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Vol. 38, No. 12

DECEMBER, 1961

THE INDIAN VETERINARY JOURNAL ^{H85}

(The Journal of the Indian Veterinary Association)

*A Monthly Record of
Veterinary Science*



(ESTD. 1924)

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Vol. 38

December, 1961

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THE INDIAN VETERINARY JOURNAL

[THE JOURNAL OF THE INDIAN VETERINARY ASSOCIATION]

PUBLISHED MONTHLY



A Monthly Record of Veterinary Science
Devoted to the cause of the
Veterinary Profession



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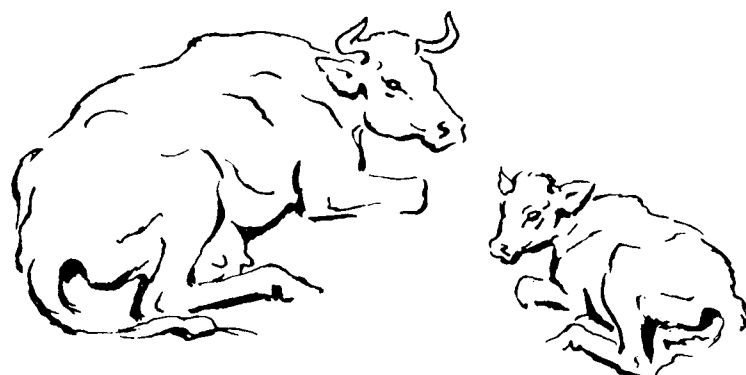


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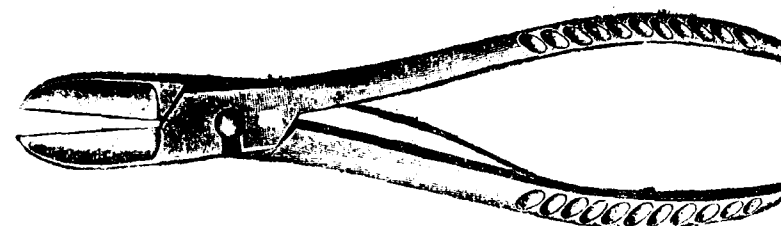
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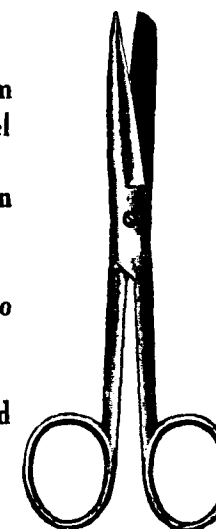


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THE Indian Veterinary Journal

(The Journal of the Indian Veterinary Association)

Vol. 38

DECEMBER, 1961

No. 12

We Wish Our Readers
A Merry Christmas!

Editorial

THE I. V. R. I. UNDER A CLOUD - II

India hangs her head in shame before the scientific world, because of a gross piece of professional misconduct perpetrated by the Director and three of his staff of the Indian Veterinary Research Institute, Mukteswar. We have been withholding our comments till now with a view to get an authoritative report on the matter. But that report is not forthcoming. In the meanwhile we have been pestered with letters from all over India demanding "the pound of flesh" from the guilty. That only gives us an indication of the righteous wrath of the entire profession in India. It is clear therefore that such erring men are only rare exceptions, who do not have anything in common with the bulk of the profession in India. They have earned nothing but contempt at the hands of the profession.

Let the story unfold itself in all its horror. The year 1961 opened for our esteemed contemporary *Journal of Infectious Diseases* (U.S.A.) with an article on "Studies on Toxoplasmosis" by Mr. P. G. Pande, M.Sc., M.R.C.V.S., the Director of the I. V. R. I., Mr. P. C. Sekariah, B.V.Sc., Lecturer in Bacteriology at the I.V.R.I., and Mr. P. K. Ramachandran, B.Sc., B.V.Sc., M.R.C.V.S., Assistant Research Officer at the above Institute. It was duly published in the January-February issue of 1961. And in its May-June 1961 issue the following apology appeared :-

AN APOLOGY

We have learned that at least five of the six figures in the paper by P. G. Pande, P. C. Sekariah and P. K. Ramachandran entitled 'Studies on toxoplasmosis. I. Histological demonstration of pseudocysts in the brain of hill cattle, together with a note on the isolation of *Toxoplasma gondii* from a Himalayan flying squirrel, PATAURISTA INORNATUS GEOFFREY, a new natural host, which appeared in the January-February 1961 number of this

A Memoir

COL. SIR ARTHUR OLVER,

C.B., C.M.G., F.R.C.V.S., F.R.S.E., F.N.I.

We regret to record the sad demise of Col. Sir Arthur Olver, who was the first Animal Husbandry Commissioner with the Government of India, from 1930 to 1938. He died in England on August 15th, 1961.

We do not hesitate to claim him as the Father of the Animal Husbandry work in India of to-day. When the Indian Council of Agricultural Research came into existence as a result of the recommendations of Lord Linlithgow Commission, it was to have two Expert Advisers to help the Council—one on the Agricultural side and another on the Animal Husbandry side. Sir Bryce Burt was immediately appointed as the Agricultural Commissioner; but the post of the Animal Husbandry Commissioner was widely advertised and it was the good fortune of India that a person of such varied experience, of such deep knowledge of animals both in health and in disease, of such organising capacity, of such breadth of vision and large heartedness, of such amiable qualities and pleasing manners, as Sir Arthur Olver, should have been selected for the post.

Writing in the *Veterinary Record* of June 4th, 1938, a much valued correspondent, drew the following sombre picture of the then existing state of affairs in India. "The fortunes of the Civil Veterinary Department were at a very low ebb, for they had been without a Veterinary representative with the Central Government for the previous 18 years. The arrangements in the different provinces for livestock improvement work varied considerably, in most cases consisting of an understaffed Veterinary Department restricted in its efforts to the cure and prevention of disease, while other activities connected with the maintenance of animal health and development of animal husbandry were provided for separately and often inadequately".

For the first time in India a unified control of both Veterinary and Animal Husbandry activities had to be programmed and pursued. It was an uncharted sea with no guidance of any kind to help. There were no 'facts and figures' worth the name about the livestock and their industry in this country. Each State followed its own policy and programme not fully aware of the potentialities of the livestock industry of this great country. It was left to Sir Arthur Olver to hold up the mirror to the people and the Government of the day by cataloguing some of the breeds of cattle in India and unfolding the

latent milking qualities of great promise in some of them. Miscellaneous Bulletin No. 17 of the I.C.A.R. written by Sir A. Olver will ever remain a great contribution which set the pattern and the pace for subsequent publications of similar nature. His insistence on "The necessity for authoritative definition of breed characteristics and unchanging control of breeding policy in India" had laid the foundation for Pedigree Registration and Production Records which were introduced in later years. He was mainly responsible for the introduction of the institution of Field Investigation staff in every State and the All-India Cattle Show. His interest in the development of sheep and goats and poultry was in no way less. In fact, his pattern of work has persisted till to-day except for the addition of the key Village Scheme. That pattern has stood the test of time and has brought nothing but laurels to the Animal Husbandry workers in India. It was again a stroke of good fortune to have had a person of the eminence of Sir Frank Ware to succeed him. He kept up the tempo and excellence of the Animal Husbandry work so ably started by his predecessor. Between them they established beyond doubt that Veterinarians make the best animal husbandry experts.

One other item of importance which stands to the credit of Sir Arthur Olver is that he presided over the Seventh All-India Veterinary Conference at Bangalore in December 1930. It was at a time when such Conferences were not much to the liking of the powers-that-be and yet he readily acceded to our request. His masterly address was a model of circumspection and proper guidance. Again he was probably the first Veterinarian to preside over the Indian Science Congress (Section of Veterinary Research) at its session in Calcutta in 1938.

Col. Sir Arthur Olver is dead; but he will continue to live in the hearts of all Animal Husbandry workers in India. We pay our humble homage to the memory of that great man and offer our heartfelt condolences to the members of the bereaved family.

Hallo !

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journal (Vol. 108, No. 1, pp. 68-74) were taken from the previously published works of other authors. The sources of these illustrations are:

Figures 4 and 5 - Frenkel, J. K. 1956, Ann NY Acad Sci. 64: 215-251.

Figures 2, 3 and 6; - Lainson, R. 1958, Trans Roy Soc Trop Med Hyg. 52: 396-407

We offer our sincerest apologies to Dr. Frenkel, to Dr. Lainson, and to the readers of our Journal for our unwitting participation in this regrettable incident.

THE EDITORIAL BOARD.

As if this one outrage on a decent scientific Journal was not enough, another was committed on another Journal of equal eminence, the victim this time being *Science* (U.S.A.) which published an article "Toxoplasma from the eggs of the domestic fowl (*Gallus gallus*)" from the pen of Mr. P. G. Pande; Mr. R. R. Shukla and Mr. P. C. Sekariah. The combination in authorship this time, as could be seen, is slightly altered. Mr. R. R. Shukla, B.Sc., B.V.Sc., M.V.Sc., is an Assistant Research Officer at the I.V.R.I. Mukteswar. We find the following in *Science* dated September 29, 1961:

AN UNFORTUNATE EVENT

We have had our attention drawn to several discrepancies in a paper by Pande *et al.* which was recently published in *Science* under the title "Toxoplasma from the eggs of the domestic fowl (*Gallus gallus*)."

The discrepancies concern the figures used to illustrate the paper. Figures 1 and 2 represent the same object, although they are described as picturing different forms of *Toxoplasma gondii* from different sources. A point-by-point comparison of the two figures shows beyond doubt that Fig. 1 is merely an enlargement of a part of Fig. 2 and that it is tilted at a slight angle.

The relevant part of the caption for Fig. 1 reads: "Cyst stages of *Toxoplasma gondii* in the impression smear of chorioallantoic membrane" that for Fig. 2 reads: "Pseudocyst of *Toxoplasma* in the ovary of white Leghorn hen". In addition, the "ghosts" of red blood cells in the background of these figures, professedly of avian origin, appear non nucleated, and therefore mammalian.

Figure 3 in the same paper, which purports to be an original photograph, is a slightly enlarged copy of Fig. 1 in an earlier paper by Frenkel, which was entitled, "Pathogenesis of toxoplasmosis and of infections with organisms resembling *Toxoplasma*." Frenkel's caption to his Fig. 1 reads: "*Toxoplasma*, fresh preparation from peritoneal exudate of mouse, showing organism free and within macrophage. Red blood corpuscles, some of which are crenated, provide a comparison for size. Phase-contrast microscope. Times 1000." The caption for Fig. 3 in the paper by Pande *et al.* reads: "Extra-cellular forms in the impression smear of peritoneal exudate of mice. Note the crenated erythrocytes (phase-contrast x 1500). May-Grunwald-Giemsa."

We apologize to our readers for this unfortunate event, thus following the precedent set by the Editorial Board of the Journal of Infectious Diseases in a similar case in which at least five of the six figures used to document an article "were taken from the previously published work of other authors."

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Editorial Board, *Science*, Washington, D.C.

We have no words to express our immeasurable sorrow on behalf of the entire profession in India. First and foremost, we are sorry that the name of such an eminent Institute as the I. V. R. I., hallowed by the memory of great men of Science, both foreign and Indian, who gave their all to build up the reputation of that remote centre of Science, nestling amongst the snow-clad peaks of the great Himalayas, should have been let down so badly. Secondly we are pained that two of the leading scientific Journals in America should have been put to the necessity of tendering an apology, because of this grave professional misconduct of some Indian workers. We can only express our sorrow to our esteemed contemporaries and to the original authors who have been wronged so grievously.

We appeal to the profession, outside India in particular, not to view this unfortunate incident too seriously. As we said in our opening paragraph, this is a despicable act of a small band of misguided men however high placed they might be and does not in the least reflect the moral-fibre of the bulk of the profession in India. Such men are found at all levels of society and under all climes. They stand self condemned with this stigma of plagiarism ever sticking on to them.

Now what action are the Government going to take against these offenders? There are other agencies also who have to move in this matter. The Interim Indian Veterinary Council, though not yet a statutory body must tender its advice both to the Central Government and to the State Governments concerned. The Universities of Agra and Madras and the Council of the Royal College of Veterinary Surgeons have to take cognisance of this serious professional misconduct. We expect these bodies to move in the matter.

We need hardly say that this is a lesson which ought not to be lost on the profession. Only in February 1961, we wrote under *News and Views* the following note which we feel would be an appropriate ending to this sorrowful editorial:—

"A righteous indignation:—The Soviet Prime Minister, Mr. Khrushchev at a discussion on agriculture in his own country, burst out "It is a crime to fake crop figures. Such people should be brought to trial whoever they are." What he said is true of all scientific data in all countries and at all times. It is not merely criminal but something sub-human or demonish to fake up scientific data. It must be exposed wherever found and the person or persons concerned should be mercilessly dealt with."

The I. V. R. I. is under a cloud no doubt. Let us hope it is only a passing cloud. It will drift away soon, not being in tune either with the sanctified atmosphere of the great Himalayas or with the dedicated atmosphere of that renowned scientific enclave there.

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EDITOR, *I. V. J.*

General Articles

GENETICS AND DISEASE RESISTANCE IN ANIMALS A REVIEW¹

BY

B. PANDA

*Department of Poultry Husbandry, University of Maryland,
College Park, Maryland, U.S.A.*

Genetics as a tool for eliminating diseases and pathological abnormalities in animals holds some promise to mankind. It bears an important role in, or relation to, pathology. Some persons believe that heredity has a minor role in pathology. Such reasoning is not in accordance with known facts. Some genetic influence operates in all of the biological phenomena of life. Because of the very nature of pathology, by far the greatest proportion of specimens subjected to diagnosis are abnormal, or defective in one or more respects. A few of the abnormalities or defects are genetic in origin. Many more are the direct result of a lack of genetic resistance to a specific pathogen. Studies with experimental plants and animals have clearly demonstrated that there is an inherited resistance or susceptibility to disease. It may be advanced on a factual basis that absence of a disease does not always imply innate immunity. Nevertheless, there is enough evidence accumulated in both plants and animals to demonstrate the importance of heredity in relation to disease. In truth, acquired and natural immunity are genetic phenomena (Waters, 1956).

When an animal shows a positive reaction to a virus or bacterial attack and recovers, it means that this animal has succeeded in building up of sufficient resistance by its ability to form antibodies to overcome the influence of the invasion. The ability of the host to combat disease through the formation of antibodies has genetic implications. Without the ability to form effective antibodies, any form of vaccination or immunization of the host would be a useless procedure.

The modern concept of disease recognizes the interdependence of three variables: (1) the inherited resistance of the host to disease and some specific abnormalities; (2) the inherent variations of disease producing agents or pathogens, giving rise to strains different in virulence; (3) the environment which may materially influence the interaction of the host and the pathogen.

¹ Scientific Article No. 943; Contribution No. 3304 of Maryland Agricultural Experiment Station (Dept. of Poultry Husbandry).

THE
INDIAN VETERINARY JOURNAL

A New Year Resolve

The *Journal* is suffering from lack of a permanent abode. The management has asked the Government of Madras and the Corporation of Madras for free grant of a piece of land to put up a building. It is likely they may consider our request favourably. But we must be prepared with the necessary finance to start work immediately. It is the sacred duty of every Veterinarian in India to send in his contribution to the Reserve Fund immediately. Let us put our shoulders to the wheel and raise this monument which is bound to attract, in years to come, members of our profession both from within and without India. Let every one of us be worthy of this noble profession. Let it not be said that we as a profession have failed her, in her hour of need. Come then, come quick, with your contribution and let us house this national *Journal* of ours in an abode of its own, before the end of 1962. Let this be our New Year resolve. Let us take a pledge to achieve this object before the new year is out.

We intend publishing a consolidated list of all contributors as a supplement to the *I. V. J.* in suitable time or as a special number with photos of all those who pay Rs. 100/- and above. May God help us in our attempt!

T. Vinayaka Mudaliar

President, Indian Veterinary Association
and
Editor, Indian Veterinary Journal.

MADRAS, }
10-11-61.

