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# JOURNAL OF ANIMAL FEED SCIENCE AND TECHNOLOGY

July - December 2021  
Volume 9 Number 2

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## Effect of Floor Type on Blood Biochemical Profile in Buffalo Heifers

Priti Shakya<sup>1</sup>, Rajneesh Sirohi<sup>2</sup>, Brijesh Yadav<sup>3</sup>,  
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### Abstract

An experiment was performed to assess the comfort level with the help of blood biochemical profile in buffalo's heifers. Randomly eighteen healthy Murrah buffaloes of almost uniform in age, body weight and health status selected for experiment at Livestock Farm Complex (LFC), College of Veterinary Sciences & Animal Husbandry, DUVASU, Mathura up to three month duration. The selected animals were randomly divided into three groups viz. Concrete flooring (T1), Cow dung bed flooring (T2) and Rubber mat installed flooring. The study revealed that mean of total protein (mg/dl) in buffalo heifers were observed significantly ( $P>0.05$ ) higher in T2 & T3 group (6.08 and 6.11) than T1 (5.45), while the total globulin (mg/dl) was significantly higher in T3 (2.60) than T1 & T2 (1.24 and 1.74) after 30 days of experimental period. The blood urea nitrogen (mg/dl), plasma creatinine (mg/dl), plasma glucose (mg/dl), plasma cholesterol (mg/dl) and plasma albumen (mg/dl) have on any significant changes during different phases of experimentation.

**Keywords:** Heifer; Plasma; Lameness.

### Introduction

Blood biochemical profile and physiological responses of an individual is an important indicator of an individual's well being (Singh *et al.*, 2009). Any deviation from the normal state is certainly reflected through alteration in the blood constituents. Thus, the blood constituents serve as valuable tool to monitor health status of an individual (Singh *et al.* 2008). In this context, the present bulletin collates the haematological and biochemical profile of various breeds of cattle and buffalo under varied seasons and environmental conditions so as to generate a reference dataset of the indigenous breeds under native circumstances.

Animal comfort is of great importance, both from welfare & economic prospective. Adequate rest has been positively associated with productivity, health, and welfare of dairy cattle. A positive correlation between the amount of rest and growth rates has been reported for growing cattle (Mogensen *et al.*, 1997). The comfort depends on type and quality of bedding material, due to which the properties of floor construction in animal houses became of utmost importance. The bedding material must be durable & must not allow slipping. Flooring of livestock house ultimately decides the walking and lying comfort of the animals. Concrete and brick paved floor which are conventionally being used in feeding and loafing area, have been reported as far

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away from the ideal walking and standing surface for animals (Phillips and Morris, 2000). Cows prefer soft flooring for standing and walking such as soft, textured rubber compared to concrete and also stands in bedded cubicles to obtain relief from concrete passageways (Telezhenko *et al.*, 2005). Lameness is one of the most important welfare and productivity problems in the dairy industry. That it causes pain (Rushen *et al.*, 2007) and reduces both milk yield (Green *et al.*, 2002) and reproductive performance makes it extremely costly (Ettema and Ostergaard, 2006).

Now a days, farmers and farm owners use various floor types for animal shed such as concrete, bricks, gravels, mattresses, rubber mats, stones, compost etc. As diverse the floor types are in their properties, simultaneously they have different effects on the health and performance of animals. Presently being used concrete or hard flooring has been found detrimental to livestock health and production. Livestock markets then began producing different kinds of flooring mats and bedding materials, which, along with increased demand, claimed to be of utmost significance in cow growth and health. This gave rise to a wide demand for flooring materials in the livestock industry, which continues to flourish now in India as well.

Since, the heifer today is the future cow and the future milk production unit, its nutritional and management needs are thus more relevant despite having a tendency to pay little attention to them. The housing facility must provide comfortable place for animal to lie down. The blood biochemical profile is a tool to assess the comfort/stress level of any animal. Keeping these facts in mind the study was undertaken with the objective to study the effect of flooring on blood biochemical profile of buffalo heifers.

### Material and Methods

The experiment was performed at Livestock Farm Complex of U.P. Pandit Deen Dayal Upadhyay Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan, DUVASU, Mathura. The

elevation (altitude) of Mathura is 174 meters (570 feet) above the mean sea level and lies between 27°-14' to 27°-58' N longitude and 77°-71' to 78°-12' E latitude (Singh, *et al.*, 2020). The average annual rainfall of the farm varies between 532-620 mm. The climate is generally characterized as hot & dry during summers. The maximum temperature varies between 45-48° C during summer and the minimum temperature dips up to 2° C during winters. The relative humidity of the farm varies from 18 to 79 percent. The study place falls under semi-arid region of the country. With the approval of Institutional Animal Ethics Committee of College of Veterinary Sciences and Animal Husbandry, DUVASU, Mathura experiment was conducted during the months of November 2019 to February 2020 to achieve the goal. The animals (murrh buffalo heifers) maintained at Livestock Farm Complex (LFC), College of Veterinary Sciences and Animal Husbandry, DUVASU, Mathura, were selected as experimental animals for present investigation. A total of 18 healthy buffalo heifers were selected and randomly divided into three groups, containing six animals in each group Treatment 1 (T1): Concrete flooring (Conventional method practiced at LFC), Treatment 2 (T2): Compost/cow dung bed flooring and Treatment 3 (T3): Rubber mat installed flooring. The data were analyzed as per standard procedure prescribed by Snedecor & Cochran (1989) and Duncan (1955).

