determine the subtype of influenza virus. The HA and NA are important in the immune response against the virus; antibodies against these spikes may protect against infection. The NA protein is the target of the antiviral drugs Relenza and Tamiflu.[36]

Transmission: Influenza transmission depends on multiple factors, including swine age, immunity, vaccination status and the presence of maternal antibodies. The natural reservoir for SIAV is birds like water fall. From this wild life reservoir SIV are frequently transmitted to domestic and commercial poultry. Transmission between poultry and pigs can also occur. Humans and avian strain can both infect pigs when the reassortment exists. Pigs are proposed to act as a mixing vessel for influenza A virus, in addition, pigs and humans have a two ways transmission ecology.[9]

The main route of transmission is through direct contact between infected and uninfected animals. These close contacts are particularly common during animal transport. Intensive farming may also increase the risk of transmission, as the pigs are raised in very close proximity to each other. The direct transfer of the virus probably occurs either by pigs touching noses, or through dried mucus. Airborne transmission through the aerosols produced by pigs coughing or sneezing is also an important means of infection.[32] The virus usually spreads quickly through a herd, infecting all the pigs within just a few days.[2] Transmission may also occur through wild animals, such as wild boar, which can spread the disease between farms.[4]

People are usually infected with viruses from other species during close contact with the living host or its tissues, respiratory secretion and certain other body fluid. In addition to respiratory secretions, certain other body fluids should also be considered potentially infectious[1] indirect contact via fomites or other means is also thought to be possible.[2] During recent cases associated with fairs, many patients had been exposed to pigs for more than one day.[4] Person to person transmission of swine influenza viruses has occasionally been reported to family members or other close contacts and a limited outbreak occurred on a military base; however, most viruses were not transmitted to other people.[14]

Pathogenesis and Pathology:

When swine influenza virus is introduced into the respiratory tract, by aerosol or by contact with saliva or other respiratory secretions from an infected individual, it attaches to and replicates in epithelial cells. The virus replicates in cells of both the upper and lower respiratory tract, notably the nasal mucosa, tonsils, trachea and lung, but almost never enters other tissues.[3] There is a massive infection of epithelial cells of the bronchi, bronchioli accompany the typical respiratory disease.[7] These inflammatory cells cause obstruction of the airways and substantial lung damage by release of their enzymes. Both the infection and disease are very transient and virus excretion in nasal swabs and virus replication in the lungs last for 6–7 days. Virus has occasionally been isolated from the serum of experimentally infected pigs, in barely detectable amounts, but virus isolation from extra-respiratory tissues is very rare. Viral replication combined with the immune response to infection lead to destruction and loss of cells lining the respiratory tract. As infection subsides, the epithelium is regenerated, a process that can take up to amonth.[8]

In uncomplicated infections, the gross lesions are mainly those of a viral pneumonia and are usually confined to the respiratory tract. Affected parts of the lungs are clearly demarcated and are atelecticor consolidated and dark red to purple-red. The lesions may be found distributed throughout the lungs but tend to be more extensive and

confluent ventrally.[32] Other areas of the lung may be pale and emphysematous. The airways are often dilated and filled with copious mucopurulent exudate. The bronchial and mediastinal lymph nodes are typically oedematous but not congested. Pulmonary oedema may also be seen. Some strains of swine influenza viruses produce more marked lesions than others. Generalized lymphadenopathy, hepatic congestion and pulmonary consolidation were reported in one outbreak of severe disease in swine. Histologically, the fully developed lesions are primarily those of an exudative bronchiolitis with necrosis, metaplasia, or attenuation of the bronchiolar epithelial cells and varying degrees of some interstitial pneumonia. Exudative tracheitis and rhinitis may also be present.[21]

Clinical Sign:

The influenza virus affects all ages of pigs. In an influenza outbreak on farm, clinical signs can be explosive, affecting all or part of a herd in a very short period of time. In pigs H1N1 virus infection produces fever, lethargy, sneezing, coughing, difficulty breathing and decreased appetite.[29] In some cases the infection can cause abortion sows and sub infertility in affected boar. Although mortality is usually low, the virus can produce weight loss, reduce milk production due to fever and poor growth, causing economic loss to farmers when infected pigs can loss up to 12-pound body weight over a 3 to 4weeks.[32] Swine flu produces most of the same symptoms in pigs as human flu produces in people. Swine flu can last about one to two weeks in pigs that survive. In a number of instances, people have developed In human the most common cause of death is respiratory failure; other causes of death are pneumonia, high fever which leading to neurological problems, dehydration due to excessive vomiting, diarrhea and electrolyte imbalance.[32] Fatalities are more likely in young children and the elder. The typical symptoms appear after an incubation period of 1 to 7 days.[3] The common symptoms include: temperature (fever), sore throat, headaches, chills, fatigue, body aches, cough, diarrhea (less common), tiredness (fatigue), vomiting, difficulty breathing, chest pain, purple or blue discoloration of the lips, signs of dehydration, dizziness when standing, reduced urine volume, in infants lack of tears when crying, dry diapers and seizure.[4] Public Health Significance: Swine influenza is one of the most common respiratory diseases in humans and one of the most significant, due to the generally high morbidity and the increased mortality of infants, elderly and chronically ill persons.[5] There are three types of influenza viruses: A, B and C. The type A viruses are the most virulent human pathogens among the three influenza types and cause the most severe disease.[2] Influenza B almost exclusively infects humans and is less common than influenza A. The only other animals known to be susceptible to influenza B infection are the seal and the ferret. This type of influenza mutates slower than type A and consequently is less genetically diverse, with only one influenza B serotype.[5] As a result of this lack of antigenic diversity, a degree of immunity to influenza B is usually acquired at an early age. This reduced rate of antigenic change, combined with its limited host range, ensures that pandemics of influenza B do not occur. Influenza C virus can infect humans, dogs and pigs, sometimes causing both severe illness and local epidemics. However, influenza C is less common than the other types and usually only cause mild disease in children.[7] Actual total is somewhat larger, because not all victims are tested for H1N1 influenza.[6] The flu usually involves: Abrupt onset of severe symptoms, which include headache, muscle aches, fatigue, high fever, cough and sometimes a runny nose with sore throat.[24] Children may experience vomiting, diarrhea and ear infections, as well as other flu symptoms. The symptoms usually resolve in 4 to 5 days, although some people can experience coughing and feelings of illness for more than 2 weeks. In some cases, flu can become more severe or make other conditions worse.[20] The swine flu virus has potential to cause severe economic consequences because of the mortality and production loss in pigs, trade sanctions on exporting animal products from an infected country or region, public health concerns leading to pig culling operations and reduced pork consumption and public health burden of the diseases.[14] It also mainly striking younger individuals, as most individuals under.[18]

Diagnosis and Treatment: The explosive appearance of an upper respiratory syndrome, including conjunctivitis, sneezing and coughing with low mortality rate, can be serves for presumptive diagnosis of SI in pig, but these signs are not enough to differentiate from other common respiratory diseases of swine.[22]

Viral Culture:

A virus culture is a diagnostic which is important for isolation of the virus. The best source for detection swine influenza viruses are bronchial swabs from post mortem tissues. But, culture is usually too slow to help guide clinical management. A negative viral culture does not exclude pandemic S-OIV (swine origin influenza

virus) infection. The virus was first cultured in embryonated chicken eggs.[13] This can be done with 10-11 day old embryonated chicken eggs inoculate 0.1-0.3 ml of inoculum into the allantoic cavity and amniotic sac, generally, 3-4 eggs are inoculated per sample, then incubate eggs at 35-37°C for 3 4 days and candle daily. Eggs with embryos that have died within 24 hours of inoculation are discarded and refrigerate eggs with embryos that have died later than 24 hours after inoculation. Harvest amniotic and allantoic fluids from eggs with dead embryos and from eggs with viable embryos at the end of the incubation period. All egg materials should be considered to be potentially infectious and should be treated accordingly to prevent SIV exposure to the laboratory worker. Centrifuge fluids at 1500-1900 g for 10-20 minutes at 4°C. Transfer the supernatant to another tube for testing, fluids are evaluated for the presence of SIV with the haemagglutination.[16]

Serology:

The primary serological test for detection of swine influenza virus antibodies is the hemagglutination inhibition test conducted on paired serum that most widely used for detection of antibodies to swine influenza virus. However, it is tedious and has only moderate sensitivity and high specificity. It has been adapted, modified and subtype specific [26]. Collection of paired serum is generally recommended 10-21 days apart. A four-fold or greater increase in titer between the first and second sample is suggestive of a recent swine influenza virus infection.[36]