Rules for the Award of
Rao Bahadur R. Swaminatha Iyer

Memorial Prize

(To Come into force from January 1962)

1. The award shall be called "Dr. R. Swaminatha Iyer Memorial Medal".
2. The award shall be made for the best clinical article appearing in the Indian Veterinary Journal in each year.
3. The cost of the award shall be met from the interest accruing on Rao Bahadur R. Swaminatha Iyer Memorial Fund.
4. Only those with a basic Veterinary qualification shall be eligible for the award.
5. Publications of clinical value, preferably of original nature, shall be eligible for consideration of the award.
6. In the case of joint authorship, the award shall be made by dividing the amount equally amongst the authors.
7. In the event of the award not materialising in any year for any reason the value of the award shall be added to the corpus of the fund.
8. The Managing Council of the Indian Veterinary Association shall appoint a Committee of three Judges - a Chairman and two Members - in December each year to determine the award. The General Secretary of the Association will act as Secretary to the Committee but he will have no voting power.
9. The majority decision of the Committee shall be final. In case all the three Judges differ, the final verdict will lie with the President of the Indian Veterinary Association.
10. The award will be announced in the April issue of the Indian Veterinary Journal each year.

T. Vinayaka Mudaliar,
President, I. V. A.

It is necessary to distinguish between pathological abnormalities that are dependent alone on genetic differences in the host and those caused by genetic interactions of both host and pathogen.

A student of veterinary medicine should recognize that a wide knowledge of biological phenomena is necessary to a more accurate diagnosis on the animals with which he is working. The appearance of a disease condition in one animal should lead to a closer inspection of the flock or the herd as a whole. A lack of knowledge of either the epidemiology or cause of disease may result in widespread dissemination not only through infection or malnutrition but also by defective germ plasm.

Both in human and in animal pathology, the student has been too prone to consider the individual host per se without due consideration of the genetic heritage of either the host or the pathogen, and the interrelationship of the environment to both the host and pathogen. There are numerous cases where pathological conditions exist which are directly caused by specific genes. The ability of the diagnostician to recognize and properly classify hereditary diseases and defects, will add much to genetic knowledge and greatly assist in ultimate eradication of heretofore incurable conditions (Waters and Bywaters, 1959).

Inherited Resistance to Disease

As early as the eighteenth century, plant breeders recognized that certain varieties of wheat were more resistant to disease than others. Subsequently, breeders found it was possible with selection to establish varieties of wheat more or less resistant to specific diseases. Biffen (1905) demonstrated the resistance in certain varieties of wheat to mycotic stem rust and this laid the foundation for important advances in the knowledge of heredity in disease. Since that time valuable strains of corn, wheat, oats, cotton and other plants have been so bred that they can resist the ravages of specific diseases. It is probably safe to say that had the plant breeders not developed varieties of wheat resistant to stem rust, there would be in North America today neither a wheat surplus nor a cheap bread.

Progress in the same direction with animals is limited because of practical and intrinsic difficulties. The advantages offered by plants, such as self fertilization, shorter germination time, and the availability of large numbers with limited facilities, are not at the disposal of workers in the field of animal research. However, in recent years numerous references involving degrees of genetic resistance to disease in animals have appeared in literature.

Gowen (1937) states, "Examples of host resistance are known for the whole range of pathogenic agents, bacteria, viruses, fungi,

protozoa, helminths and chemical poisons. In fact, so far as I am aware, no investigator who has adequately sought inherited host differences in disease response has failed to find them". Sabin (1952) demonstrated the complete resistance of PRI (Princeton Rockefeller Institute) mice to 17 D strain yellow fever virus, and this provides an example of precise genetic response in host-pathogen relationship. He showed that PRI albino mice may show 100% resistance to yellow fever, whereas, Swiss mice are 100% susceptible. Crosses between the PRI albino mice and Swiss mice suggest that resistance to 17D strain of yellow fever virus is dependent upon a single autosomal dominant factor for expression.

Scott (1932) was able in six years of selective breeding to reduce mortality from mouse typhoid (caused by *Salmonella typhimurium*) from 82 to 24%. Similar genetic differences among strains of house mice have been demonstrated in the ability to resist various infectious diseases. They include piliformis disease (caused by *Bacillus piliformis*), infection by *Salmonella enteritidis* and such virus diseases as louping ill, St. Louis encephalitis, and pseudo rabies (Hutt, 1958).

A recent report by Bang and Warwick (1960) shows that the apparent genetic differences in susceptibility of mice was reflected in the resistance of cells in the tissue cultures made from those mice. Cultures obtained from resistant strains of mice showed no destruction of macrophages by mouse hepatitis virus, whereas cultures made from susceptible strains of mice yielded macrophages which are destroyed by the same virus. Tests of hybrid resulting from crosses between resistant and susceptible strains indicate that susceptibility is inherited and that genetic segregation of susceptibility and resistance occurs in the F₂ and back cross generations. This has been shown in both cases, i. e., in the mice themselves and in cultures obtained from the different genetic cross.

Genetic resistance to infectious diseases has also been demonstrated in rats, guinea pigs, and rabbits. The last two of these species are susceptible to the bacillus causing tuberculosis in man, but in both, some strains have been shown to be more resistant than others. Wright (1921) has shown that long continued inbreeding brought about a fixation of genetic factors affecting growth, body size, fertility, and resistance to tuberculosis. Inbred strains of rats were found to differ greatly in susceptibility to the large tapeworm, *Taenia taeniaformis*, and hence to the tumour caused by cysticerci of that parasite (Hutt 1958).

Investigation by Waters *et al.*, (1958, at the U. S. Regional Poultry Research Laboratory, East Lansing, provides an example of an apparent autosomal dominant single gene pair capable of providing complete

resistance to induced erythroblastic leucosis in chickens. Lambert and Knox (1932) demonstrated that selective breeding decreased perceptibly the mortality from fowl typhoid. Four generations of selection for resistance to a standard dose of fowl typhoid bacteria (*S. gallinarum*) resulted in a decided decrease in mortality in selected population. Innate resistance of domestic fowl to *S. pullorum* has been demonstrated by Roberts and Card (1926, 1935) and by Roberts *et al.*, (1939). The facts presented by these authors suggest that the difference between resistant and susceptible chickens is due to an inherited differential in the number of lymphocytes at the time of greatest susceptibility to pullorum disease, which is immediately after hatching.

Experimental confirmation of the fact that Leghorns are more resistant to disease than heavy breeds was obtained by Hutt and Scholes (1941). Higher body temperature (Hutt 1949), and higher lymphocytes at the time of hatching (Severns *et al.*, 1944), have been shown as the causes for greater resistance of White Leghorns.

Waters and Prickett (1946) and Waters (1954a, 1954b) demonstrated that inbreeding and selection were successful in establishing six inbred lines of chickens showing various degrees of resistance and susceptibility to visceral lymphomatosis. In these experiments none of the chickens was inoculated, and exposure to infection was dependent entirely on natural occurring visceral lymphomatosis. Hutt *et al.*, (1945) and Hutt and Cole (1953) established strains of chickens resistant and susceptible to fowl leucosis, and here also exposure to infection was dependent on natural transmission. These results show that it is entirely possible by selective breeding to develop stock so resistant to leucosis that mortality from that disease under conditions of fairly severe exposure can be reduced to almost negligible level. Cole (1950) has shown that susceptibility to blue comb is genetically determined, and this fact has since been confirmed by Montrie *et al.*, (1955). Good Rosenberg *et al.*, (1954), who demonstrated clearly the feasibility of developing stock highly resistant to that protozoan parasite. We have observed in our recent coccidiosis work at the University of Maryland that there is much variation in individual response to body growth. The birds used were from one breed, from same hatch, and kept under the same environment and nutrition. Each bird was given a dose of 100,000 infective oocysts of *E. acervulina* and 10,000 infective oocysts of *E. necatrix*. We have recorded wide variation in body growth ranging from 900 gm. to 2200 gm. (Panda and Combs, 1961). Such a wide variation in weight may be due to genetical factor which makes one bird more susceptible than the other. Ackert *et al.*, (1935) found that heavy breeds such as Rhode Island Reds and Plymouth Rocks were more resistant to ascaridiosis than White Leghorns. Confirmatory

evidence was reported by Morgan and Wilson (1939), who found that among different breeds maintained at a laying test under fairly uniform conditions the cecal worm, *Heterikis gallinae* was more numerous in White Leghorns than in Rhode Island Reds and White Wayandottes.

Genetic influence on resistance and susceptibility to infection with *Aspergillus fumigatus* has been reported by Brooksband and Austwick (1955). The role of the genes in determining such resistance and susceptibility has been shown by conclusive evidence, reported by Goodwin *et al.*, (1956), that the F1 generations from crosses between strains are more resistant to respiratory diseases than the parent strains that are crossed. Such crosses are already popular in the U.S.A., because their hybrid vigor often results in better egg production or better growth than can be had with pure strains.

Waters and Fontes (1960) demonstrated the genetic variation among families of White Leghorns, representing 5 different and unrelated inbred lines when they were inoculated intracerebrally at one day of age with Rous sarcoma virus. Some of them showed complete resistance while others were completely susceptible.

In case of large animals, there are also interesting results showing the genetical resistance to many diseases. Cameron *et al.*, (1942) developed a resistant strain of swine to the infection of *Brucella suis*. Because of these and similar results, Cameron (1946) recommended that "Brucellosis in swine can be controlled under average field conditions by the use of lines that are genetically resistant to *Brucella suis*". Similar genetic resistance to swine erysipelas, hog cholera and dysentery has been reported (Hutt, 1958).

An interesting finding by Dungal *et al.* and Palsson (cited by Hutt, 1958) about the possibility of developing resistant sheep to infectious pulmonary adenomatosis in Iceland has been encouraging. Stewart *et al.* (1937) reported some resistant strain of sheep to *Ostertagia circumcincta*. Further evidence of genetic differences in resistance to nematode worms was found by Gregory *et al.*, (1940) and by Whitlock (1955), who determined the severity of infection with *trichostrongyle* worms of any kind in lambs of different sire families. Over a nine year period in which Warwick *et al.*, (1949) compared the progeny of rams and ewes resistant to the worm, *Haemonchus contortus* with unselected control, the selected stock proved significantly better able to withstand infestations than the controls. However, resistant rams mated with unselected ewes did not produce resistant lambs, showing that resistance is polygenic, and hence that, to be effective, selection must be exerted in parent stock of both sexes. Selection for resistance to the same worm was apparently somewhat more effective in goats than in sheep.

Following selection, some of the resistant sheep and goats showed much better performances.

I have treated few hundreds of cattle, sheep and goats for these stomach worms with phenothiazine, which has been used as a standard anthelmintic drug against these trichostrongyle worms. In many instances, the owners had returned to the veterinary hospital with the same complaint, which proves that the drug does not kill all the worms but only reduces them to a number that the animal can tolerate for some period. It is most probable that phenothiazine acts as an instrument of selection whereby the most susceptible worms are killed, leaving the resistant ones to flourish and to reproduce. If resistant strains of worms should eventually prove better able to withstand increasing doses of phenothiazine than their host, one solution might be to find a new drug. Such instances are not rare. Resistant strains of bacteria showing resistance to such antibiotics as streptomycin, aureomycin, terramycin, penicillin, and to some chemicals, have been demonstrated. Similar evidences have also been reported about the resistant strains of coccidia which have not responded to the treatment of many coccidiostats. Therefore, both measures combined *i.e.*, developing resistant breeds and treatment might be more effective than either alone.

There are quite a few number of reports about genetic resistance to diseases in cattle. Let us consider the disease resistance capacity of Indian cattle. The cattle of India (*Bos indicus*) have been in service of mankind for many thousands of years. Throughout their long history they have endured famine, insect pests, disease and the extremely hot to extremely cold climates of India and other countries. Nature has fortified them with the ability to preserve and to perpetuate their life, where other types have failed. Since the very early days of history, certain superior qualities of the cattle of India have kept them in wide demand. In all their expansion, these cattle have crossed freely with the cattle in the lands into which they were introduced, and they improved the cattle of their adopted countries. The famous American Brahman breed, which is the result of amalgamation of several *Bos indicus* breeds (breeds from India such as Nellore, Krishna Valley, Gir, and Gujarati) occupies an unprecedented position and has found a welcome home in the Southern States of the U. S. A. With its many other attributes, the Brahman has strong genetic resistance to many diseases, *e. g.*, pink eye, tick fever, anaplasmosis and lumpy jaw. The complete absence of cancer eye is due in part to the dark pigmented skin. This breed also has the benefit of natural protection against diseases transmitted by such insects (Hutt, 1958).

The Indian breeds, in addition to their many other virtues, are remarkably resistant to tuberculosis. The literature on that subject which indicates that tuberculosis in cattle of Zebu type in India is completely uncommon, has been reviewed by Carmichael (cited by Hutt, 1958).

Gaiger and Davies (1949) have stated that Indian cattle and Algerian sheep are fairly resistant to Anthrax, a dreadful disease which takes heavy tolls among some of the European breeds of cattle.

There are many interesting reports showing how genetics play a greater role in producing susceptible and resistant families of cattle to mastitis, a disease quite common in some of the dairy herds in U.S.A. The work done in this field by Zieger, White and Ibsen, Ward, Ligates and Grinnels, Murphy *et al.* and Reid has been well presented by Hutt (1958).

Foot and mouth disease, another dreadful disease for European breeds of cattle does not produce much harmful effects among the Indian cattle. This is perhaps due to inherited resistance among the Indian cattle. We generally notice the difference in genetic resistance to rinderpest among the cattle in hill areas and in plains. Cattle in the hills have been observed to be more susceptible to rinderpest than cattle in the plains. This difference might be due to the fact that cattle in the plains have been more exposed to this disease due to free mixing and easy communication, whereas cattle in the hills are much more confined to their areas without being much exposed to this disease. This might explain the difference in severity of rinderpest outbreak we have observed among the cattle population in the former state areas and the coastal districts of Orissa. The author believes that the rinderpest control scheme may help in producing resistant progeny which will be able to withstand the onslaught of the future rinderpest outbreaks in the same manner as the Indian cattle have proved their resistance to foot and mouth disease.

A few instances about genetic resistance to paratuberculosis in cattle, encephalomyelitis and mallebers in horses have been cited by Hutt (1958).

Exhaustive studies on cancer in mice show definitely that the hereditary make-up of the mouse influences the degree of resistance to nearly all types of tumors. Indeed, under controlled conditions, it has been possible to demonstrate that single gene differences are responsible for the presence or absence of tumors. There is evidence that genes expressing susceptibility to mouse tumors are influenced by other known genes (Waters, 1960).

Application of Genetics in Controlling Non-infectious Pathological Conditions

There are many examples of the inheritance of morphological and non-infectious pathological conditions in the animal kingdom. When such defects or abnormalities are found in domestic animals, it usually results in an economic loss. Many of these disorders can be classified as hereditary diseases in that the genes of the host animal alone, involving either one or few pairs of genes, are responsible for deviations from normal. Many of these genetic defects and abnormalities of animals could be corrected or eliminated through proper planning in breeding.

Remarkable deviations from normal can arise from the mutation of a single gene. Waters and Bywaters (1943) reported on a "wingless" mutation in chickens that is expressed as single autosomal recessive; it is lethal in the homozygous condition and affects nearly all parts of the body. Other single gene mutations occur, causing drastic modifications in structure such as the "talpid" lethal reported by Cole (1942); the "creeper" lethal, Landauer and Dunn (1930); the "cornish" lethal, Landauer (1935).

There are many other lethal gene mutations of poultry that cause pathological conditions, some of which are dominant and others recessive in expression. Presumably additional gene mutations having quantitative and qualitative expressions of economic importance also occur. Many other genetical defects have been reported by Lerner (1944), Landauer (1951), Hutt (1949, 1958), and Jull (1952).

Fisher (1960) reported that crooked tail is an inherited defect in swine. He observed this condition in the pig stocks of the Institute of Animal Husbandry, Bogor, Indonesia and stated that the anomaly seems to be due to action of a dominant gene rather than to a recessive. Aamdal and Nes (1958) reported that the persistent frenulum praeputii as a cause of mating importance in boars. They have suggested that the defect may be inherited. Johnson (1940) reported a remarkable abnormality "legless" condition in swine.