### Result and Discussion

The plasma blood urea nitrogen concentration (mg/dl) values ranged from 16.44 to 17.10 mg/dl in T1 (Control), 15.95 to 16.15 mg/dl in T2 and 16.35 to 16.82 mg/dl in T3 treatment groups. The pooled mean value of blood urea nitrogen concentration was found to have no significant difference ( $P>0.05$ ) between the groups. The plasma creatinine concentration (mg/dl) values ranged from 1.23 to 1.29 mg/dl in T1 (Control), 1.08 to 1.27 mg/dl in T2 and 1.06 to 1.25 mg/dl in T3 treatment groups. Similarly, the pooled mean value of plasma creatinine, glucose, cholesterol concentration was non significant difference ( $P>0.05$ ) between the treatments.

**Table 1:** Effect of floor type on blood biochemical profile (mg/dl) in buffalo heifers

Parameters	Days	Treatment			SEM	P value
		T1	T2	T3		
Blood Urea Nitrogen (mg/dl)	0	16.51	16.11	16.78		
	30	16.95	16.09	16.82	0.35	0.34
	60	16.44	15.95	16.35	0.33	0.78
	90	17.10	16.15	16.73	0.42	0.54
	Mean	16.75	16.07	16.67	0.37	0.58

Table cont....

	0	1.24	1.27	1.25	0.09	0.95
	30	1.29	1.22	1.12	0.11	0.77
Creatinine (mg/dl)	60	1.28	1.09	1.11	0.06	0.28
	90	1.23	1.08	1.06	0.07	0.51
	Mean	1.26	1.16	1.13	0.08	0.62
	0	47.82	51.92	52.20	1.32	0.08
	30	48.95	48.30	51.83	1.41	0.26
Blood glucose (mg/dl)	60	48.57	53.73	50.06	1.55	0.15
	90	52.21	52.07	52.00	1.17	0.57
	Mean	49.39	51.49	51.52	0.70	0.09
	0	95.71	83.18	84.45	2.93	0.16
	30	109.74	105.33	137.26	9.43	0.34
Cholesterol (mg/dl)	60	103.69	111.96	131.04	7.26	0.30
	90	107.64	118.39	101.07	6.15	0.53
	Mean	104.19	104.71	113.45	3.63	0.51
	0	6.55	6.84	6.65	0.20	0.86
	30	4.74a	5.30a	6.30b	0.20	0.00
Protein (mg/dl)	60	5.15a	6.09b	5.51a	0.12	0.00
	90	5.26	6.10	5.96	0.22	0.38
	Mean	5.45a	6.08b	6.11b	0.11	0.02
	0	3.48	3.53	3.46	0.07	0.933
	30	3.50	3.55	3.70	0.05	0.394
Albumin (mg/dl)	60	3.73	3.50	3.79	0.05	0.092
	90	3.64	3.47	3.62	0.05	0.348
	Mean	3.59	3.51	3.64	0.03	0.243
	0	3.06	3.30	3.18	0.21	0.91
	30	1.24a	1.74a	2.60b	0.20	0.01
Globulin (mg/dl)	60	1.52a	2.59b	1.72a	0.15	0.00
	90	1.72	2.63	2.33	0.24	0.31
	Mean	1.88	2.57	2.46	0.11	0.06

Means bearing the different superscript with in a row differ significantly

The total plasma protein concentration (mg/dl) values ranged from 4.74 to 6.55 mg/dl in T1 (Control), 5.30 to 6.84 mg/dl in T2 and 5.51 to 6.65 mg/dl in T3 treatment groups. The values of protein were found significantly higher in T3 at day 30 compared to T1 and T2. Also, at day 60 it was found significantly higher in T2 compared to T1 and T3. The pooled mean values of total plasma protein concentration were found to be significantly ( $P>0.05$ ) higher in T2 and T3 compared to control group.

The total plasma albumin concentration (mg/dl) values ranged from 3.48 to 3.73 mg/dl in T1 (Control), 3.47 to 3.55 mg/dl in T2 and 3.46 to 3.79 mg/dl in T3 treatment groups. The total plasma albumin concentration (g/dl) at monthly intervals were found to have no significant difference ( $P>0.05$ ) between groups.

The total plasma globulin concentration (mg/dl) values ranged from 1.24 to 3.06 mg/dl in T1 (Control), 1.74 to 3.30 mg/dl in T2 and 1.72 to 3.18 mg/dl in T3 treatment groups. The overall mean value of total plasma globulin concentration was non significantly different ( $P>0.05$ ) between treatment groups. However at day 30 total plasma globulin concentration was significantly higher in T3 compared to T1 and T2 and significantly higher in T2 compared to T1 and T3 at day 60.

The results revealed that the floor type had no significant effect on the plasma concentration of blood urea nitrogen, creatinine, glucose, cholesterol and total albumin. All these parameters showed the values within the normal physiological range suggesting that floor types used do not have any adverse effect on the murrah buffalo heifers. These results are in line with the findings of Peter et al

(2006),

The analysis of the results for plasma total protein revealed significantly higher values in T3 at day 30 compare to T1 and T2; at day 60 it was found significantly higher in T2 compared to T1 and T3. The pooled mean value of total plasma protein concentration were found to be significantly ( $P < 0.05$ ) higher in T2 and T3 compared to control group. The overall mean value of total plasma globulin concentration was non-significantly different ( $P > 0.05$ ) between treatment groups. However at day 30 total plasma globulin concentration was significantly higher in T3 compared to T1 and T2 and significantly higher in T2 compared to T1 and T3 at day 60. Similarly findings were also observed by Chikwanda *et al.* (2017) in Nguni goats.

### Conclusion

Comfortable and clean housing system with adequate flooring is essential for proper rest, sleep and to exhibit normal behaviours of animals. Adequate rest and sleep is essential for the welfare of growing animals. On the basis of experimentation It may be concluded that there is no any adverse effect on health of Murrah buffalo heifers reared under three different types of flooring.