Necropsy Findings: Molecular Diagnosis (PCR):

The PCR can be performed on a wide range of samples including nasal swabs, lung tissue or cell culture isolates. Currently, the PCR test is rather expensive and therefore it is used more for research than for diagnostic purposes.[26] RT-PCR tests have been developed for the diagnosis of swine influenza and for hemagglutinin and neuraminidase typing.[18] With the identification of the pandemic H1N1 in 2009, molecular assays based on an avian influenza matrix real-time PCR were adapted for use in swine. Modifications to the assay vary by country and a swine influenza reference laboratory should be consulted for the most suitable matrix PCR assay. Additional real-time PCR assays that can differentiate the novel H1N1 from seasonal flu H1N1 based on differentiable matrix realtime or N1 real-time assays have also been developed for use in North America. In many instances it is necessary to conduct partial or complete gene sequencing of one or more of the SIV genes (i.e. matrix, neuraminidase, haemagglutinin) to ascertain the subtype of detected virus.[36]

The outstanding lesions are present in the upper respiratory tract. Swelling and marked edemaof the cervical and mediastinal lymph node is evident. There is congestion of the mucosa of the pharynx, trachea and bronchi and more tenacious, colorless, frothy exudates is present in the air passages.[37] Copious exudates in the bronchi are accompanied by collapse of the ventral part of the lung. This atelectasis is extensive and often irregularly distributed, although apical and cardiac lopes are more affected and the right lung more so than the left. The lesions are clearly demarcated, dark red to purple in color and leathery in consistency [36]. Surrounding the atelectatic area the lung is often emphysematous and may show many petechial hemorrhages. There is often moderate to severe engorgement of spleen and severe hyperemia of the gastric mucosa especially alon the greater curvature. Patchy congestion and mild catarrhal exudation occur in the large intestine, but there are no erosions of the mucosa.[27]

Differential Diagnosis:

Swine influenza virus is one of the several agents involved in acute respiratory disease in pigs and can frequently be accompanied by other respiratory diseases such as Hog cholera, PRRS (Porcine Reproductive and Respiratory Syndrome) virus, Aujesky's disease virus, porcine circovirus type 2,Bordetella bronchiseptica, Pasteurella multocida and Mycoplasma hyopneumoniae.[35]

Treatment:

As swine influenza is rarely fatal to pigs, little treatment beyond rest and supportive care is required.

Instead veterinary efforts are focused on preventing the spread of the virus throughout the farm, or to other farms. Vaccination and animal management techniques are most important in these efforts. Antibiotics are also used to treat this disease, which although they have no effect against the influenza virus, do help prevent bacterial pneumonia and other secondary infections in influenza-weakened herds.[30]

Prevention and Control:

Biosecurity: A biosecurity plan for swine influenza must identify potential pathways for the introduction and spread of disease. Because swine influenza virus is spread predominantly through

the respiratory route and is highly transmissible between pigs, effective biosecurity can be difficult to achieve. Once swine influenza is established on a farm, it can be very difficult to completely eradicate without complete depopulation.[30] Partial depopulation, segregation of early weaned piglets, all-in all-out systems, combined with good hygiene practices, are steps that can be taken to control the incidence and minimise the economic impact on an affected farm.[36] Because cross species transmission of influenza viruses can occur between humans and pigs, biosecurity measures must also take into account human–pig interactions, particularly the exposure of pigs to persons with influenza-like illness. Additional sources of infection to consider in biosecurity plans include contact with wild and feral pigs, wild birds (especially waterfowl and other birds from aquatic habitats), poultry, unsafe water sources that may contain viruses and possibly even other species such as horses.[37]

Vaccination: Vaccination is commonly used as a control measure for influenza in swine farms. Vaccine candidates should be shown to be pure, safe, potent and efficacious. Inactivated vaccines may not protect against a new strain that appears to be antigenically different than the vaccine strain.

Conclusions and Recommendations

Swine influenza is a highly contagious viral infection in pigs and it is widely distributing in various continent. Swine flu is one of the most significant respiratory diseases of human due to its high morbidity and mortality of infants, elderly and chronically ill persons. It also has an immense economic consequencedue to production loss, swine mortality, herd culling and trade sanctions on affected.

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