Crew (1923) reported a pathological defect in Dexter cattle termed achondroplasia, which results in extremely short legs, together with a generalised syndrome of morphological disturbances throughout the body. Wriedt and Mohr (cited by Waters, 1960) reported the occurrence of achondroplasia in cattle that is less extreme in its manifestations and is recessive in nature. This defect has also been reported in dogs, pigeons, chickens, and many other animals, including man (Waters, 1958).

The occurrence of muscular hypertrophy in South Devan cattle has been reported as a hereditary defect (Mackeller, 1960). A hereditary lethal defect to calves "atresia ileii" has been reported by Nihleen and Eriksson (1960) from Norway. They concluded that the defect in calves is inherited as an autosomal recessive. I have operated on many calves of one to three days old having atresia anii (imperforated anus). These calves were always brought to the veterinary hospital (Khurda, Orissa) from a few particular herds of cattle every year (1953-1957).

Lush *et al.* (1930) reported the condition in goats wherein there is a failure of one or both testes to descend into the scrotum. Hardley and Warwick (1927), McKenzie (1931), and McPhee and Buckley (1934) reported similar instances of cryptorchidism in livestock. This defect is inherited as recessive, and is sex limited in that it is only manifested in males.

Numerous other defects in the larger animals have a genetic basis. Likewise many lethal genes cause death at, or prior to, birth in mammals, or at the hatching time of birds. Occurrence of lethals in domestic animals causes appreciable economic loss. The presence of lethals or semilethals in man, of which there is an appreciable number, is the cause for much sorrow and anguish as well as great financial sacrifice. Some of the more common disorders have been described by Eaton (1937), McPhee (1942), Gates (1946), Gowen (1948, 1951), and Sorby (1953).

Changes in Virulence of Pathogenic Organism

To obtain an understanding of genetics and its relationship to pathology, we cannot confine our studies to the complex animal alone. It is necessary also to investigate the organisms responsible for diseases. Genetic control usually involves not only a study of the host animal but also of the pathogenic organisms which parasitize the host.

It is matter of common knowledge that pathogenic organisms vary considerably in virulence, but very little is known about the cause of their variations. They may be due to the effects of a changing environment or to some inherent changes in the organism itself, or to both. Genetic studies in bacteria are in the infant stage. Genetic change is suggested in that they mutate, hybridize, segregate, and recombine. New mutant strains of bacteria have been established (Gale, 1952).

Bacterial mutations that show resistance to such antibiotics as streptomycin, aureomycin, terramycin and penicillin, have been demonstrated. Some of the resistant strains of coccidia have also been recorded. The fact that such changes occur introduces another

complexity into the relation of genetics to disease. This resistance to specific antibiotic or specific drug is of great practical importance in human and animal therapy. Of greater significance is the fact that such changes in the pathogen present diverse immunological relations in the host.

The host animal, then, be it human, cattle, swine, sheep, goat, mouse, or chicken, responds according to its genetic capacity. The lesser forms of life, bacteria, viruses, or more complex parasites will invade and affect the host, according to their genetic capabilities. Jacob and Wollman (1961) have published an interesting report explaining the mechanism of both heredity and infection. They have shown that when a virus infects a bacterium, the genes of the virus sometimes act as genes of their host. Thus, we must recognize two independent variables responsible for disease, the host and the pathogen.

Genetics and Environment in Relation to Disease

Another important variable exists — environment, which may influence materially the interaction of the host and pathogen. Any discussion of animal diseases must, therefore, consider not only the interrelationship of host and pathogen but also the environment that surrounds and influences all living matter. Questions as to the relative importance of heredity and environment are age old. Today's students trained in biological sciences, recognize heredity and environment as separate components, but often so closely interrelated that they are often difficult or impossible to separate.

When the maternal animal is fertilized by a male cell, it has received a quota of inheritance from its dam and a quota from its sire. Nothing genetic will be added to this animal as long as it may live. As soon as this animal is conceived, it becomes subject to (and influenced by) the surrounding environment established in the body of the dam. After birth the animal will be bombarded by the conditions around it. Animals are conceived, then, with certain genetic potential abilities. Environment can suppress or bring out the abilities if present. But environment will never develop abilities that were not inherent in the animal (Waters, 1956).

The environment appears to have less influence on certain genetic characteristics than on others. For example, a White Leghorn fowl of a single comb variety will develop a single comb regardless of environment conditions. However, the possibility of such a bird succumbing to fowl typhoid will depend not only on its innate resistance to the pathogen, but also on many environmental factors, affecting both the host and the pathogen.

Waters *et al.*, (1950) found that in certain inbred lines of White Leghorn chickens there were genetic differences in the mortality for the first 21 days after hatching. Modification in the diet fed during this period could markedly influence this mortality.

Hutt (1938) and Fox (1951) have shown that Leghorns can withstand high temperatures better than the heavy breeds can. Fox has given an interesting clue to the reason for Leghorn superiority in this respect. This, according to him, is due to higher water consumption by the Leghorns than by the heavy breeds under high temperature. His experiments suggest that the Leghorns may be genetically better endowed with the ability to cope with an extremely unfavourable environment.

Asmundson and Hinshaw (1938) have illustrated in turkeys how some abnormality in one environment might appear to be caused entirely by heredity, but in another to be induced solely by temperature or by some other extraneous factor. To test environmental influence, susceptible poults were divided into two groups. One group was kept at Davis, California (Temperature 92.5°F) and the other group at Tomales (temperature 74°F.), which is only two miles from the ocean. They recorded an incidence of pendulous crop of 67.2% among the poults kept at Davis, whereas there was no incidence of the same condition in the other group kept at Tomales. These results show clearly that in the cooler atmosphere, the genetic susceptibility to pendulous crop was never expressed.

Black *et al.*, (1952) showed that when they used infra-red light during brooding there was no occurrence of curled toe among their stock but they had just the opposite result when they used outside fowls. Occurrence of curled toe among the outside stock might be due to the fact that genes involved in bringing out this condition among the outside stock could not develop the characteristic unless they had the proper environment.

Generally, a chicken is resistant to anthrax and shows no reaction to anthrax invasion. However, this resistant animal may show a reaction if environmental conditions surrounding it are markedly altered and may be killed by such an invasion if body temperature is reduced experimentally (Waters, 1956).

There are also genetic differences in ability to get along on deficient diets. White Leghorns have been shown to be more resistant to deficiency of thiamine, riboflavin, vitamin E, vitamin D, and manganese than heavy breeds like Rhode Island Reds, Plymouth Rocks and White Wayandottes (Hutt, 1958).

Similar instances showing genetic differences among large animals in feed utilization and ability to withstand heat have been reported. The American Brahman, like many other Indian cattle, can stand very poor grazing conditions and live on forage that would not sustain many other types of cattle. They prefer to graze out in the sun on the hottest day when European cattle would lounge under shady trees. Significant is the fact that Brahman hybrids will equal the gains made by pure bred European breeds on high concentrate rations and will surpass them on low concentrate rations. This characteristic has also been shown to be transmitted to the progeny (Florida Bull. No. 597, 1958).

Genetic variations in metabolism are also known in various molds and bacteria, such as neurospora and pseudomonas (Gale, 1952). In higher animals genetic defects of metabolism are more often concerned with blocks whereby the transformations of complex proteins, fats, and carbohydrates to the simple forms in which their constituents are utilized, is stopped at some critical points. Such an interruption prevents the next product being formed and leads to an accumulation of the immediately preceding substance. Conditions like phenylpyruvic oligophrenia, alcaptonuria and albinism, all of which arise due to hereditary defect in metabolizing amino acids, phenylalanine and tyrosine, have been reported in man. An abnormality in the metabolism of fats in man whereby sphingomyelin is accumulated in the body tissues produces Tay Sachs' disease known as amaurotic idiocy which is a simple recessive character and is usually lethal for the children before three years of age. Diabetics is another example of a genetically aberrant metabolism of carbohydrates. The defect is hereditary and is lethal to babies homozygous for the causative gene (Hutt, 1958).

A condition known as porphyria, which is characterized by the accumulation of porphyrin in the blood, its deposition in the bones, teeth, and other tissues, and its excretion in the urine, is a simple recessive defect of protein metabolism in cattle and swine. Excessive porphyrin in the blood makes the animal extremely sensitive to sunlight on areas of the skin not protected by hair; exposure to the sun causes blisters that eventually become deep ulcers and may leave bad scars (Hutt, 1958). Another interesting case of aberrant metabolism is found in Dalmatians. In most dogs allantoin, a product of uric acid metabolism, is the chief end product of purine metabolism. Dalmatians, however, excrete relatively high amounts of uric acid and apparently do not break any of it down to allantoin, although they do have the enzyme uricase (Hutt, 1958). This affords an excellent example of the way in which a simple recessive mutation can affect a physiological process.

From the few examples mentioned here, it seems clear that genetic differences in metabolic processes have much to do, not only with the viability and health of animals, but also with the profits and losses of every producer of livestock. Further, these discussions indicate that there are genetic factors of importance in all aspects of growth, development and aging, and in every manifestation of behavior of the organism both in health and in diseases. The attention of the scientists now must focus upon the precise interaction of genetic and environmental factors.

Conclusions

Majority of the animals, if not all, would respond to genetic selection for resistance to disease if emphasis were directed toward this method of control. Gowen's statement mentioned earlier in this article would justify this approach. In most instances, however, such a genetic approach would not be economically sound in view of the proven control method now practised. Despite the paucity of genetic studies on disease resistance in the large domestic animals, many genetic investigations involving small animals have contributed much to our knowledge of disease resistance. Further, many of the abnormalities and disorders of non-infectious nature in animals are gene directed. Many of these genetic defects and abnormalities of animals could be corrected or eliminated through proper planning in breeding. Therefore, the importance of genetics to Animal Husbandry of today is unquestioned. And as the demand increases for food to sustain exponentially increasing populations of man, its significance to Agriculture and Animal Husbandry will surely grow.

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REFERENCES

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| Aamdal, J. and Nes, N. (1958) | ... Nord. Vet. Med. 10 : 444-446. |
| Ackert, J. E., Eisenbrandt, L. L., Wilmoth, J. H., Glading, B., and Pratt, I. (1935) | ... J. Agr. Res. 50 : 607-624. |
| Asmundson, V. S., and Hinshaw, W. R., (1938) | ... Poultry Sci. 17 : 276-285. |
| Bang, F. B. and Warwick A., (1960) | ... Proc. National Acad. Sci. 48 (8) : 1065-1075. |
| Biffen, R. H. (1905) | ... J. Agr. Sci. Cambridge, 1 : 4. |
| Black, D. J. G. and Morris, T. R. (1952) | ... Nature, 170 : 167. |
| Brooksbank, N. H. and Austwick, P. K. C. (1955) | ... Brit. Vet. Jour. 111 : 64. |
| Cameron, H. S. (1946) | ... American J. Vet. Res. 7 : 21-26. |

- Cameron, H. S., Hughes, E. H., ... *J. Animal Sci.* 1:106-110.
and Gregory, P. W. (1942)
- Cole, R. K. (1950) ... *Poultry Sci.* 29: 398-404.
Cole, R. K. (1942) ... *J. Hered.* 33: 83.
Crew, F. A. E. (1923) ... *Proc. Roy. Soc. (London)* B95: 228-255.
Davies, G. O. (1949) ... Gaiger and Davies Veterinary Pathology and Bacteriology. Bailliere, Tindall & Cox. London W.C. 2.
- Eaton, O. N. (1937) ... *J. Heredity* 28 (9): 820-326.
Fisher, H. (1960) ... *Hemera Zoa.* 67: 33-37.
Fox, T. W. (1951) ... *Poultry Sci.* 30: 477-483.
Gale, E. F. (1952) ... The Chemical Activities of Bacteria. Academic Press, New York.
Gates, R. R. (1946) ... Human Genetics. Vol. 1 and 2. The Macmillan Co., New York.
Goodwin, K., Dickerson, G. E., Lamoreux, W. F., Schaaf, Kermit and Urban, W. D. (1956) ... *Poultry Sci.* 35: 916-924.
Gowen, J. W. (1951) ... Genetics and Disease Resistance. Genetics in the 20th century. Chap. 19, pp. 401-429. The Macmillan Co., New York.
- Gowen, J. W. (1948) ... *Am. Rev. Microbiol.* 2: 215-254.
Gowen, J. W. (1937) ... *J. Hered.* 28: 233-240.
Gregory, P. W. and Carroll, F. D. (1956) ... *J. Heredity.* 47: 107-111.
Hadley, F. B. and Warwick, B. L. (1927) ... *J. Amer. Vet. Med. Assoc.* 70: 492.
Hutt, F. B. (1958) ... Genetic Resistance to Disease in Domestic Animals. Comstock Publishing Assoc., Ithaca, New York.
Hutt, F. B. and Cole, R. K. (1953) ... *World's Poultry Sci. J.* 9: 7-13.
Hutt, F. B. (1949) ... Genetics of the Fowl. McGraw-Hill Book Co., Inc. New York.
Hutt, F. B., Cole, R. K. and Bruckner, J. H. (1945) ... *Poultry Sci.* 24: 564-571.
Hutt, F. B. and Scholes, J. C. (1941) ... *Poultry Sci.* 20: 342-352.
Hutt, F. B. (1938) ... *Poultry Sci.* 17: 454-462.
Jacob, F. and Wollman, E. L. (1961) ... *Scientific Amer.* (June) 93-107.
Johnson, L. E. (1940) ... *J. Heredity* 31: 239.
Jull, M. A. (1952) ... Poultry Breeding. 3rd Ed. John Wiley & Sons, Inc., New York.
Lambert, W. V. and Knox, C. W. (1932) ... Iowa Agr. Expt. Sta., Research Bull. 158: 261-295.
Landauer, W. (1935) ... *J. Genetics* 31: 287.
Landauer, W. and Dunn, L. C. (1930) ... *J. Genetics* 23: 397.
Lerner, I. M. (1944) ... *J. Heredity* 35: 219-224.
Lush, J. L., Jones, J. M. and Dameron, W. H. (1930) ... *Tex. Agr. Expt. Sta. Bull.* 407.
MacKeller, J. C. (1960) ... *Vet. Rec.* 72: 507-510.
McPhee, H. C. and Buckley, S. S. (1934) ... *J. Heredity.* 25: 295-304.
McKenzie, F. F. (1931) ... Missouri Agr. Expt. Sta. Bull. 800.
Morgan, D. O. and Wilson, J. E. (1939) ... *J. Helminth.* 17: 177.
Moultrie, F., Cottier, G. J. and King, D. F. (1955) ... *Poultry Sci.* 34: 458-461.

- Nihleen, B. and Eriksson, K. (1958) ... *Nord. Vet. Med.* 10: 113-127.
Panda, B. and Combs, G. F. (1961) ... Unpublished data.
Roberts, E. and Card, L. E. (1935) ... *Agr. Expt. Sta. Bull.* 419: 465-493.
Roberts, E., Severns, J. M. and Card, L. E. (1939) ... Proc. 7th. Worlds' Poultry Congr. P. 52.
Roberts, E. (1932) ... International Congress Proc. 6 (2): 169-170.
Roberts, E. and Card, L. E. (1926) ... *Poultry Sci.* 6: 18.
Rosenberg, M. M., Alicata, J. E. and Palafox, A. L. (1954) ... *Proc. Natl. Acad. Sci. U. S.* 38: 540-546.
Sabin, A. B. (1952) ... *J. Infect. Dis.* 75: 33-46.
Severns, J. M., Roberts, E. and Card, L. E. (1944) ... *Genetics* 17: 203-229.
Schott, R. (1932) ... Clinical Genetics. The C. V. Mosby Co., St. Louis, Mo.
Sorsby, A. (1953) ... *J. Agr. Res.* 55: 923-930.
Stewart, M. A., Miller, R. E., and Douglas, J. R., (1937) ... *J. Animal Sci.* 8: 609 (abstract)
Warwick, B. L., Berry, R. O., Turk, R. D., and Morgan, C. O., (1949) ... Biol. Chem. Control Plant Animal Pests. 209-216.
Waters, N. F., (1960) ... *J. Nat. Cancer Inst.*, 25 (2): 351-357.
Waters, N. F., and Bywaters, J. H., (1959) ... Disease of Poultry, 3rd ed., Edited by H. E. Biester and L. H. Schwarte, Iowa State University Press, Ames Iowa.
Waters, N. F., Burmester, B. R., and Watter, W. G., (1958) ... *J. Nat., Cancer Inst.* 20 (6): 1245-1256.
Waters, N. F., (1956) ... Genetics and Disease. Year B. Agr. 46-54.
Waters, N. F., (1954) a. ... *Poultry Sci.* 33: 365-378.
Waters, N. F., (1954) b. ... Proc. Worlds' Poultry Cong. 10th Congr., Edinburgh.
Waters, N. F., Groschke, A. C., and Szott, H. M., (1950) ... *Poultry Sci.* 29: 685.
Waters, N. F. and Prickett, C. O., (1946) ... *Poultry Sci.* 25: 501-508.
Waters, N. F., and Bywaters, J. H., (1943) ... *J. Hered.* 34: 218.
Whitlock, J. H., (1955) ... *Cornell Vet.* 45: 422-489.
Wright, S., and Lewis, P. A., (1921) ... *Amer. Nat.* 55: 20-50.