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## Differentiation of Post-partum Estrus and Non-estrus Stages of Dairy Animals on the Basis of Haematological Attributes

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### Abstract

The present investigation was planned to differentiate various stages of estrus i.e. onset of estrus, standing heat and non-estrus conditions in Sahiwal cows by observing various haematological attributes. The experiments were conducted on ten healthy, cyclic Sahiwal cows maintained at Livestock Farm Complex (LFC) of College of Veterinary Science & Animal Husbandry, DUVASU, Mathura. The selected Sahiwal cows were observed for signs and symptoms of heat/estrus. Detection of onset of post-partum estrus was performed by observing the first response of teaser bull and rectal palpation of cow at every 3 hours interval after onset of estrus. Blood sample was collected for haematological changes during their onset of estrus, standing heat and non-estrus stages. The mean values for RBC ( $6.79 \pm 0.10 \times 10^6/\text{mm}^3$ ), WBC ( $10.65 \pm 0.18 \times 10^3/\text{mm}^3$ ), PCV ( $33.41 \pm 0.54\%$ ), and haemoglobin ( $11.47 \pm 0.15 \text{ mg/dl}$ ) of experimental cows were found to be significantly ( $P < 0.01$ ) higher during standing heat condition as compared to onset of post-partum estrus and non-estrus stages in Sahiwal cows. On the basis of above facts haematological attributes (RBC count, WBC count, blood hemoglobin and PCV) may be used for precise identification of onset of estrus, standing heat and non-estrus stages in Sahiwal cows.

**Keywords:** Cyclic; Estrus; Hematology; PCV; Sahiwal cows.

### Introduction

Dairying is an important secondary source of income for millions of rural families and is assumed to be the most important enterprise in providing employment and income generating opportunities, particularly, for women and marginal farmers in India. Animal husbandry is an economic enterprise & considered as "survival enterprise" for millions of people in India, especially Arid & Semi-Arid

regions. Hence livestock is an engine for economic diversification, livelihood security and sustainable rural development of the country (Singh *et al.*, 2018). Production performance of a herd largely depends upon ratio of wet and dry animals. Ideally, a dairy farm is considered to be economic when 66 to 75% of its herd strength remains always in milk. Productive and reproductive performance of dairy animals is largely affected by their nutritional and health statuses and various management practices.

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The reproductive efficiency of the dairy animals has a direct impact on productivity and profitability of dairy farms (Lobago *et al.*, 2007). Therefore, reproduction management is a major concern in dairy industry. To get maximum profitability from dairy industry there is a need of better reproductive management of dairy animals so that they must be in regular cycle and must be bred at definite intervals. So, the concept of timed AI must be followed which is only possible with the accurate detection of different stages of heat.

The postpartum period is regarded as important in the reproductive life of the cow because of its important effect upon future fertility (Fonesca *et al.* 1983; Oltenacu *et al.* 1983). It has been reported that the total blood leukocyte counts increase markedly on the day preceding the calving (Merrill and Smith 1954; Paterson 1957). Merrill and Smith (1954) found that lymphocyte, eosinophil numbers increased and neutrophils decreased while monocytes did not show any definite change up to 10 days postpartum. The mean blood total leukocyte and absolute blood lymphocyte counts as well as the neutrophil counts dropped sharply after parturition and then increased gradually toward the 20 days after parturition (Hussain and Danial 1992; Guidry *et al.* 1976). Saad *et al.* (1989) found that the number of blood lymphocytes decreased before and at parturition, returning to a higher level during the second week postpartum. Similar findings were made by the other investigators in cows. Regarding the mammary gland, extensive influx of neutrophils into the colostrums and milk occurs around calving and during the first week after calving (Guidry *et al.*, 1976; Straub *et al.*, 1959). Peripheral leukocyte count was not influenced by the reproductive state of cow; however, the mean neutrophil concentration was significantly different between the reproductive states (PCommunication of the timing of the physiological event of ovulation and coordination of sexual behavior are important for successful fertilization (Schams *et al.*, 1977; Ziegler *et al.*, 1993). The success rate of artificial insemination in cattle mainly depends on the time of estrus it is inseminated. Inefficient and inaccurate heat detection results in failure of conception during that attempt, which in turn leads to significant economic losses (Karir *et al.*, 2006). The efficient and accurate detection of estrus and the timing of AI has remained major challenge in improving reproductive and economic efficiencies of dairy farms (Heersche and Nebel, 1994). The detection rates of visual observation have been observed to be even below 50% at larger herd sizes (Van Eerdenburg *et al.*, 2002). Therefore, there is a need

for adoption of improved technologies for accurate and timely detection of estrus so that dairy animals may be inseminated at the most appropriate time without missing even a single estrus cycle (Saint-Dizier and Chasant-Maillard, 2012). Therefore, keeping in view the above facts, the present study was carried out for the accurate identification of various stages of estrus.

## Material and Method

The experiment was conducted at District Dairy Demonstration Farm (DDDF) within the premises of Livestock Farm Complex (LFC) of U.P. Pandit Deen Dayal Upadhyay Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan (DUVASU), Mathura from the month of September 2018 to march, 2019. The elevation (altitude) of Mathura is 174 meters (570 feet) above the mean sea level and lies between 27°-14' to 27°-58' N longitude and 77°-71' to 78°-12' E latitude. The average annual rainfall of the farm varies between 532-620 mm. The climate is generally characterized as hot & dry during summers. The maximum temperature varies between 45 - 48°C and the min. temperature goes as down as up to 2°C during winters. The relative humidity of this farm varies from 18 to 79 percent. The study area falls under semi-arid conditions.