STUDIES ON FERTILITY OF POST-IRRADIATED PROTECTED X-IRRADIATED MALE MICE

By

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Soon after the discovery of x-ray, Albers - Schonberg (1903) described x-irradiation damage to the mammalian testes and during the last two decades considerable work has been carried out in the field of mammalian spermatogenesis and radiation. The voluminous literature on the subject, has been reviewed by Schinz and Slotopolsky (1925), Von Wattenwyl and Joel (1941), Glucksmann (1947), Shaver (1953), Casarett (1956), Ellinger (1957), Rugh (1960), Maqsood (1960) and others. The effects of x-irradiation on seminiferous epithelium are direct in that irradiation of the body, with testes shielded, does not produce the damage (Kohn, 1955). In general, the extent of damage to the testes vary with the dose of radiation. A single acute exposure of the mouse testes to 800 r causes temporary sterility and an exposure to 1800 r or more causes permanent sterility.

Russell (1954) reported that mice made partially sterile but able to produce some offspring after doses of 500 to 1000 r transmitted to their offspring partial sterility. Nuzhdin, *et al.* (1955) have shown that whole body x-irradiation of male mice at an exposure of 400 r temporarily decreases their mating capacity and lowers the number of progeny in the litters obtained by mating x-irradiated males with non-irradiated females. Further direct exposure of the testes to 5000 and 10000 r render the animals permanently sterile (Abbott, 1959). Recently, Ashikawa and Anderson (1960) have shown that olive oil, when administered intraperitoneally within an hour after x-irradiation, is both protective and therapeutic to whole body x-irradiated male mice. No information on the effects of olive oil treatment on fertility and litter size of x-irradiated male mice is available. In the present series of experiments the effects of intraperitoneal administration of olive oil within an hour after x-irradiation, on fertility and litter size of whole body x-irradiated male mice [LD 50 (30)] were investigated.

Method and Material

Groups of male Swiss white mice 6-7 weeks old and weighing 26 ± 4 gm were used for x-irradiation experiments. The Webster strain

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obtained from Simonsen Lab., Gilroy, California, was used in the present experiments. The animals were caged individually in glass jars from 2 to 3 weeks prior to irradiation and were fed *ad libitum*. Care was taken to select healthy mice for the experiments.

During x-irradiation, each mouse was held in a special lucite holder, large enough to allow freedom of movement and adequate ventilation to prevent overheating and anoxia. The x-ray source was from a Philips 250-Kv, 25-Ma deep-therapy unit operated at 200 Kvp, 15 Ma, with 0.5 mm Cu and 1.0 mm. Al filter. Each mouse received whole body x-irradiation in a single exposure of 625 r [LD 50 (30)] and a total of 40 mice were x-irradiated simultaneously (fig. 1). Dose rate was determined to ± 2 percent periodically during the exposure with 250 r-meter. Victoreen thimble chambers by positioning them in the lucite mouse holders as shown in fig. 1. In order to have an absolutely planar surface, the positioning wheel was machined from a 1 1/4th inch thick dural plate. The wheel was rotated at 3 RPM. After x-irradiation the mice were divided into groups as shown in table I. Olive oil treated groups of mice received a single intraperitoneal injection of 1 ml of pharmaceutical-grade olive oil (McKesson and Robbins) within an hour after x-irradiation. Each experimental male mouse was mated at different time intervals after x-irradiation with 5 non-irradiated young female mice, 10-12 weeks old, in the proestrus and estrus stages as shown in tables I and II. On 17th day of post fertilization, the female mice were killed and the number of fetuses counted.

Results

Male Fertility. The data in table I shows that x-irradiated olive-oil treated male mice and untreated x-irradiated male mice did not differ in their fertility rating during the 1-15 day period following x-irradiation. These two groups, when compared with the control group, showed a 20 percent decrease in their fertility ratings. It was interesting to find that x-irradiated olive oil treated male mice were twice as fertile as the untreated x-irradiated group, when they were mated 30 days post x-irradiation. Chisquare test showed that olive oil treatment significantly stimulated x-irradiated males to recover sooner from temporary sterility caused by whole body X-irradiation (table III). The data in table I also shows that the control, x-irradiated and x-irradiated olive oil treated groups did not differ in their fertility ratings when mated 60-75 days after x-irradiation.

Litter Size. The litter size of the x-irradiated and x-irradiated olive oil treated male mice when mated with non-irradiated, female mice during the 1-3 day and 15-17 day periods after x-irradiation, showed a marked decrease when compared with the control group

(table II). The litter size showed a further decrease when the experimental male mice were mated with the female mice, 30-45 days after x-irradiation. The data in table II shows that the mean litter size of the x-irradiated and x-irradiated olive oil treated male mice returned to normal after 60-75 days after x-irradiation.

Discussion

Oakberg (1955, 1955a) states that the various stages from the earliest spermatogonia to the mature spermatozoa exhibit very different sensitivities to the same dose of x-radiation. The testicular effects produced by radiation are qualitatively similar in all laboratory mammals and in man, but vary quantitatively according to differences in testicular radiosensitivity and recovery capacities among different species. In general, depletion of the seminiferous epithelium is largely the result of a period of time during which there has been little or no replacement of the spermatogonia. The time required for the production of sperm from spermatogonia is about 3-4 weeks for laboratory rodents and therefore maximum hyperplasia of the seminiferous epithelium takes approximately this amount of time. By the time the spermatozoa and the spermatids are used up, the derivatives of the more sensitive spermatocytes, whether or not they can differentiate, are so damaged they cannot function. Sterility may last for weeks or months, depending on the scarcity of active and functional spermatogonia that are left and their ability to repopulate the seminiferous tubules. This has been termed temporary sterility.

In the present experiments, histological examination of the testes of the male mice exposed to 650 r whole body x-irradiation indicated that the spermatids and maturing spermia did not show any degenerative changes while the spermatogonia and spermatocytes showed marked degenerative changes (Maqsood, 1961). Poor fertility and a significant decrease in litter size production of the x-irradiated male mice during 1-30 days post irradiation could be due to poor physiological condition of the surviving animals and degenerative changes in the testes as a result of radiation damage. The data on fertility and litter size of the whole body x-irradiated male mice differed from that reported by Rugh (1960) probably due to strain differences. It may be mentioned here that there is a range of several hundred roentgens between LD 50 (30) values for various strains of mice and these may well be correlated differences in radiosensitivity of the testes. For instance, effects were described for LAF mice whose testes were exposed to 200 r which gave results similar to those when C₃H testes were exposed to 50 r (Henshaw, 1944).

Mammalian testes when subjected to an acute dose of irradiation, followed by temporary sterilization, may "recover" to the extent of

being able to reproduce functional spermatozoa. Whatever the source of recovery of the germinal cells, this does not mean that the surviving cells and their progeny are without genetic damage but simply that they are alive and able to reproduce by mitosis and to produce primary spermatocytes. There is no doubt but that such cells, after exposure to any irradiation, carry more than their prior quota of deleterious, irradiation-induced mutations. It is for this reason that the meaning of the word "recovery" must be clearly understood. It does not mean a return to preirradiation condition except in so far as the ability to produce functional spermatozoa is concerned. The "recovery" or "regeneration" of the germinal epithelium of the testes after irradiation depopulation may be delayed for various lengths of time, depending on the dose and possibly on the rate of irradiation, providing the fractionation is over a long period. Further sterility in the male is never immediate after x-irradiation because of the high radioresistance of the spermatozoa as well as the spermatids.

The reduction in litter size after x-irradiation is generally attributed to severe chromosomal aberrations which cause developmental abnormalities, intra-uterine death, or abortion (Snell, 1935, 1941). It is very doubtful that spermatozoa once mature, can be so damaged by ionizing radiations as to be without motility or fertilizing power, but if the exposure occurs prior to full maturation the damage may be such as to prevent normal pronuclear fusion during fertilization and this would preclude normal embryonic development. Further, the sperm nucleus can initiate development and carry it to a critical phase, such as gastrulation, and then prove deleterious to further development, resulting in intra-uterine death. This could be due to genetic factors for some members of a litter, while others survive, thus reducing litter size (Rugh, 1960). The decrease in litter size in the olive oil treated and untreated x-irradiated male mice 1-45 days postirradiation, is explainable in the light of the above observations.

The improvement in fertility of the olive oil treated x-irradiated male mice over the untreated x-irradiated controls, 30-45 days post-irradiation was due to the accelerated rate of spermatogenic recovery when compared with the untreated x-irradiated control group. The fertility values as judged from the litter size production of the olive oil treated and untreated x-irradiated groups, returned to control value, 60-75 days postirradiation, indicating that an exposure of 625 r caused a temporary decrease in fertility and litter size production in the Swiss white male mice. The data on testes and seminal vesicles weights and histological examination of testes, spleen and thymus at different time intervals postirradiation indicate that olive oil therapy accelerated rate

of recovery by stimulating regenerative process in the x-irradiated male mice (Maqsood, 1961a).

Summary

Whole body x-irradiation of male Swiss white mice at a single exposure of 625 r [LD 50 (30)] decreased fertility rate and significantly lowered the number of progeny in litters obtained by mating x-irradiated males with non-irradiated females, 1 to 45 days after irradiation. At this dose level x-irradiated males recovered in their fertility rate as judged from their litter size production after 60-75 days postirradiation. Intraperitoneal administration of 1 ml pharmaceutical-grade olive oil within an hour after whole body x-irradiation of male mice [LD 50 (30)], improved fertility rate of treated male mice, 30 days postirradiation. The olive oil treated mice were twice as fertile as the untreated x-irradiated male mice. The data on litter size from matings of olive oil treated and untreated x-irradiated male mice, did not differ. Post-irradiation olive oil treatment appears to accelerate rate of recovery by stimulating regenerative processes in the x irradiated male mice.

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TABLE I

Effect of olive oil treatment on fertility of male Swiss white mice following exposure to 625 r whole-body x-irradiation. Males were mated with non-irradiated female mice.

Treatment	Time of Mating after X-Irradiation of Males		
	1-15 days	30-45 days	60-75 days
	% Fertile	% Fertile	% Fertile
Control	85 (40)*	—	98 (100)
Untreated	65 (20)	33 (18)	94 (18)
Treated	65 (20)	60 (20)	100 (20)

*Figures within parentheses indicate number of animals in each group.

TABLE II

Effect of olive oil treatment on litter size of x-irradiated male mice when mated with non-irradiated female mice. Males were exposed to 625 r whole body x-irradiation [LD 50 (30)]

Treatment	Time of Mating after X-Irradiation of Males							
	1-3 days		15-17 days		30-45 days		60-75 days	
	% with litter	litter size	% with litter	litter size	% with litter	litter size	% with litter	litter size
Control	—	—	47.5 (40)	8.3	98.0 (100)	9.8	—	—
Untreated	15.0 (40)*	5.7	37.5 (40)	4.0	11.1 (90)	3.1	73.0 (89)	9.2
Treated	25.0 (40)	5.4	17.5 (40)	5.6	21.0 (100)	2.7	88.7 (97)	10.5

*Figures within parentheses indicate number of females mated.

TABLE III

Chisquare test on the level of significance of post-irradiation olive oil therapy in accelerating recovery of spermatogenesis from radiation induced temporary sterility in whole body x-irradiated male mice [LD 50 (30)] 30-45 days after x-irradiation as judged from their litter size production.

Group	X ²	P
Table I		
Treated Vs Control	3.13	<0.10
Untreated Vs Control	10.59	0.001
Treated Vs Untreated	2.70	~0.10
Table II		
Treated Vs Untreated	3.39	~0.05

REFERENCES

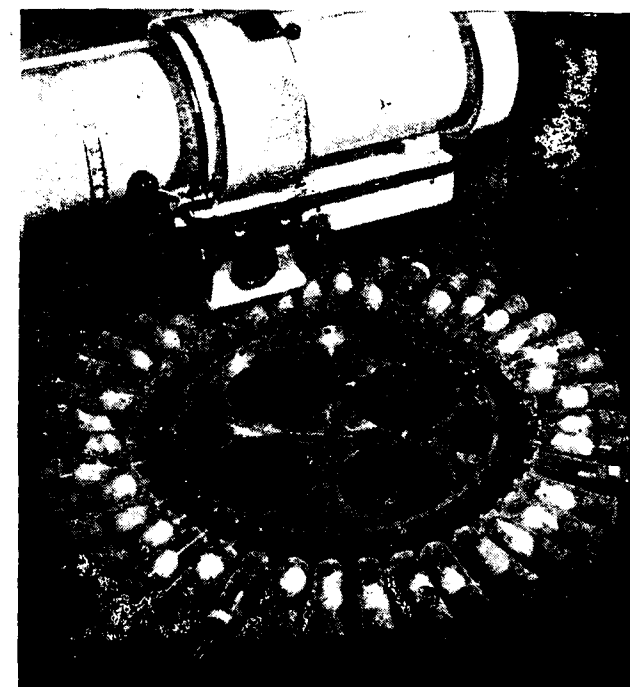
- Abbott, O. R. (1959) ... The effect of X-irradiation on the secretory capacity of the testis, *Endocrinology*, **19**, 33-43.
- Albers-Schonberg (1903) ... Uber eine bisher unbekannte Wirkung der Rontgenstrahlen auf den Organismus der Fiere, *Munch. Med. Wochschr.* **50**, 1859-1860.
- Ashikawa, J. K. and Anderson, O. K. (1960) ... Postirradiation protection of x-irradiated mice with olive oil, *Radiation Res.*, **13**, 99-107.

- Casarett, G. W. (1956) ... The effects of ionizing radiations from external sources on gametogenesis and fertility in mammals. UR-441, Rochester, New York.
- Ellinger, F. (1957) ... Medical Radiation Biology, Charles C. Thomas, Springfield, Illinois.
- Glucksmann, A. (1947) ... The effects of radiation on reproductive organs, *Brit. J. Radiol.*, Suppl. 1, 101-108.
- Henshaw, P. S. (1944) ... Experimental roentgen injury. II Changes produced with intermediate doses and a comparison of the relative susceptibility of different kinds of animals, *J. National Cancer Inst.*, 4, 485.
- Kohn, H. I. (1955) ... On the direct and indirect effects of x-rays on testes of the rat, *Radiation Res.*, 3, 153-93.
- Maqsood, M. (1961) ... Effect of olive oil therapy on spermatogenesis in x-irradiated male mice. *Proc. I Internat. Biophysics Cong.*, Stockholm.
- Maqsood, M. (1960) ... Effects of ionizing radiation on fertility. *Pak. J. Health*, 10, 28-33.
- Maqsood, M. (1961a) ... Paper under preparation.
- Nuzhdin, N. I., Shapiro, N. I., Petrova, O. N. and Kitseva, O. N. (1959) ... Effect of ionizing radiation on the fertility of mice and the viability of their offspring, *Conf. Acad. Sci. U.S.S.R. on Peaceful Uses of Atomic Energy*, IAEA, Biol. Sci. p. 14-33.
- Oakberg, E. F. (1955) ... Degeneration of spermatogonia of the mouse following exposure to x-rays, and stages in the mitotic cycle at which cell death occurs, *J. Morphol.*, 97, 39-54.
- Oakberg, E. F. (1955a) ... Sensitivity and time of degeneration of spermatogenic cells irradiated in various stages of maturation in the mouse, *Radiation Research*, 2, 369-391.
- Rugh, R. (1960) ... Chapter I, General Biology: Gametes, the developing embryo, and cellular differentiations, in *Mechanisms in Radiobiology*, Vol. II, edited by M. Errera and A. Forssberg, Academic Press, New York.
- Russell, W. L. (1954) ... Chapter 12, Genetic effects of radiation in mammals, in *Radiation Biology*, ed. by A. Hollaender, Part II, pp. 825-859, McGraw-Hill Book Co., New York.
- Schinz, H. R. and Slotopolsky, B. (1925) ... Der Rontgenhoden. *Ergeb. Med. Strahlenforsch.*, 1, 448-526.
- Shaver, S. L. (1953) ... X-irradiation injury and repair in the germinal epithelium of male rats. I. Injury and repair in adult rats, *Amer. J. Anat.*, 92, 391-432.
- Snell, G. D. (1935) ... The induction by x-rays of hereditary changes in mice, *Genetics*, 20, 545-567.
- Snell, G. D. (1941) ... The induction by roentgen rays of hereditary changes in mice, *Radiology*, 36, 189-194.
- Von Wattenwyl, H. and Joel, C. A. (1941) ... Die Wirkung der Rontgenstrahlen auf den Rattenhoden, *Strahlentherapie*, 70, 160-183.