Ten healthy, cyclic, Sahiwal cows, which never expressed any reproductive abnormality in the past, were selected for the experiment. No heifer was selected as experimental animal in order to avoid the adverse effect of any type of congenital reproductive defects. No special management practice was followed for the experimental animals. They were kept along with their original herd mates in the same shed under loose housing system. The feeding and other management practices for these cows remained same as was normally practiced for other cows of the herd. The onset of estrus, standing heat and non-estrus stages of same individual was compared for differences in their haematological attributes. The selected cows were observed for signs and symptoms of heat/estrus. The first heat was missed and thereafter the animals were kept under close observation from 17<sup>th</sup> day onward of first heat for appearance of onset of second heat. Detection of onset of estrus was done by observing the first response of teaser bull to a cow. Thereafter, standing heat condition was identified by observing stand still or receptive stage of the cow to a teaser bull and it was confirmed by rectal palpation of cow at every 3 hours interval after onset of estrus. Approximately

10 ml blood sample was collected from jugular vein of each estrus cow during their onset of estrus, standing heat and non estrus stages. The blood samples were collected in heparinized vacutainer tubes. A portion of collected blood sample was utilized for haematological examinations (total erythrocyte count, total leukocyte count, packed cell volume and haemoglobin concentration).

### Result and Discussion

The results (Table 1) revealed a significant ( $P < 0.05$ ) effect of different stages of estrus on total erythrocyte count, total leukocyte count, packed cell volume and haemoglobin concentration of experimental Sahiwal cows. The overall pool mean for total erythrocyte count, total leukocytes count, PCV, hemoglobin concentration of experimental

Sahiwal cows in present study was observed to be  $6.62 \pm 0.06 \times 10^6$  per  $\text{mm}^3$ ,  $10.21 \pm 0.13 \times 10^3$  per  $\text{mm}^3$ ,  $30.52 \pm 0.53\%$  and  $10.50 \pm 0.17$  mg/dl, respectively, whereas the mean values for total erythrocyte count were observed to be  $6.62 \pm 0.11 \times 10^6$ ,  $6.79 \pm 0.10 \times 10^6$ ,  $6.46 \pm 0.10 \times 10^6$  per  $\text{mm}^3$ , total leukocytes count were  $10.14 \pm 0.21 \times 10^3$ ,  $10.65 \pm 0.18 \times 10^3$ ,  $9.85 \pm 0.20 \times 10^3$  per  $\text{mm}^3$ , PCV were  $29.70 \pm 0.70$ ,  $33.41 \pm 0.54$ ,  $28.46 \pm 0.71\%$  and haemoglobin concentration were  $10.25 \pm 0.23$ ,  $11.47 \pm 0.15$  and  $9.77 \pm 0.19$  mg/dl, respectively during onset of estrus, standing heat and non-estrus stages of experimental sahiwal cows. Thus, the mean value for total erythrocyte count, total leukocyte count, PCV and blood hemoglobin concentration of these experimental cows were found to be significantly ( $P < 0.05$ ) higher during their standing heat stage as compared to onset of estrus as well as non-estrus stages.

**Table 1:** Mean  $\pm$  SE values for haematological attributes of experimental sahiwal cows during their different stages of estrus.

Stages of estrus	RBC ( $\times 10^6/\text{mm}^3$ )		WBC ( $\times 10^3/\text{mm}^3$ )		PCV (%)		Hb (mg/dl)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Onset of estrus	6.62ab	0.11	10.14ab	0.21	29.70b	0.70	10.25b	0.23
Standing heat	6.79a	0.10	10.65a	0.18	33.41a	0.54	11.47a	0.15
Non-estrus	6.46b	0.10	9.85b	0.20	28.46b	0.71	9.77b	0.19
Overall pool mean	6.62	0.06	10.21	0.13	30.52	0.53	10.50	0.17

Values with different superscripts in the same column differ significantly ( $P < 0.05$ ) from each other. The mean RBC and WBC counts during standing heat condition of estrus in experimental sahiwal cows under present study was found to be significantly higher than during their non estrus condition but no significant difference for these attributes could be observed between onset of estrus and standing heat as well as onset of estrus and non-estrus conditions. Similarly, Perumal *et al.* (2014) also reported that the total RBC count was non significantly ( $P \geq 0.05$ ) higher in estrus cows than other stage of reproduction. This increase in total RBC count in estrus cows may be due to hyperactivity and excitement, which may be due to release of high level of estrogen (anabolic effects) from graffian follicles (Coles, 1986; Perumal *et al.*, 2013). The leukocytosis during estrus may be attributed to adrenaline mediated mobilization of the marginal neutrophil pool cells through leukocytosis inducing factor (Sastry, 1989). The mean PCV and Hb concentration during standing heat condition of estrus in experimental Sahiwal cows under present study was found to be significantly higher than during their onset of estrus as well as non estrus conditions but the

difference between onset of estrus and non-estrus conditions was found to be non-significant ( $P \geq 0.05$ ). The present observations may be supported by the finding of Pathan *et al.* (2011) that the levels of haemoglobin and PCV were significantly higher in cyclic cows than those in non-cyclic cows. The higher levels of Hb and PCV are attributed to increase in RBC count in cyclic animals because of hyperactivity and excitement under the influence of estrogen (Ahmed *et al.*, 2003).

### Conclusion

The inefficient and inaccurate knowledge about the estrus, non-estrus and standing heat among the farmers leads to poor heat detection, failure of conception, increasing service and calving interval of animals, results in huge economical losses to our dairy farmers in India. Hence, on the basis of present experiment it can be concluded that hematological attributes (RBC count, WBC count, blood hemoglobin and PCV) may be used for precise identification of onset of estrus, standing heat and non estrus stages in Sahiwal cows. So, to improve the reproductive efficiency of dairy animals in terms of reducing service period,

conception rate and calving interval the estimation of hematological parameters can be used as a biomarkers for the onset of estrus, standing heat and non-estrus stages in Sahiwal cows to improve the productive, reproductive performances of cows as well as to improve the socio-economic condition of the farmers.

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**Conflict of interests:** The authors have declared no conflict of interest exist.

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## The study of Incidence of Reproductive Disorders in Non-descriptive Cows in Rewa District

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### Abstract

A field study was carried out in the Rewa district; Incidence of reproductive disorders studied in seventeen villages of potential dairy pocket of Rewa district includes peri-urban and rural areas. After conducting survey on 409 animals of 193 farmers the total percentage of true anoestrus cows was 35.45 per cent followed by 15.54 per cent sub-oestrus animals, 8.31 per cent repeat breeders, 3.91 per cent retention of placenta (ROP) and 3.17 per cent of prolapse cases. So the total percentage of reproductive disorders was 66.38 per cent. Reproductive disorders may be due to anoestrus and other problems related to mineral and other deficiencies in feeds and fodders in field conditions.

**Keywords:** Anoestrus; Incidence; Prolapse; Repeat breeders; Retention of placenta.

### Introduction

In rural areas animals were suffering from anoestrus and other problems related to reproduction associated with mineral deficiencies in feeds and fodders in field conditions. Under nutrition is one of the most limiting factors in livestock in rural areas. The imbalances or deficiencies or toxicities of certain minerals severely affected reproduction, growth and health in animals. In field practices

crossbred animals are fed less feed or low nutritive feed leading to negative energy balance condition. Insufficient intake of energy, protein, vitamins, and macro and/or micro minerals are associated with suboptimal reproductive performance such as delayed puberty, reduced ovulation, lower conception rate, lengthened post-partum anoestrus and reduced perinatal survival as well as performance (Robinson, 1990). Deficiency of energy for an extended period leads to anovulation,

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postpartum anestrus, as well as infertility (Staples *et al.*, 1990).

Reproductive disorders have been found to be a major reason for decreased reproductive efficiency in cattle and consequently reproductive efficiency is the major determinant of lifetime productivity of cows (Lobago *et al.*, 2006). In the last few decades, as the major epidemic disease, were brought under control, emphasis have increasingly shifted to economically important diseases to the dairy producers and animal health problem stands out as the most prominent. (Msangi *et al.*, 2005). Regular breeding depends upon the normal function of the reproductive system.

### Material and methods

Technical survey regarding farmer's status, animal status, feeding practices adopted by farmers, productive and reproductive status of potential dairy pockets of Rewa district. Animals were selected randomly on the basis of history, interview schedule, farming status (existing housing and managemental condition) and animal status. Record the data of reproductive disorders like anoestrus, repeat breeding, retention of placenta and prolapsed of breedable population of dairy cattle was done. Definitions of recorded diseases are mostly from Sarder *et al.*(2010).

**Anoestrus and subestrus:** Lack of expression of the oestrus at an expected time is called anoestrus. Clinically if a heifer is 18 or more months old or a cow has passed 40 days post-partum but did not

show oestrus the condition is referred as anoestrus.

**Retained placenta:** A cow was considered to have RP when the foetal membranes were visible at the vulva or were identified in the uterus or vagina by vaginal examination more than 24 h after calving.

**Repeat breeders:** Cows failing to conceive after a defined number of inseminations (generally three or more) with fertile semen, have been classified as repeat breeders (Zemjanis, 1980; Gunther, 1981; Levine, 1999).

### Results and discussion

Incidence of reproductive disorders studied in seventeen villages of potential dairy pocket of Rewa district includes peri-urban and rural areas (table 1). After conducting survey on 409 animals of 193 farmers the total percentage of true anoestrus cows was 35.45 per cent followed by 15.54 per cent sub-oestrus animals, 8.31 per cent repeat breeders, 3.91 per cent retention of placenta (ROP) and 3.17 per cent of prolapse cases. So the total percentage of reproductive disorders was 66.38 per cent. Present findings are close to the findings of Shukla *et al.* (2007), Tiwari *et al.* (2007) and Devasena *et al.* (2010). In rural areas animals were suffering from anoestrus and other problems related to reproduction associated with mineral deficiencies in feeds and fodders in field conditions. Under nutrition is one of the most limiting factors in livestock in rural areas. The imbalances or deficiencies or toxicities of certain minerals severely affected reproduction, growth and health in animals.

Table 1: Incidence of different reproductive disorders in Rewa district.

Name of village	No. of farmers	Total animals	Reproductive Disorders				
			True anoestrus	Sub-oestrus	Repeat breeder	ROP	Prolapse
Bichhiya (Rewa)	Lakshman bagh Goshala	37	19	9	6	4	2
Kuthulia	10	25	9	3	2	1	0
Baisa	12	28	11	5	3	1	0
Padokhar	8	21	8	4	3	2	1
Hardi	11	23	4	2	1	0	0
Silpara	12	18	8	3	2	1	1
Udki	10	19	6	4	1	0	0
Bhatlo	7	12	5	2	1	1	2
Dihya	6	10	3	1	1	0	1
Amiliki	24	38	18	6	3	2	1
Bela	14	36	10	4	1	1	0
Raura	11	18	6	1	4	2	2
Ajgara	10	20	4	2	3	1	1

Table Cont....

Bela	17	39	14	4	3	2	1
Nipaniya	12	21	8	3	1	0	0
Raipur kerchurian	15	42	17	7	4	2	1
Chorhata	14	39	14	4	1	0	2
<b>Total</b>	<b>193</b>	<b>409</b>	<b>145</b>	<b>64</b>	<b>34</b>	<b>16</b>	<b>13</b>
<b>% Disorders</b>			<b>35.45</b>	<b>15.64</b>	<b>8.31</b>	<b>3.91</b>	<b>3.17</b>

The total percentage of reproductive disorders are 66.38 per cent in which 51.09 per cent is due to true anoestrus and suboestrus, this findings are close to the findings of Lall et al. (2000), Shukla et al. (2007), Tiwari *et al.* (2007) and Devasena *et al.* (2010). Reproductive disorders may be due to anoestrus and other problems related to mineral and other deficiencies in feeds and fodders in field conditions.