Studies on fertility of post-irradiated protected X-irradiated male mice

BY

PROF. M. MAQSOOD AND DR. J. K. ASHIKAWA.



Simultaneous X-irradiation of 40 mice.

A note on a case of cutaneous Aspergillosis in a domestic fowl

By

J. V. NARAYANA,

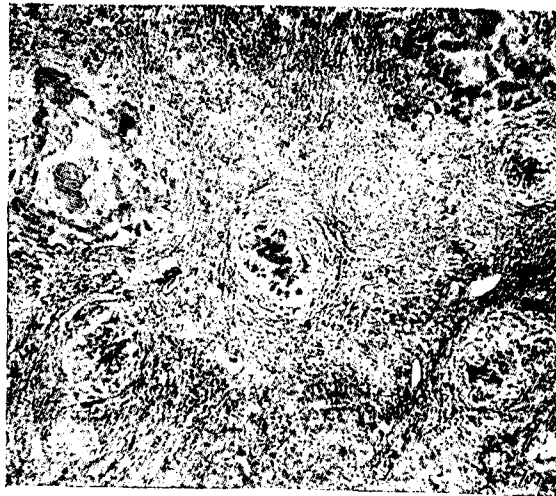


Fig. 1

Numerous granulomatous foci in the dermis. Foci showing central area of necrosis surrounded by a band of epithelioid cells and giant cells. (H & E x 35).



Fig. 2

Photomicrograph. Septate and branching hyphae in the necrotic foci. P.A.S. x 950.

A NOTE ON A CASE OF CUTANEOUS ASPERGILLOSIS IN A DOMESTIC FOWL

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Introduction

Aspergillosis is a common mycotic affection in domestic fowl and other avians like pigeons, ducks, turkeys, geese etc and the cause is a mould, *Aspergillus*, the name first adopted by Michaeli (1729).

Few cases of cutaneous Aspergillosis have been on record. Blount (1947) has included four cases of cutaneous mycoses in his table showing the distribution of mycotic lesions among birds. Bullis (1952) stated that organisms of *A. glaucus* and *A. niger* may particularly be encountered in cutaneous Aspergillosis. The author has encountered with a case of cutaneous Aspergillosis in his routine histopathological examination of specimens. The histological account of the present case is reported because it is found by the per-view of the available literature that few cases only have been on record comparatively.

Case History

The subject was a Desi hen admitted in the Veterinary Hospital, Rajole, East Godavari. The history provided by the Veterinary Assistant Surgeon is that there is a nodular cancer-like growth at the region of the angle of mouth.

Materials and Methods

Paraffin sections were cut at 4 to 6 microns thickness and stained by Haematoxylin and Eosin stain. A few were stained by Periodic-acid-Schiff stain for the study of hyphae.

Gross appearances

As reported by the Veterinary Assistant Surgeon, the lesion was in the form of a nodular, tough but cancer-like growth located at the region of the angle of beak and extending to the mucosa of mouth cavity. The consistency of the lesion was firm and there was interference to the normal movements of the beak.

Microscopic pathology

The tissue sections, prepared from the biopsy material received in the laboratory were studied microscopically. The epithelial layers of the skin were thickened, and showed slight proliferative changes. In the dermis were found innumerable granulomatous foci. Each such focus, when young, was found to consist of a necrotic centre surrounded by a prominent band of epithelioid cells and giant cells. The giant cells were of the "foreign body" type. Around this band were found numerous lymphocytes. The whole focus was surrounded by an extensive fibrous

capsule containing numerous lymphocytes. Older foci contained large caseous centres.

On haematoxylin and eosin staining, the hyphae were not clearly visible. Periodic - acid - Schiff stain revealed the granulomatous foci showing well stained numerous septate and occasionally branching hyphae, morphologically identical with the *Aspergillus* fungal elements. The hyphae were rather delicate and measured on an average 2.8 to 4.2 microns wide and 8.4 to 11.2 microns in length. Duplicate sections stained by Ziehl-Neelsen's stain failed to reveal acid fast organisms.

The intervening tissue of the granulomatous foci was highly cellular and revealed infiltration by chronic inflammatory cells.

Summary

(1) A case of cutaneous *Aspergillosis* is reported. (2) The lesion is characterised histologically by numerous granulomatous foci confined to the dermis. (3) The identification of *Aspergillus* is based on morphologic criteria.

Acknowledgments

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REFERENCES

1. Blount, W. P. (1947) ... "Diseases of Poultry". 1st Edition. Bailliere Tindall and Cox, London.
2. Bullis, K. L., (1952) ... "Diseases of Poultry". 8rd Edition. Edited by Biester, H. E., and Schwarte, L. H.

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PLACE OF DAIRYING IN CATTLE DEVELOPMENT PROGRAMME

By

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Marketing is the right and ultimate incentive for any increased production and all planning should, in fact, take into account the marketing end. This holds good in the case of all agricultural and industrial commodities. The more the consumption in the market, the more shall be the incentive for production. The two can keep pace. This applies equally to all developments in the Animal Husbandry field as well. The limitations in the field of cattle industry are quite obvious, as cattle rearing to its utility age is a time consuming job. That requires specialisation, as the act of rearing them to their full inherent capacity and exploitation and then their marketing should go hand in hand and the two cannot be separated.

Another important feature in cattle rearing is the confinement of various breeds to their specific home tracts. This is all the more necessary to improve quality in its production by intensive multiplication of breed characteristics and intensification in its performance capacity. The breed of arid zones may not actually thrive in an altogether unfavourable environment. This means separate markets and marketing practices breedwise, as unlike other commodities in general, these cannot be transhipped from place to place on motives of profit alone. Any shift in the nucleus stock from its original home may in all likelihood prove a permanent loss, as no replacement is possible. Cattle marketing, therefore, is a delicate task as any large scale injudicious trading may do more harm at the production end as has already happened in the depletion of our best milch stock from their zonal homes and tracts.

Apart from this, dairying on the profitable selling of milk and milk products constitutes a major market for the cattle-rearing profession. Good returns from the dairying ensure a substantial source of income to the farmer or the producer and this lays the very foundation of any cattle husbandry. It induces him to keep heavy yielders which are more economical to him. For apparent reasons he feeds his livestock better because every ounce of better feed reflects in his milk pail and finally in his purse. He starts better management practices in order to keep the dry period in his herd at the minimum and infertility at the lowest ebb. The value of the bull is then better known to him as he

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aims his future generation of stock to excel in performance over the parent stock. He also appreciates better the significance of culling the poor stock and retaining the best. He learns to maintain the valuable records pertaining to the calving time, dry period, date of service etc. to compare and contrast with past practices. In brief, dairy revenue is conducive to improved animal husbandry practices as his final success or failure in this undertaking is hinged on these issues. Thus in years to come, such a farmer can have a fine herd which is an asset to the village community. The villagers and those of nearby villages can draw inspiration from his stock and can have reliable nucleus for their herd from him, besides services from the quality bull he maintains or gets with the assistance of the State. Such a network of foci established in the length and breadth of the country naturally goes a long way in the development of country's livestock.

Dairying makes the farmer more progressive in his agricultural outlook as well. He knows that he is to divert a sizable piece of land out of his fixed holding for fodder cultivation. He sets upon planning as to how best he can have maximum yield from his fields. He looks for better yielding fodder seed strains and with additional irrigation facilities, he tries to maintain his family and milch herd on the same holding available to him. He takes to intensive agriculture, and coupled with judicious cropping programme and liberal use of fertilizers, he improves his lot. Thus the land development gets a substantial fillip as a side issue under dairying and he utilises all his farm yard manure for the said objective in view.

Such a farmer living in his own village and on his land by adopting dairying as additional source of supplementing his income can find employment for other members of his family who are not fruitfully employed. He does not need to dispose of his quality stock during the dry period as it costs very little at home to maintain his herd. The free labour of extra members amongst his family, his own land, and village community grazing pastures, go a long way to reduce his expenditure during the lean period. He in fact practises the "Mixed Farming" technique recommended in our National Plans.

The basic essential for success in his endeavour is that he may be provided with market at his door. His produce may be collected from his village without permitting middle man to take away a major slice of his income. He may be spared the trouble of running to the town to ensure proper disposal of his daily milk. In fact he may be encouraged to stay at his place and concentrate more on increased production by better feeding and management of his stock and some other organisation may take his produce for proper disposal. That should be the crux of our Dairy planning, of-course, besides financial assistance

of loans or grants that may be rendered to enable him to purchase his stock and the necessary farm equipment. Cooperative pattern of milk collection societies can come to his rescue through which producers like him can avail of the marketing and ancillary transport facilities. The producers of these societies may be given a dominant role in such organisations to enable them to guide their destinies themselves. The 'know-how' assistance to handle this perishable commodity may be rendered by the experts. That would be an enviable position wherein lot of villages can be improved and for that purpose milk collection scheme may operate far into the interior and cover the breeding tracts completely in particular.

In the absence of such broad-based milk collection schemes, the milk stock starts moving into or near the cities in search of remunerative milk markets. There, the accommodation is insanitary and fodder supply is scanty. The best of our animals go out of form in one lactation and prolonged dry periods in towns prohibit their further maintenance. Their progeny being out of our 'best' succumbs under malnutrition and their return to villages becomes impossible because of heavy transport cost. Such a quality stock is thus lost to the Nation along with the future progeny from them. The vicious cycle further follows in its wake. More useful animals are continuously brought to cities year after year and meet the same fate after they are out of lactation. This unscrupulous dairy trade requires to be checked as the milk stock cannot be replaced at such rapid speed as are being lost in the city life in India. The only alternative is more and more milk collection schemes to cover the major part of rural India. These schemes may not operate just around the city belt wherefrom milk ordinarily flows through private enterprise. It requires collection over wider areas to meet the needs of all breeding tracts and areas. That could only check the tendency of shift in milch stock towards the unfavourable urban areas. This obviously calls for more refrigeration facilities during collection, transport and distribution stages, and with the formation of our national plans in increased power supply there is no doubt that milk industry will develop in its right perspective.

Furthermore, a country like ours where the per capita consumption of milk is hardly 5-6 ounces, time probably is not opportune at this juncture for the establishment of dairy plants to manufacture milk powder etc. Even in tracts where milk production is somewhat better, per capita milk consumption is hardly beyond 8 ounces which cannot be termed adequate from any known health standards. Poor economy of the villager may compel him to forego his meagre family quota of milk in order to feed these plants and the cost of milk may locally go up. Moreover professional traders finding better remunerations may

be tempted to import more dairy stock in the area operated by a dairy factory as dairy practice in industrial areas means that the dry animals would be got rid of and new animals in lactation from other areas would be brought in from year to year. This does not entail intensive breeding programme in the area nor, does it add to increased milk production or cattle development in the country. Instead, animals from neighbouring areas would be wasted away. Dairy factories in practice are established to dispose of 'surplus' milk beyond the needs of fluid milk consumption of the country. That stage obviously has not been reached in India. The country may at first attempt to produce more and more quality stock so that the glut production in milk may justify such undertakings at a 'later stage. These industrialised dairy programmes, therefore, may be given a second thought and may preferably wait till boom in production has been achieved. Too ambitious dairy programme at this stage may actually do more harm than good. Dairy schemes in the present set-up in India have essentially to remain subsidiary to cattle development programme. Cattle rearing is a slow process and is an ancillary activity to agriculture. The farmer may be helped to raise and improve his milk strain on his own land and in his own village. Any transfer of his stock from his land is not in the larger interests of the country. What he requires is the market for his produce at his door and dairy schemes may essentially concentrate at that end in view.

COMPOSITION OF COLOSTRUM OF CAMEL

By

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The composition of colostrum of various species of domestic animals have been studied in detail by various workers. The information regarding the composition of colostrum of camel is not readily available. An opportunity was therefore taken to study the various aspects of colostrum of camel.

Material and Method

Colostrum samples were obtained from 11 she-camels maintained at Rajasthan Camel Breeding Farm, Bikaner. The samples were collected for study immediately after parturition and at 6, 12, 24, 30, 36, 48, 72, 96, 120, and 168 hour intervals. The study comprised both

of physical properties and composition of various constituents. The techniques applied for the observation of physical properties are given in the remarks column against each observation. For testing the percentage of fat, samples were tested by Gerber's method of fat determination. Kjeldahl's method for the determination of total nitrogen was used for the estimation of total proteins. The total solids content and mineral matter were determined by gravimetric method and the milk sugar by difference from the rest of the milk analysis.

The findings on the physical properties are given in Table I and the percentage of constituents along with the range of variation is given in Table II. The changes in the composition of colostrum till its change to normal milk are recorded in Table III.

TABLE I

Table showing the Physical Properties of Colostrum of Camel.

S. No.	Property	Observation	Remarks
1	Colour	Yellowish white	Naked eye observation.
2	Odour	Faintly abnormal	Objective test.
3	Taste	Unpleasant	Actual testing.
4	Viscosity at 80 degrees F	1.72 times as viscous as water	Draining from pipette.
5	Specific gravity	1.079	By Pycnometre method.
6	Refractive Index	1.382	By ABBE Refractometer.
7	Boiling point	210°F	By boiling at atmospheric pressure.
8	Hydrogen ion concentration	5.9	By Beckman's Ph meter.
9	Titrateable acidity	0.38% (after 12 hrs.)	By titration.
10	Consistency	Thicker than cow's colostrum but thinner than buffalo's colostrum.	By comparison.

TABLE II

Table showing the percentage composition and range of variation of constituents of colostrum of camel.

S. No.	Constituents	Maximum	Minimum	Average
1	Water	83.69	72.15	75.22
2	Total solids	27.85	21.81	24.76
3	Fat	0.40	0.10	0.15
4	Total proteins	19.52	15.79	17.78
5	Milk sugar	5.13	3.98	4.25
6	Mineral matter	2.80	1.44	2.60

TABLE III

Table showing the composition of colostrum of camel at various intervals from calving till its change to normal milk

Time after calving. (Hrs.)	Sp. Gr.	Titra- table acidity. (as lactic acid %)	Total solids. %	Fat. %	Total proteins. %	Lactose. %	Ash. %	Clot on Boiling.
Immedi- ately after calving	1.079	0.38	24.78	0.15	17.78	4.25	2.60	+
6	1.077	0.31	21.18	0.2	14.49	4.27	2.40	+
12	1.067	0.19	20.37	0.3	13.46	4.63	1.90	+
24	1.067	0.15	16.87	0.3	10.28	4.02	1.22	+
36	1.056	0.18	15.96	0.6	10.10	4.24	1.02	+
48	1.054	0.21	14.96	0.8	8.46	4.82	0.98	+
72	1.037	0.20	12.64	0.4	5.48	4.79	0.97	—
96	1.034	0.17	12.50	2.1	4.50	4.94	0.96	—
120	1.031	0.14	12.94	2.2	4.10	5.67	0.97	—
168	1.031	0.14	12.90	2.7	3.95	5.31	0.94	—
			12.90	2.8	8.95	5.36	0.86	—

Discussion and conclusion

As is apparent from the foregoing figures the colostrum of camel is characterised by a high specific gravity and high average content of free acidity, total solids, total proteins and ash. The low average content of fat is also remarkable. The lactose is also less than in the normal milk of camel but the difference of this constituent in the colostrum and normal milk is not so wide as in the case of other species. In each of the constituents of colostrum, except fat, in which it is generally inferior, camel's colostrum is consistently richer than cow's colostrum (1). The rate of change to normal milk is almost on lines noticed in cow's colostrum (2), and is completed in about a week's time, although clot on boiling stops after 36 hours. The period required to attain the normal percentage of fat is however longer. Among the physical properties, colostrum is accompanied by a high value of density, refractive index and a low heat coagulation point.