### Conclusion

According to our study anoestrus, repeat breeders, retention of placenta and prolapse are important reproductive diseases. Mitigation strategies about these diseases are already available should be extended to farmers to control them.

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## Recovery and Processing of Edible fat from Slaughter House Byproducts

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### Abstract

Slaughtering of food animals not only provides meat but also provide valuable byproducts to the mankind. By slaughtering and processing of meat animal, only one third portion is meat while the rest of the portion includes byproducts and waste, which need to be adequately processed and efficiently utilized in various ways. Efficient utilization of byproducts has direct impact on the economy as well as environmental pollution. By products include meat and bone trimmings, blood, fat, intestinal content etc., among which fat is an important slaughter house byproduct which is used for edible as well as inedible purposes. Fat is obtained by rendering process, which may be dry, wet and low temperature rendering depending upon the utilization of finished product. Recovered edible and inedible fat may be used for various food and technical purposes which is directly or indirectly improves the economics of slaughter house industry.

**Keywords:** Slaughter house; Byproducts, Fat recovery; Edible; Inedible; Economics.

### Introduction

Meat is a highly nutritious food eaten by human beings since time immemorial. It provides high quality protein, important minerals, vitamins etc. with all of the natural advantages of animal food products; there still remains a great quantity, often in excess of 40% of animal byproducts. Slaughter house by products are basically left over after recovery of meat from food animals after slaughter. This slaughter house by products can

be efficiently utilized to improve economy upto 7-11%. By products can be classified as primary (bones, blood, ingesta) or secondary (bone meal, blood meal etc.) by products. The quantity of animal byproducts available for utilization can be estimated by subtracting the dressing percentages, which fall into two categories: edible and inedible byproducts. Earlier this inedible fat was used prehistorically for lighting, softening and for preparation of waterproofing garments, but now a days it is used in various industries for making

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paint, soap, machinery parts, watches, lubrication oil etc.

Animals are slaughtered to produce their by products which can be well utilized for various applications in day to day human life, thus, contributing to the value of animals. Removal of fat from various parts of the animal body can be done by various methods, mainly dry rendering and wet rendering (Sharma et al., 2013). Rendering is the methods of processing of animal byproducts into important products of technical and edible use. It is the method of recovery of purified fats like lard or tallow from animal fatty tissue. It may be carried out at household level or small scale or large scale industrial level. The majority of raw material comes in form of meat trimmings, bones, fat, skin, hide and intestinal content abattoirs, restaurant grease, house kitchen and butcher shop. This material can include fatty tissue, bones, and offal, as well as entire carcasses of animals condemned at slaughterhouses, and those that have died on farms, in transit, etc.

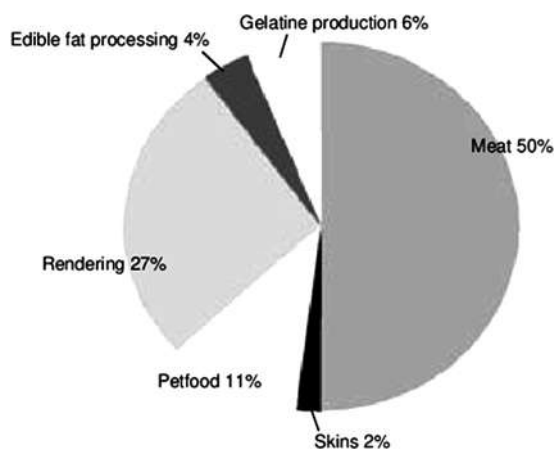


Fig. 1: Estimated utilization of slaughtered animal (by % weight) (Woodgate and Veen, 2004).

### History

The development of rendering was primarily responsible for the profitable utilization of meat industry by-products, which in turn allowed the development of a massive industrial scale meat industry that made food more economical for the consumer (<https://mavitecrendering.com>). The earliest rendering was done in a kettle over an open fire. This type of rendering is still done on farms to make lard and tallow for food purposes. The development of an industry to utilize by products for fertilizer came during the nineteenth century. With the development of steam boilers, double jacketed steamers were used to product high quality

heat sensitive products, where raw material would not come in contact with heating system. A further development came in the late nineteenth century with the use of the steam "digester" which was simply a tank used as a pressure cooker in which live steam was injected into the material being rendered. This process is a wet rendering process called "tanking" and was used for both edible and inedible products, although the better grades of edible products were made using the open kettle process. After the material is "tanked", the free fat is run off, the remaining water ("tank water") run into a separate vat, and the solids removed and dried by both pressing and steam-drying in a jacketed vessel.

The tank water was either run into a sewer or it was evaporated to make glue or protein concentrate to add to fertilizer. The solids were used to make fertilizer. Technological innovations came rapidly as the 20th century advanced. Some of these were in the uses for rendered products and others were in the rendering methods themselves. In the 1920s, a batch dry rendering process was invented, in which the material was cooked in horizontal steam-jacketed cylinders that were similar to the fertilizer dryers of the day. Advantages claimed for the dry process were economy in energy use, a better protein yield, faster processing, and fewer obnoxious odours attending the process. Gradually, over the years, the wet "tanking" process was replaced with the dry process, so that by the end of World War II, most rendering installations used the dry process. In the 1960s, continuous dry processes were introduced, one using a variation of the conventional dry cooker and the other making use of a mincing and evaporation process to dry the material and yield the fat. In the 1980s, high energy costs popularized the various "wet" continuous processes. These processes were more energy efficient and allowed the re-use of process vapours to pre-heat or dry the materials during the process

The rendering process simultaneously dries the material and separates the fat from the bone and protein. A rendering process yields fat (yellow grease, choice white grease, bleachable fancy tallow, etc.) at top most layer and a protein meal (meat & bone meal, poultry byproduct meal, etc.) at lower surface of digester. In this way, rendering process simultaneously dries the material and separates the fat from the bone and protein. The rendering industry today produces hundreds of useful products that can be broadly classified as edible and inedible oils, chemicals, meat meals, bone meals etc. these valuable products are produced from animal by products like viscera, bones, trimmings,

dead stock, feathers etc. which were earlier usually considered as waste from the slaughter house and abattoir industry.

#### *Rendering process for inedible purposes*

Fat, meat trimmings and other slaughter house byproducts that are not suitable for edible purposes and used for various industrial and other purposes are the feedstocks for inedible rendering processes. There are basically two methods for rendering for inedible purposes:

1. Dry rendering it is done at 75 psi for 3-5 hours in dry renderer, where material is cooked in its own moisture. Dry renderer is a double jacketed horizontal steam jacket with load capacity of 8-10 quintals. The resultant material is known as crackling which is usually gritty, fibrous and non slippery. Fat is removed from this crackling inside the centrifugal expeller and fat settling tank.
2. Wet rendering it is carried out in vertical type steamer where steam directly comes in contact with raw material. It is cooked at 40 psi for 4-8 hours. After processing, the tankage or slush is allowed to settle

for 2 hours, fat floats on the top which can be removed first, followed by water and finally by tankage with digested meat and bones (Sharma, 1996).

Fat recovery may be a batch or a continuous process at industrial level in which the material is heated in a steam jacketed vessel to drive off the moisture and simultaneously release the fat from the fat cells. The material is first ground, then heated to release the fat and drive off the moisture, percolated to drain off the free fat, and then more fat is pressed out of the solids, which at this stage are called "cracklings" or "dry rendered tankage". The cracklings are further ground to make meat and bone meal. A variation on a dry process involves finely chopping the material, fluidizing it with hot fat, and then evaporating the mixture in one or more evaporator stages. Some inedible rendering is done using a wet process, which is generally a continuous process similar in some ways to that used for edible materials. The material is heated with added steam and then pressed to remove a water fat mixture which is then separated into fat, water and fine solids by stages of centrifuging and/or evaporation. The solids from the press are dried and then ground into meat and bone meal. Most independent renderers process only inedible material.

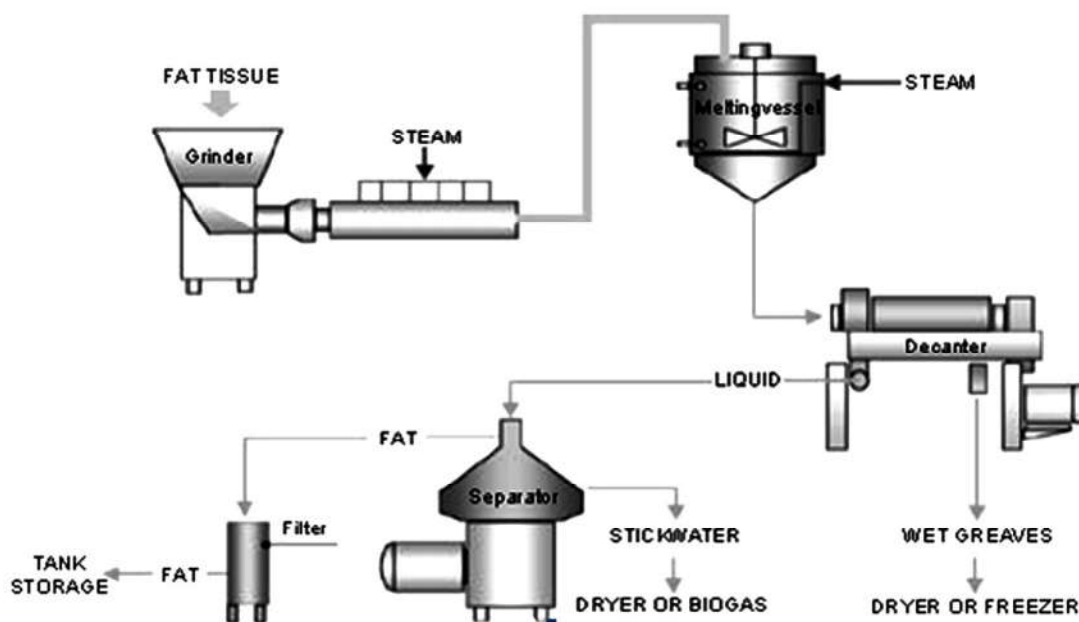


Fig. 2: Processing of recovered fat for edible purposes

#### *Low temperature or edible fat rendering*

Edible rendering processes are basically meat processing operations and produce high quality fat, normally used as food ingredients in culinary practices. Edible rendering is generally carried out

in a continuous process at low temperature (less than the boiling point of water) at around 70-100°C (158-212°F), at this temperature raw material need not to be washed. The process usually consists of finely chopping the edible fat materials (generally fat trimmings from meat cuts), heating them with

Source: lipidlibrary.aocs.org

or without added steam, and then carrying out two or more stages of centrifugal separation. The first stage separates the liquid water and fat mixture from the solids. The second stage further separates the fat from the water. The solids may be used in food products, pet foods, etc., depending on the original materials. The separated fat may be used in food products, or if in surplus, it may be diverted to soap making operations. Most edible rendering is done by meat packing or processing companies. One edible product is greaves, which is the unmeltable residue left after animal fat has been rendered. An alternative process cooks slaughterhouse offal to produce a thick lumpy stew which is then sold to the pet food industry to be used principally as tinned cat and dog foods. Such plants are notable for the offensive odour that they can produce and are often located well away from human habitation.