Summary

1. Samples of colostrum from 11 she-camels at varying intervals from calving till conversion to normal milk are tested to study the physical properties and chemical composition. 2. Composition of colostrum of camel is compared with the colostrum from other species.

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REFERENCES

1. Davis, J. C. & MacDonald ... Richmond's 'Dairy Chemistry. Fourth ed. Charles Griffin & Co. Ltd., London.
2. Ling, E. R. (1956) ... A Text Book of Dairy Chemistry. 2nd ed. Chapman & Hall Ltd., 37 Essex Street, W. C. 2, London.

THE RATE OF DILUTION AND QUALITY OF SEMEN ON SURVIVAL OF SPERMATOZOA AFTER FREEZING AND STORAGE FOR 12 MONTHS AT - 79°C.

By

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Much work had been done on factors affecting freezing and storage of semen at -79°C, but none on the effect of rate of dilution and quality of semen on freezability. Bishop (1954) lists the effect of dilution as many and in general, it means increased sperm metabolism. He believes that the increased sperm metabolism is due to the dilution of an inhibitor present in seminal plasma. O'Dell and Almquist (1959) working with 6-37 successive ejaculates collected during 12, 2 hour depletion trials with eight dairy bulls found no significant differences in freezability in the same bulls when frequency is two to six ejaculates per week. Beyond the 10th ejaculate the freezability was found significantly poor. Pooling acceptable ejaculate from a depletion trial resulted in freezability comparable to freezing ejaculates separately. Erickson and Graham (1959), in an experiment with 469 first service cows bred with frozen semen containing 10 million live spermatozoa, 479 cows with semen containing 20 million live spermatozoa and 472 cows with semen containing 30 million live spermatozoa per insemination, obtained 75 day non-return percent of 63.1, 68.9, 72.9 respectively. The difference between ten million and thirty million live spermatozoa per insemination was found significant at 1% level.

Materials and Methods

The research material consisted of 5 Jersey and 5 Holstein Friesian bulls regularly used in artificial breeding maintained by Dairy and Animal Husbandry Department, Oregon State University, Corvallis, Oregon. After semen was collected, sample was evaluated for motility

and sperm concentration assessed. The semen was then diluted with homogenized and pasteurized milk heated to 95°C for ten minutes and cooled, to get a sperm concentration of 5 million, 10 million, 20 million, 30 million and 40 million spermatozoa per milliliter. After dilution 1000 units of penicillin and 1000 micrograms of streptomycin were added per ml. Immediately they were transferred to 1 cc. glass vials and sealed. Freezing was done with 95% Ethyl alcohol and chipped dry ice. The semen thus frozen was held in a vacuum flask for a period of 12 months in dry ice and alcohol in a deep freeze. The glycerol used in all cases was 7%. The rate of freezing was 1-2° per minute from + 5°C to -20°C and from -20°C to -79°C was as fast as possible by dropping large quantities of dry ice. After a storage period of 12 months frozen semen was removed and dropped in chilled water and sample evaluated for motility on a thermostatically controlled stage and live spermatozoa assessed by differential staining technique. The motility ratings were made on a scale of 0 to 10, 10 being the best.

The second stage of the experiment consisted of ten bulls maintained by Dairy and Animal Husbandry Department, Oregon State University, Corvallis, Oregon. From the previous records bulls were selected and graded as A, B, C, D and E depending upon sperm concentration, differential staining and progressive motility of each one of their semen. The semen was collected once weekly and was immediately diluted with homogenized and pasteurized milk heated to 95°F for ten minutes and cooled. After dilution 1000 units of penicillin and 1000 micrograms of streptomycin were added per milliliter of extended semen. The glycerol level used was at the rate of 7%. No time was allowed for equilibration. The semen ready for freezing was transferred to 1 cc pyrex glass vials and sealed immediately, frozen simultaneously and was stored at -79°C for a period of 12 months. After the storage period samples were thawed in chilled water and evaluated for motility and live spermatozoa by differential staining.

TABLE I

Mean motility and mean percent live spermatozoa by differential staining after storage at - 79°C.

Concentration	Motility	Live spermatozoa by differential staining in percent
5 Million / ML	4	45
10 Million / ML	6	55
20 Million / ML	6	60
30 Million / ML	7	62
40 Million / ML	7	63

TABLE II

Mean motility and mean percent live spermatozoa by differential staining after storage at - 79°C.

Quality	Rate of Dilution	Motility	Live spermatozoa in percent
A	20 Million / ML	8	72
B	"	7	65
C	"	6	58
D	"	6	50
E	"	5	52

TABLE III

Analysis of Variance (Motility ratings)

	d. f.	M. S.	F.
Between Dilutions	4	12.68	4.1**
Error	195		
Total	199		

TABLE IV

Analysis of Variance (Live spermatozoa by differential staining)

	d. f.	M. S.	F.
Between Dilutions	4	17.6	
Error	195	5.2	3.4**
Total	199		

TABLE V

Analysis of Variance (Motility ratings)

	d. f.	M. S.	F.
Between quality	4	8.23	3.7**
Error	195		
Total	199		

Motility ratings and live spermatozoa obtained by differential staining on quality of semen were subjected to analysis of variance and results are given in Table V and VI.

TABLE VI
Analysis of Variance
(Live spermatozoa by differential staining)

	d. f.	M. S.	F.
Between quality	4	12.61	2.5**
Error	195		
Total	199		

Results and Discussion

Analysis of variance as given in Table III and IV shows a difference significant at 1% level in motility and live spermatozoa between dilution rates when semen was frozen and stored at -79°C . The difference is highly significant at a concentration of 5 million spermatozoa/ML and between 10, 20, 30 and 40 million/ML respectively. But the difference is not significant between 10, 20, 30 and 40 million/ML. The same is true when live spermatozoa by differential staining is used as the criterion for semen assessment.

When semen of different quality viz., A, B, C, D and E were frozen and stored for a period of 12 months they were found to differ significantly in motility and differential staining at 1% level after thawing. The difference was highly significant between quality A and qualities B, C, D, and E. The difference was significant at 5% level between B and C, D and E. It was also noted that there was a significant difference at 1% level between quality, when live spermatozoa by differential staining is considered. The difference was significant at 1% level between quality A and qualities B, C, D and E. But differences were not significant between B, C, D and E. In summary it could be said that a concentration of 5 million spermatozoa/ML was not satisfactory for freezing and storage at -79°C . But a concentration of 10, 20, 30 and 40 million spermatozoa/ML was equally satisfactory for freezing and storage at -79°C . In the same way qualities C, D and E were found to be poor compared to qualities A and B. This suggests that semen of only superior quality should be used for freezing and storage at -79°C .

Summary

For freezing and storage of semen, the semen used for the purpose should be of a superior quality and should have a concentration of at least 10 million spermatozoa/ML.

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REFERENCES

1. Bishop, M. W. H. (1954) ... Studies on fertility. Blackwell Scientific Publications, Oxford.
2. Erickson, W. E. and Graham, E. F. (1959) ... *Journal of Dairy Science*, 42, 520.
3. Kennelly, J. J., R. S. Hoyt, R. H. Fouts & Bratton, R. W. (1960) ... *Journal of Dairy Science*, 43, 1140.
4. Li, Jerome, C. R. (1957) ... Introduction to Statistical inference. Edward Bros. Inc. Michigan, U. S. A. pp. 558.
5. O'Dell, W. T., Almquist, J. O.... and Amann, R. P. (1959) ... *Journal of Dairy Science*, 42, 1209.
6. VanDemark, N. L., W. J. Miller, W. C. Kinney, Jr., Carlos Rodriguez and M. E. Friedman (1957) ... University of Illinois, Agricultural Experiment Station, Bulletin No. 621.

A STUDY ON THE PREPARATION AND STORAGE OF READY TO COOK CHICKEN

By

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In India only live birds are marketed for table purposes and the production of ready to cook chickens is not known to have been done on a large scale. The production of ready to cook chicken has several advantages. It involves centralisation of slaughter and thus ensures better sanitary production and more efficient inspection of poultry meat. Transporting and marketing of the dressed birds are easier than live birds. This method also eliminates the inconvenience, inefficiency and aesthetic undesirability of dressing birds at home. The reduction

in weight of birds is an advantage in the transportation of these food products. The development of visceral taint by diffusion from intestinal tracts into the meat is also reduced (Hansline Weaner and Klose, 1955).

For the first time a study was undertaken in the Meats Department of this college on the preparation and storage of ready to cook chicken in a kerosine worked refrigerator.

Materials and Method

In this study 12 cockerels in each of Rhode Island Red, White Leghorn, Farm Bred Desi and Market Desi varieties were used to determine the shelf life and also the difference in the shelf life of the varieties studied.

The birds were fasted for about 18 hours prior to slaughter and were given adequate supply of drinking water. They were housed in a well ventilated and cool place and care was taken not to excite the birds unnecessarily prior to slaughter. All the knives and utensils used were sterilised prior to use and chlorinated water was used in the dressing of the birds. The birds were slaughtered by first pithing the brain with a narrow bladed knife. The knife was thrust through the cleft of the hard palate and was given a quarter turn so that the Medulla was destroyed. The object of this pithing was to loosen the feathers during the process of defeathering. The birds were then slaughtered by cutting the blood vessels in the neck. Bleeding was allowed to continue till death. The birds were then slack scalded by dipping in hot water at 128°F. The scalding was done for 2 to 3 minutes till the feathers slipped easily. Then hand picking was done and feathers were removed completely. The head was removed first. The legs were removed at the hock joint after pulling the tendons in each leg. The crop and trachea were removed by hooking a finger through an incision on the superior aspect of the neck. The lungs were then loosened. The oil-gland at the tail was removed and a circular incision was made around the vent to remove the entrails. The lungs, liver, heart, gizzard and intestines were then drawn out, care being taken not to break the intestines. The kidneys and testicles were then removed with the help of a pair of forceps. The bird was finally washed thoroughly inside out in chlorinated tap water. The dressed chickens were allowed to drain for about 1 hour after which they were trussed and packed in cellophane and stored in a kerosine worked refrigerator which maintained a temperature of 4°C and 80% humidity. After 24 hours the birds were repacked in polyethane paper. The birds were examined daily for the presence of off flavour or putrefactive changes. The shelf life was determined by finding out the number of

days from the date of slaughter to the date on which putrefactive changes or off-odour were noticed. Bacteriological examination of meat samples from four birds was made. The fungus growth on the chicken was also identified.

Eighteen chickens after 10 days storage were cooked and consumed for judging the quality.

Observations

The shelf life of the birds is furnished in Table I.

TABLE I

S. No.	Rhode Island Red.		White Leghorn.		Farm bred Desi.		Market Desi.	
	Bird No.	Days.	Bird No.	Days.	Bird No.	Days.	Bird No.	Days.
1.	661	16	3341	14	3463	8	1	9
2.	662	8	48	14	3458	8	2	7
3.	664	7	3338	12	3199	15	3	10
4.	313	15	162	8	3456	16	4	11
5.	3296	15	231	8	3452	18	5	15
6.	3311	15	135	10	3455	18	6	14
7.	3307	15	3323	12	3447	15	7	13
8.	3309	14	9280	15	99	8	8	8
9.	3302	13	74	15	60	7	9	8
10.	3276	13	170	7	84	8	10	13
11.	291	15	188	7	99	8	11	14
12.	624	10	66	8	155	8	12	12
Mean		13	Mean		10.83	Mean		11.33
						Mean		11.58

General Mean = 11.68 days.

TABLE II

Table of analysis of variance

Source of variation	Degree of freedom	Sum of square	Mean square
Total	47	580.31	
Varieties	3	81.06	10.35
Error	44	549.25	12.41

F. ratio — 0.38.

The mean shelf life was found to be, Rhode Island Red 13 days; White Leghorn 10.83 days; Farm Desi 11.33 days; and Market Desi 11.58 days; and it is seen from Table II that the differences are not significant.

Bacteriological examination of meat from four birds was made after 8 days storage and the results are furnished in Table III.

TABLE III

S. No.	Bird No.	Result of cultural examination
1	Rhode Island Red 662	Anthracoid and Diphtheroids.
2	do. 3095	Staphylococci and Diphtheroids.
3	Market Desi 3	No growth.
4	do. 1	Gram negative organisms.

Mouldy growth was observed in 17 carcasses on the 13th day of storage and the following species of fungus were identified, from the samples of poultry meat (Rangaswamy 1960).

1. *Microsporum* species.
2. *Gonatorrhoidiella* sp.

The chickens were found to be more palatable and tender than fresh ones. It was found that the time taken for cooking was found to be 20 minutes in a pressure cooker and about 30-45 minutes in an ordinary cooker. The chicken prepared in this way were found to be best suited for frying.

Discussion

It will be seen from Table I that the shelf life of the ready to cook birds stored in a refrigerator has a mean shelf life of 11.68 ± 0.5 days. The differences in the mean shelf life of Rhode Island Red White Leghorn, Farm Desi and Market Desi were not significant and it indicates that breed or farm rearing of desi chicken does not influence the shelf life of the bird. The preslaughter treatment of the birds have a profound influence on the bleeding and keeping quality of the birds. Dillon (1947) advises starving of the birds for 12 to 18 hours for lessening the chances of intestinal breakage when dressing, to enhance the keeping quality after slaughter, and to avoid the danger of objectionable gray or green appearance of the skin. Thornton (1952) also advocates starving of birds for 24 hours prior to slaughter and allowing of plenty of water to ensure emptying of crop and intestines for better keeping quality and a more pleasant flavour. Efficient bleeding of poultry improves the appearance of the flesh and the flesh of unbled birds loses its firmness quickly, develops stale or other abnormal odours and decomposition is more rapid (Thornton, 1952). Pentzer (1955) recommends the storing of fresh poultry at 32°F and at a relative humidity of 85 to 90% for one week. According to Hansline Weaner and Klose (1955) bacterial spoilage renders the ready to cook products unacceptable after one

week storage at usual commercial holding temperatures. Ayres *et al* (1958) observe that the prevalent types of bacteria on processed poultry include the following genera: *Pseudomonas*; *Micrococcus*; *Proteus*; *Bacillus*; *Sarcina*; *Streptococcus*; *Eberthella*; *Salmonella*; *Escherichia* and *Aerobacterium chromogenae*.

Bacteria represent 50 to 60% of the initial bacterial contamination on processed poultry but these are displaced during chilled storage by a preferential growth of *Pseudomonas* and to some extent by gram negative cocci. Approximately 108 micro-organisms per square centimeter are present before off-odour or slime becomes evident. Bacterial spoilage can be reduced by sound sanitary practises in processing and by the use of chlorinated tapwater (10 to 20 p.p. m.) in processing ready to cook poultry (Drewnaik *et al* as quoted by Hansline Weaner and Klose, (1955). Essary and Howes (1960) state that removal of kidneys from fryers extended the average shelf life by 1.27 days. Accordingly the kidneys of the dressed chicken were removed to get a maximum possible shelf life.

Tomkins (1952) observes that the moulds attacking meat include *Thamnidium* species; *sporotrichum* species; *penicillium* species; and *Gladosporum herbarium*. *Thamnidium* are coprophites and other types are ubiquitous and that infection takes place during the cleaning of the carcass. He suggests cleanliness of the surroundings and also in handling and storage of birds at low temperatures with high humidity.

According to Ziegler (1954) the most effective way of preventing moulds on untreated meat is to store them in a dry well ventilated room in temperature between 45° to 65°F by suspending them in such a manner that they do not touch one another.