#### *Processing of recovered fat for edible purposes*

There are a number of suppliers of oil and fat products used for edible purposes. These products include, but are not limited to olive oil, peanut oil, soybean oil, sunflower oil, shortening, butter, and margarine, but also the byproducts of slaughterhouse like lard, tallow etc. The raw materials for these products include animal by-products, fleshy fruits (palm and olive), and oilseeds. The crude fats and oils from these sources are recovered using a number of methods such as rendering, pressing and extracting with solvents. Some oils, such as virgin olive oil, are ready for consumption after this initial step (pressing), while other requires additional processing. The extent of fat and oil processing depends on the source, quality, and nature of the end use.

#### **Alkali Refining**

The growing demand for bland-tasting, stable oils and shortenings for the end user has driven the development of extensive processing techniques. The constituents of crude fats and oils that contribute to unwanted flavor and color are free fatty acids, waxes, color pigments, phospholipids (gums), oxidized products, metal ions, and carotenoids. Many of these undesirables can be removed by Alkali refining. Alkali refining is the removal of these unwanted items by a chemical reaction with an alkali (caustic soda).

This process is completed by a four step process: Conditioning, Neutralization, Washing, and

Drying. The fats are heated between 40° and 85°C and treated with an aqueous solution of sodium hydroxide or sodium carbonate. Conditioning transforms non hydrate phospholipids into their hydrate form by breaking down metal/phosphatide complexes with a strong acid. In neutralization the removal of free fatty acids and residual gums takes place. Washing is the removal of residual gums by hot water. And drying is the removal of moisture under a vacuum.

Inductivity Conductivity can be used to provide a continuous, on-line indication of the aqueous Alkali solution concentration. The aqueous emulsion formed by the impurities is drawn off the bottom of the tank (in batch refining) or centrifuged off (in continuous refining). After alkali refining, the oil is usually washed with water to remove any residual alkali or emulsion. Measuring the conductivity of this wash water can indicate its quality. Clean water with low dissolved solids will exhibit low conductivity.

#### *Water Refining*

Also known as degumming, water refining consists of treating the crude oil with a small amount of water. "Degumming" is where phosphotites in the Oil are hydrated with water and then removed by separating in the Centrifugal Separators. The Degummed Oil is then subject to neutralization with caustic soda where the free fatty acids are converted into residual gums and are separated in hermetic separators. The neutralized oil is then washed and dried (Fidel et al., 2020). The "gummy" emulsion of phospholipids created by the treatment with water is then centrifuged off. In the case of corn and soybean oil, this emulsion can be dried to produce a substance known as lecithin, which is used as an emulsifier in many applications. Because of this, the water used in the degumming process needs to be of high quality. Any impurities in the water will end up in the product after the drying process. Once again, conductivity can provide a low maintenance indication of water quality.

#### *Deodorization*

Most fats, even after refining, have characteristic flavors and odors, and vegetable fats especially have a relatively strong taste that is foreign to that of butter and are considered undesirable. In order to produce a tasteless, butter-like fat, these oils may undergo deodorization. To do so steam is blown through the heated oil to distill the volatile components responsible for these flavors and

odors. Of course, in order to generate steam you will need water, clean water. pH and conductivity measurements of the feed water are mandatory in this process to ensure the protection of the process equipment from corrosion and scaling. Other than water, you need heat to generate the steam. Proper control of excess oxygen in flue gas allows the boiler to be operated efficiently and safely.

### *Hydrogenation*

For many purposes, it is desirable for the oil to be solid, or semi-solid (margarine and shortenings). The process that converts liquid oils to higher-melting solids is called hydrogenation. The process consists of dispersing hydrogen atoms to double bonds of a molecule through heated oil in the presences of a catalyst. Cylinders from a vendor may supply the hydrogen, but some plants produce it on-site. This usually involves the electrolysis of water to form oxygen and hydrogen. It is critical for the water used in the process to be pure. Contacting conductivity can be used to ensure the quality of the water in order to prevent damage to the expensive equipment used to generate the hydrogen. The purity of the hydrogen used in this process is critical, both for the product quality, and the process efficiency. There are many points in the processing of edible fats and oils that benefit from the use of analytical measurements. Inductive conductivity, contacting conductivity, gas density and pH can be utilized to increase the quality of the end product, as well as protecting expensive process.

### **Conclusion**

Present day health conscious consumer requires food ingredients with improved quality in terms of nutrition, safely processed and good for health. Rendering of fat and other slaughter house byproducts with different methods produce product of various industrial, technical (grease, animal feed, soap, candles, biodiesel, and as a feed stock) and edible uses. Edible fat recovered from

processing of slaughter house byproducts will not only improve the economics of abattoir industry, even will help to provide fat of superior quality for culinary purposes at lower price.

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The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Materials, Statistical analysis used, Results and Conclusions. Below the abstract should provide 3 to 10 keywords.

## Introduction

State the background of the study and purpose of the study and summarize the rationale for the study or observation.

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Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

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Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, What this study adds to the available evidence, effects on patient care and health policy, possible mechanisms)? Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other

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## References

List references in alphabetical order. Each listed reference should be cited in text (not in alphabetic order), and each text citation should be listed in the References section. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines ([http://www.nlm.nih.gov/bsd/uniform\\_requirements.html](http://www.nlm.nih.gov/bsd/uniform_requirements.html)) for more examples.

### Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. *J Oral Pathol Med* 2006; 35: 540-7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. *Acta Odontol Scand* 2003; 61: 347-55.

### Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone iodine antiseptics. State of the art. *Dermatology* 1997; 195 Suppl 2: 3-9.

### Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. *J Periodontol* 2000; 71: 1792-801.

### Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. *Dent Mater* 2006.

### Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

### Chapter in book

[7] Nauntofte B, Tenovou J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O,

Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. p. 7-27.

### No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

### Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. [www.statistics.gov.uk/downloads/theme\\_health/HSQ20.pdf](http://www.statistics.gov.uk/downloads/theme_health/HSQ20.pdf) (accessed Jan 24, 2005): 7-18.

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