The temperature of the kerosine worked refrigerator was only 4°C and the humidity 80% and these conditions were conducive to the growth of *Microsporum* sp. and *Gonatorrhoidiella* sp. Since the temperature and humidity of the refrigerator could not be altered to such a level which will inhibit the growth of moulds the refrigerator was periodically disinfected with Formaldehyde and Ammonia fumes besides adopting strict sanitary measures in dressing and processing.

Packing of fresh raw meat is essential to protect it from extraneous contamination. An essential factor of the packing material is transparency to enable the consumers to see the meat purchased by them. A permeable type of package such as cellophane or cellulose acetate is advantageous for preserving the colour of meat for first two days after packing and for preserving the colour longer than 48 hours a film of very low gas permeability is required (Olein Ball, 1955). Accordingly cellophane was used to pack the chicken for first 24 hours

when it was changed to polyethane. This method of packing was found to be satisfactory for the preservation of the colour.

The increased tenderness and less time taken for cooking the chicken are due to ageing of chicken during storage.

Since the breed of the bird has no influence on the keeping quality as indicated by this study it is only pre-slaughter treatment of the birds and sanitary processing and dressing methods that determine the shelf life of the dressed chicken. If the chickens are required to be stored for a longer time they have to be stored in a freezer and further study is being made on the shelf life of dressed chicken in a freezer at - 20° C.

Summary

The birds were slaughtered by cutting the blood vessels in the neck after pithing the brain. Dressing was done after slack scalding in hot water at a temperature of 128°F. The dressed birds were packed in cellophane for 24 hours and then they were repacked in Polyethane.

Storage life of 12 dressed cockerels each of Rhode Island Red, White Leghorn, Farm bred Desi, and market Desi in a kerosine worked refrigerator (temperature 4°C. and Humidity 80%) was studied. Mean storage life was found to be 11.68 days. Rhode Island Red had a storage life of 13 days, White Leghorn 10.83 days, Farm Desi 11.33 days, and Market Desi 11.58 days. The difference in the storage life of different varieties was not significant.

Eighteen birds were cooked and consumed and were found to be more tender and delicious. Time taken to get cooked was considerably less than for fresh birds. The chickens were found to be best suited for frying. Bacteriological examination was made in four birds after 8 days of storage. In one bird there was no growth, in a second one gram negative organisms were present, in the third one Staphylococci and Diphtheroids were present and in the fourth Anthracoids and Diphtheroids were present.

Mouldy growth was observed in 17 carcasses after 13th day of storage and they were identified to be *Microsporum* sp. and *Gonatorrhoidiella* sp.

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REFERENCES

1. Ayres, J. C., Ogily, W. S., and ... *Food technology* 7, 275.
Stewart, G. F., (1953)
2. Dillon, C. F. (1947) ... *Meat slaughtering and processing.*
Published by Meat Merchandising Inc.,
U.S.A. p. 168.
3. Essary, E. O. and Howes, C. E. ... *Bacterial flora of Poultry Kidneys and*
(1960) ... *effects of Kidney removal on yield and*
shelf life. Poultry science 39, 1.
4. Hansline Weaner and ... *Hand book of food and agriculture.*
Klose, A. A. (1955) ... Edited by Fred C. Blank, Reinhold
publishing corporation, New York,
p. 623.
5. Olein Ball (1955) ... *Handbook of Food & Agriculture, Edited*
by Fred C. Blank, Reinhold Publishing
Corporation, New York, p. 709.
6. Pentzer, W. T. C. (1955) ... *Handbook of Food and Agriculture.*
Edited by Fred C. Blank, Reinhold
Publishing Corporation, New York,
p. 325.
7. Rangaswamy, G. (1960) ... *Personal communications.*
8. Thornton, H. (1952) ... *Textbook of meat inspection. II Edition.*
Baillaire Tindall and Cox, London,
Pages 457 to 459, 539.
9. Tomkins, R. G. (1952) ... *Food Science, A symposium on quality*
and preservation of food. Edited by
E. C. Batesmith & T. N. Morris, Syndi-
cate of Cambridge University Press,
p. 178.
10. Ziegler Thomas, P. (1954) ... *Meat we eat. IV Edition, The inter-*
state Printers and Publishers, Illinois.
p. 187.

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Characteristics of Rath i Cattle

By
S. P. OHRI AND B. K. JOSHI.

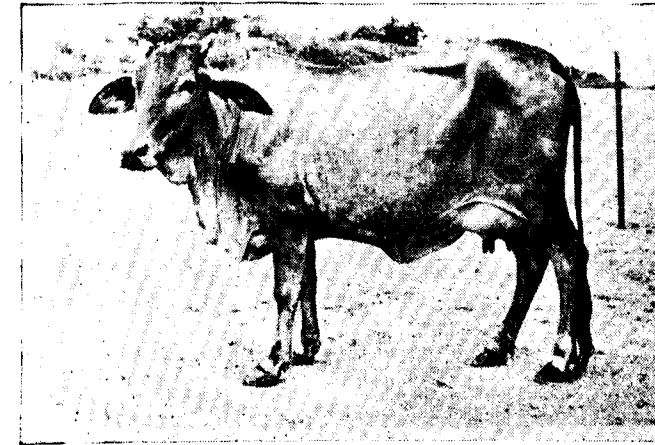
TABLE I
Average Measurement in Inches.

Number animals studied	30	30	48	35	28	27	21	48	
Age	At birth	One week	One month	Three months	Six months	One Yr.	Two Yrs.	Adults Rath i	Adult Sahiwal (Singh, 1955)
Height behind hump.	27.0	29.3	29.5	33.9	38.0	45.5	47.2	49.6	48.7
Length from point of shoulder to pin bone.	23.0	24.0	25.5	32.0	38.0	42.0	46.5	52.6	56.8
Length of quarter from angles of hip to pin bone.	8.0	8.3	9.0	10.5	12.0	15.0	15.5	16.0	17.7
Height at angle of hip.	27.0	28.8	29.5	33.4	37.0	45.5	45.8	46.5	48.4
Width between angles of hip.	5.0	6.3	6.8	9.0	10.7	14.0	14.4	16.1	18.0
Height of pin bone.	23.0	25.3	26.9	31.5	34.5	40.5	41.1	43.1	43.4
Length of tail and height of end of switch from ground.	16.5	18.0	19.3	23.6	29.0	36.0	45.1	45.9	40.0
Girth.	9.5	9.8	10.5	9.9	10.5	8.0	2.5	1.5	5.5
Height at point of elbow.	24.0	26.5	30.5	33.4	42.0	56.0	61.0	64.2	67.6
Measurement of bone from knee.	16.0	17.3	17.5	19.7	21.5	24.0	24.9	25.6	27.1
Length of face from occipital crest to upper edge of muzzle.	9.5	9.8	10.0	11.2	12.0	12.3	12.9	13.0	7.7
Width of face immediately above eyes.	9.0	9.5	9.6	11.1	13.3	17.5	18.4	19.5	19.9
Length of lower surface of ear measured from tip to junction of ear to face.	4.5	5.8	6.0	7.2	7.5	7.6	7.8	7.9	8.0
Greatest width of ear.	6.0	7.3	7.4	7.8	9.2	10.0	1.11	11.3	11.0
Slope of rump i.e. height to hook bone minus height to pin bone.	3.5	4.0	4.0	4.2	4.9	5.5	5.8	5.9	4.5
Weight (pounds).	3.0	3.5	3.7	4.6	5.0	5.5	5.6	5.8	5.0
	42.6	58.0	85.2	158.3	235.0	485.0	627.5	650.8	9.0

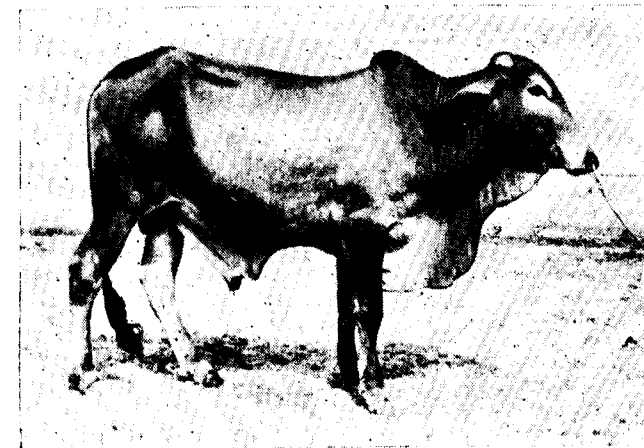
The comparison between the milk of Rath i cow and that of Sahiwal is given in Table II and Table III shows the comparison between the colostrum of the two breeds.

TABLE II
Composition of Milk (percent)

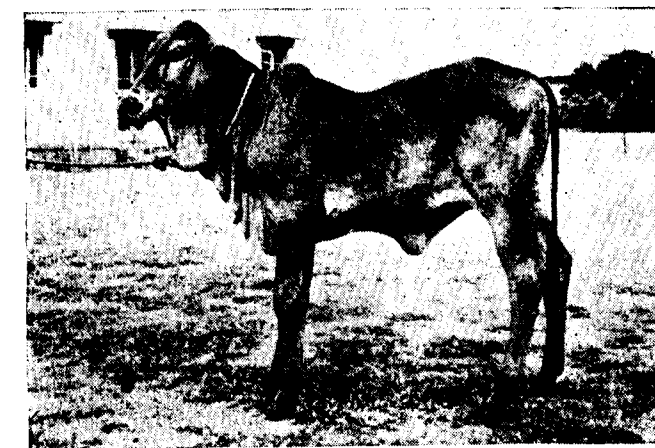
Breed	No. of samples tested	Sp. Gr. at 60°F	Total solids.	Fat.	S.N.F.	Protein	Lactose	Ash.	Water
Rath i	80	1.029	12.852	3.97	88.8	3.974	4.58	0.72	87.18
*Sahiwal	184	1.082	13.85	4.65	9.20	—	—	—	86.15



Rath i Cow



Rath i Bull



Cross (Female calf)
between a Sahiwal bull
and Rath i cow.

CHARACTERISTICS OF RATHI CATTLE

By

S. P. OHRI, B.V.Sc. and B. K. JOSHI, B.V.Sc. & A.H.

Rajasthan College of Veterinary Science & Animal Husbandry, Bikaner.

Sahiwal, Sindhi, Gir and Deoni are the recognised Indian breeds of milch cattle. Hariana, Tharparkar, Ongole, Gaolao, Krishnavalley and Kankrej are regarded as dual purpose breeds. The Rathi breed of cattle is not yet recognized by Indian Council of Agriculture Research. The animals of this breed are concentrated in the area known as the "Rathi Tract" which comprises of a part of Bikaner, Ganganager and Jaisalmer districts of western Rajasthan which has got a rain fall of 10-20 cms. per year and temperature ranging between 34°F and 120°F. The cattle population in this tract is about two and half lakhs. The breed is a mixture of Sahiwal, Sindhi and Hariana breeds of cattle with a predominant trend towards Sahiwal. Most of the animals are owned and bred by Nomads in semi-wild condition who keep their herds moving in the tract according to the availability of water and grazing. The individual nomad family generally owns more than hundred animals on an average and due to the sale of milch cows and ghee, they are fairly well off financially. The Rathi animals have most of the characters of Sahiwal and Sindhi breeds; they therefore hold very promising future in establishing good dairy herds of upgraded Rathi animals by cross breeding with Sahiwal and Sindhi males. As most of the areas of Sahiwal and Sindhi animals have gone to Pakistan and our cattle development work has been handicapped for want of good milch animals to form basic herds, it is essential that these animals should be upgraded. Being essentially a mixture of the three above mentioned breeds, Rathi animals should be able to do fairly well in most parts of the country.

As no authentic literature or information was available about Rathi cattle the following study was undertaken in a Dairy herd comprising of 46 cows and 47 calves of different age groups at Rajasthan College of Veterinary Science and Animal, Husbandry, Bikaner. The adult cows had been purchased from the Rathi Tract. The present study was limited to red animals as the policy of the college is to have animals of red colour for crossing with Sahiwal bull. In the Rathi Tract however, most of the animals are of various shades of red, fawn, red with white patches and black with white patches. Animals of pure grey or black colour are very rare.

Rathi breed of cattle is a medium heavy breed with symmetrical body, broad head (except a few who have Hariana head), short horns and fine loose skin. The female has the general appearance of good

milch animal. In the male, the hump is of considerable size, the dewlap is voluminous and sheath pendulous.

Characteristics

Head:—

- Forehead: Medium size and lean.
- Face: Broad between eyes and slightly dished.
- Muzzle: Broad, not coarse, with wide open nostrils, jaws strong.
- Eyes: Mild, full and placid.
- Ears: Medium size and more or less dropping.
- Horns: Short and generally do not exceed 3 or 4 inches in length.

Body and Limbs:

- Neck: Lean and long, with clean throat.
- Dewlap: Fine and loose.
- Chest: Broad, deep between and just back of forelegs.
- Legs: Proportionate to size and of fine quality with good feet.
- Shoulders: Light, well set but thin at withers.

Barrel:

- Back: Straight and strong, level along tail-head.
- Ribs: Ample sprung and wide apart, giving wedge shape.
- Navel-flap: Prominent in female.
- Sheath: Loose and pendulous.

Hind quarters:

- Loins and hips: Hip bone high and wide apart. Loin broad and strong.

Rump and pin bone: Rump long to tail setting and nearly level between hip bones. Pin bones wide apart.

Tail: Long, fine, tapering to a good black switch well below the hock (in partially coloured animals tapering to a white switch).

Udder: Well developed, firmly suspended from the body without deep cuts. Teats of good length. Milk vein prominent.

Skin and hair: Loose mellow with fine short hair.

The measurements of Rathi animals of different ages and the comparison of its adult female with that of Sahiwal female are given in Table I.

Melanoma in a Piglet

By

JOSE V. TACAL, MARCIAL E. RAMOS AND CRISTOBAL L. MIRANDA.



Fig. 2



Fig. 4

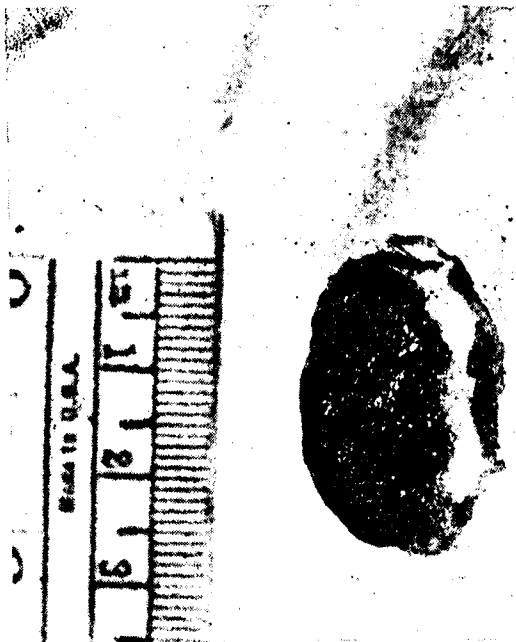


Fig. 1



Fig. 3

TABLE III
Composition of Colostrum (percent)

Breed	No. of samples tested	Sp. Gr. at 60°F	Total solids	Fat	S.N.F.	Protein	Lactose	Ash.	Water
Rathi	57	1.076	25.571	3.25	22.32	17.22	3.30	1.715	74.429
*Sahiwal	—	1.058	22.55	4.6	17.95	13.21	3.30	1.20	77.45

*Military Dairy, Peshawar (1916) as mentioned by Rangappa, K. S. and Achaya, K. T. (1948).

Discussion.

A study of Rathi animals maintained at Rajasthan College of Veterinary Science and Animal Husbandry, Bikaner was undertaken in order to judge their suitability for grading them up with Sahiwal male. The study clearly indicates that Rathi animals are physically very suitable for upgrading by Sahiwal. The striking difference in weight appears to be due to the fact that the average weight recorded of Rathi animals is of purchased stock, whereas that of Sahiwal is of farm bred which are always well looked after and properly fed. The result of first cross between Sahiwal male and 23 Rathi cows has been very encouraging as far as their colour is concerned and almost 100% progeny have been of red colour. The production record of 27 animals which have completed one lactation is given below in Table IV.

TABLE IV
Production record of Rathi Cows.

Highest milk yield	...	5686 lbs.
Average daily yield based on monthly average	...	11.1 lbs.
Highest average	...	12.6 lbs.
Highest daily yield by best animal in the herd ever attained	...	19.0 lbs.
Average lactation yield	...	2919 lbs.
Average days in milk	...	354.5
Average dry days	...	173.6 *
Lowest yield	...	1805

*Average dry days figure is questionable as for some period there was no male in the herd.

REFERENCES

1. Singh, Harbans (1955) ... Gosamvardhana, 3, 16.
2. Warner, J. N. (1958) ... Dairying in India. Macmillan & Co., Ltd., Calcutta.
3. Manager, Government of India ... Rep. Marketing of milk in India and Burma, 1943.
4. Rangappa, K. S. and Achaya, K. T. (1948) ... The Chemistry and Manufacture of Indian Products. The Bangalore Printing & Publishing Co, Ltd., Bangalore.

REFERENCES

1. Feldman, W. H. (1932) ... Neoplasms of Domesticated Animals. W. B. Saunders Co., Philadelphia & London, 410 pp., 193 Figs.
2. Frank, E. R. (1953) ... Veterinary Surgery. Revised Edition. Burgess Publishing Co., Minneapolis, Minn., U. S. A., 302 pp., 277 Figs.

Abstracts

Acute Theileriasis in Sheep in Hyderabad (India).—By RAGHAVACHARI, K. and MADHAVA KRISHNA REDDY (1959). *Indian J. Vet. Sci.*, **29**, (4). 1-12.

Studies made in an outbreak of acute Theileriasis in sheep in Hyderabad, as well as, in transmission experiments in the laboratory were described by the authors. The incubation period ranged from 12 to 24 days with an average of 16.31 days. The minimum quantity of blood needed for giving the infection was 1 c.c. intravenously. The affected sheep were off feed with high fever ranging from 104 to 108°F. The superficial lymphatic glands stood out prominently due to marked increase of their size. The animals became very weak and exhibited dyspnoea and tottering gait. In the last stages they lay prostrate. Some had diarrhoeic motions. The blood showed Theilerial parasites and Koch's blue bodies. The monocytic count rose up to 60-70% with a severe fall in the count of polymorphs and lymphocytes to about 10-15%. A large percentage (74.2%) of the infected sheep died. On post-mortem the superficial lymphatic glands presented a very characteristic feature by revealing on the surface about 24 haemorrhagic areas of the size of a split pea. Spleenomegaly, oedema of the lungs and oedema as well as ulceration of the abomasal surface were noticed. Subcutaneous administration of Sulphamezathine 33½% gave encouraging results in the treatment trials. Though the pathogenic species of *Theileria* of sheep — *T. hirci* is known to infect sheep as well as goats, the strain from Hyderabad was found not infective to normal and splenectomised goats. Hence the parasite was considered as a variant of *T. hirci*, and was named as *Theileria hirci* var *deccani*.

V.S.A.

"Q" Disease in Chickens: Studies at Walleceville Animal Research Station, Australia have indicated that for the last four years there have been numerous cases of a disease in young chickens which has been designated as "Q" disease because all attempts to determine its cause have been unsuccessful. It occurs in well grown thrifty chickens aged from 9 to 30 days. Affected chickens die suddenly in a convulsion with the head thrown back and legs outstretched.

On post-mortem examination the most striking feature is an excess of clear fluid in the sac surrounding the heart, slightly enlarged liver with haemorrhages around the borders of the liver, and enlarged pale kidneys. The gizzard and the first part of the intestine usually contain a blackish fluid.

Studies at the above Research Station to date do not indicate that the disease is infective, though there have been some field evidence that the condition occurs in certain lines of chickens. The possibility of its being due to some nutritional condition has been investigated, but this approach has not been successful, though it would still seem to be the most likely source of the trouble. Originally mortalities up to 10% have been recorded but the late report shows that the mortality rates are increasing, up to 25%.

(New Zealand Journal of Agriculture, July, 1961.)

B. PANDA.

Influence of Iodine On Fertility: I. I. Saderi (U.S.S.R.) investigated the influence of iodine on the fertility of farm animals. He found that fertility depends to a large extent on the iodine content of both males' and females' cells which are concerned in reproduction. On farms with low fertility of cows, the sperms of the male were lower in iodine than on farms with high fertility. On the administration daily of 50 mg. potassium iodide per bull, the iodine content of the bull's sperms multiplied and the fertilized ova contained 2.5 times more iodine than the unfertilized ova. He has also shown that the hatchability of the chicken's eggs was increased when they were put in a 0.1% solution of iodine for 1-1½ minutes.

(From a report by Dr. R. Seiden, Feedstuffs, September 2, 1961).

B. PANDA.

A Formula For Antibiotic Determination: Microbiological methods for the determination of the activity of the antibiotics in feedstuffs are time-consuming. A. S. Borosdina, a Russian scientist, found that 50 c.c. of a mixture of 5% 4N hydrochloric acid, 65% acetone, and 30% water suffice to extract the antibiotics from a sample of 5 grams. The extract is then colorimetrically investigated and its antibiotic content determined according to the following formula:

$$\frac{50 \times \text{activity (determined)}}{a \times b} = \text{units per gram}$$

In this formula "a" represents the amount (in c.c.) of solvent mixture used and "b" is the amount (in grams) of the sample investigated.

(From a report by Dr. R. Seiden, Feedstuffs, September, 2, 1961).

B. PANDA.

Removal of Strontium 90 from Milk:—A method for removing strontium 90 from milk has been developed by the joint work of Agriculture Research Service, Atomic Energy Commission and Public Health Service of the United States, to assure a safe and palatable milk supply in the event of a nuclear attack. It is being tested now on a pilot plant basis at USDA's Agricultural Research Center, Beltsville, Maryland.

The test equipment is similar to that in a very small milk plant, except that pipes, or columns, containing an ion-exchange resin have been added. To remove the strontium, the cold raw milk is treated with dilute citric acid and passed through the column. The resin removes about 98% of the radioactive element. Action of the resin is similar to that of chemicals used to soften hard water. After the strontium 90 is removed, the milk is treated with dilute potassium hydroxide to neutralize acid, then pasteurized and homogenized. Water added with the acid and alkali is removed by flash heating the milk in a vacuum chamber. These treatments do not noticeably alter flavour. Pure milk run through the experimental pilot plant to standardize the procedure has been proved as palatable as commercial market milk. Removal of 98% of strontium would make milk one of the safest foods during emergencies.

(Agricultural Research, Sept., 1961)

N. SATAPATHY.

Iron in Water Causes Egg Spoilage:—Washing eggs in water of high iron content 5 to 10 parts per million, increases the rate and extent of spoilage. This has been reported by J. A. Garibaldi and H. G. Bayne at USDA's Western Utilization Laboratory, Albany, California. Research shows that wash water containing excess iron carries this iron through the shell and shell membrane into the inner egg tissue. Here, iron reverses the protective action of the egg's conalbumin—the iron binding protein in egg white, and accelerates spoilage. Earlier studies show that conalbumin normally protects eggs from *Pseudomonas* family of bacteria—a prevalent cause of egg spoilage. Conalbumin chemically binds normal amounts of naturally occurring iron, making it unavailable to these microorganisms, which need iron for their growth. Bacteria responsible for such spoilage are *Pseudomonas fluorescens* and *Pseudomonas ovalis*. These organisms cause spoilage known as fluorescent sour (commonly called *Pseudomonas* rot) in shell eggs. This common type of spoilage can be detected by candling eggs with ultraviolet lamps, which reveal the bright blue-green fluorescent pigments excreted by the bacteria during their growth.

(Agricultural Research, May, 1961)

B. PANDA.

Worm Tissues Lived Weeks in vitro:—Tissues from swine roundworms have been kept alive 7 weeks in test tubes by the Agricultural Research Service parasitologist D. J. Doran at USDA's parasitology laboratory, Beltsville, Maryland. This unique accomplishment provides a way to study the metabolism of parasitic tissue. Such studies may provide better understanding of means and ways to combat animal parasites. His proof that roundworm tissues can remain alive and bacteria free in test tubes also means studies may now be made to see if viruses will multiply within parasite cells. If so, the question whether viruses can be biologically transmitted by internal parasites may be answered. Most round worm tissues, intestinal and uterine, died after 4 or 5 days. Tissue taken from the tip of the ovary of the worm, however, remained viable upto 46-49 days. He proved the life of the cells by using a neutral indicator, phenol red, in the nutrient medium. The indicator turned yellowish orange as the metabolizing cells produced acids, causing the pH to change.

(Agricultural Research, October, 1961)

B. PANDA.

News and Views

English and the Sciences:—Dr. P. V. Cherian, Chairman of the Madras Legislative Council, made a strong plea for retaining English as the permanent medium of instruction for the sciences. "Medical education is highly specialised and complicated" he said "and linguistic fanaticism should not lead doctors getting stranded without an adequate knowledge of the advanced sciences. National pride might dictate that we should use our own language, but national pride must not conflict with national interest."

* * *

Semi-Doctors:—Dr. Cherian said lowering the standard of medical education would be a crime against humanity and would spell disaster. Medical education, he declared, should not be tampered with by people who were not experts in the subject. "Hindu", Madras. 6-11-61.

* * *

Dr. Radhakrishnan in a message broadcast on the eve of the Gosamvardhan Day said "Any development plan for welfare of the nation as a whole should include the well-being of its cattle wealth". Let people realise both are inter-dependent.

* * *

Better to know than not to know at all:—Dismissing a writ petition, His Lordship Mr. Justice G. R. Jagadisan of the Madras High Court observed "Though as a general rule, seniority may facilitate and help promotion, suitability, fitness and merit play a larger part. No civil servant has claim to ask for promotion as of right and the giving or refusal of promotion is a matter within the exclusive discretionary domain of the executive authorities concerned in the matter".

Leather Waste:—A process for the manufacture of leather boards from tanned leather shavings and trimmings, discarded in shoe factories and tanneries has been developed at the Central Leather Research Institute, Madras. The boards can be used as in-soles for shoes. About 3000 tons of leather trimmings available annually are discarded as waste. It is estimated that nearly 25 lakhs worth of leather boards can be produced from it. *Commerce* 18, Novr. 1961.

A wise man speaks:—Mr. Aldous Huxley said recently in Madras "Technology is advancing at headlong speed and that man is far from prepared socially for this speed. The bewildering speed of its advance has a deadly impact on society". Is India on the right path?

A Handsome Tribute:—President Kennedy said at a Press Conference recently, after his talks with Prime Minister Nehru that he did not know any figure in the world who was more committed to individual liberty than Mr. Nehru. He further added "I have a high regard for the Prime Minister and it became higher still during our conversations". That is from the first citizen of that land of liberty. How does an average American feel? He seems to have said "Prime Minister Nehru is the greatest man in the world to-day".

South African Horse Sickness:—"1075 horses have died of South African Horse Sickness in 23 districts in Madhya Pradesh" reads a press message. This dreadful disease appears to be establishing itself firmly in this country also. Let us fight it out to the last ditch.

Cattle trade in Mysore:—The Agricultural Minister of Mysore told the Mysore Assembly that over 22,000 families were engaged in the cattle breeding industry in the State and the annual turnover of the cattle trade was near about Rs. 197 crores. He added that proposals for establishment of Feed mixture plants in all suitable district centres and silo-pits were under way.

Indian Students abroad were invited by Prime Minister Nehru to return to India after completion of their studies and not to remain abroad. "They might be better off financially abroad" he said "but they would miss the adventure of building up a revolutionary India whose face is changing after centuries of stagnation".

Mr. Nehru on Research:—"A country has to be judged by the research work it does" said Mr. Nehru, speaking at a Medical Conference recently. Let the profession be up and doing. We want honest piece of research and not the counterfeit variety which struts the land sometimes in false glory. Such work is bound to be exposed sooner or later.

British Justice:—"Mrs. Sarah Heath, daughter of Prime Minister Harold Macmillan was fined £78 at Maimebury on November 22, on each of two offences of using an unlicensed automobile and making a false declaration for a vehicle licence. Mrs. Heath said that she signed the licence application form without reading it. She denied any intention to defraud." *Hindu*, 24-11-61. Where is India in such matters?

The extent of American Loan:—Mr. R. M. Nixon in a letter to the "Hindu" discloses the fact that America has given India loans and grants to the tune of three billion seventy-two million dollars since India became independent! Staggering, is it not? *Hindu*, 19-11-61.

Dr. C. I. John, G.M.V.C., A.I.D.I.:—We are glad to note that our popular Joint Secretary and Treasurer of the Indian Veterinary Association, Dr. C. I. John, has been promoted as Chief Veterinary Officer, of the Corporation of Madras. We offer our hearty felicitations to him and wish him success in his new assignment, which is indeed a responsible one.

Dr. D. R. Marwaha, B.V.Sc., M.R.O.V.S.:—We are happy to learn that Dr. D. R. Marwaha has been appointed as the Joint Director of Veterinary Services in West Bengal. We most heartily congratulate him and wish him all success in his new sphere of work.

Dr. M. S. Das, B.Sc., M.R.O.V.S., M.S.:—We are happy that Dr. M. S. Das has been appointed as the Principal of the Bengal Veterinary College. We most heartily congratulate him and wish him all success in his new sphere of work.

Dr. Umesh Chandra Misra, B.Sc., M.R.C.V.S.:—We regret to record the sad demise of Dr. U. C. Misra at Meerut on 4-4-61. He was a Colonel in R.V.F.C. and was serving at the R.V.F.C. Centre and School at the time of his death. He was a highly popular Army Veterinary Officer.

* * *

Dr. P. Subbsrayudu, We regret to record the demise of Dr. P. Subbarayudu, G.M.V.C., Retired District Veterinary Officer of the erstwhile Madras State at Madras on 7-11-61.

Association News

The Indian Veterinary Association

**Proceedings of the meeting of the Managing Council held on
3-12-61 at 10 A. M., at Hotel "Dasaprakash, Madras-7.**

Members present :—

Dr. T. Vinayaka Mudaliar, President I. V. A., and
Editor I. V. J. (in the chair).
,, V. S. Alwar, General Secretary, I. V. A., and
Associate Editor, I. V. J.
,, C. I. John, Jt. Secretary and Treasurer, I. V. A.

1. Minutes of the last meeting held on 26-3-61 at hotel "Ashoka" Madras were read and confirmed.

2. As no reply has so far been received from the I. C. A. R. to the resolution passed at the last meeting of the Council on the question of an annual publication grant for the *Indian Veterinary Journal*, the Secretary was requested to remind the I. C. A. R. about the same.

3. Read the D. O. letter of the President to the Principals of all the Veterinary Colleges in India on the enrolment of student subscribers to the *I. V. J.* The Council looks forward to a good response from all the colleges.

4. Read the representations made by the President to the Government of Madras and to the Madras Corporation for the assignment of a site to put up a building for the *I. V. J.* as well as the replies received. The President was requested to pursue the matter further.

5. Read the reply sent by the President to the Government of West Bengal for their communication justifying the transfer of the Animal Husbandry Section from the Veterinary Department to the Directorate of Dairy Development. Read also the Editorial in *I. V. J.* on the question. It was decided to defer further action for the present as the West Bengal Veterinary Association was pursuing the matter.

6. Read the reply of the Government of Madras for the resolutions passed at the 14th All-India Veterinary Conference at Calcutta. Resolved to communicate the reply to Resolution No. 7 to the Madras Veterinary Association for further action.

7. Resolved to remind the Secretary, Indian Council of Agricultural Research about Resolution No. 10 passed at the last meeting of the Council on the nomination of the General Secretary Sri V. S. Alwar as a Member of the Interim Indian Veterinary Council in the vacancy caused by the resignation of Rao Bahadur V. R. Phadke.

8. Read the rules drafted for the award of Rao Bahadur R. Swaminatha Iyer Memorial Prize by the members of the Committee appointed for the purpose. The final draft based on the suggestions of the members of the drafting Committee was approved. The General Secretary was authorised to release the rules for publication in the *I. V. J.* It was also resolved to give effect to the rules from January 1962.

The Council placed on record its grateful thanks to the following members of the drafting committee for the help rendered in the finalisation of the rules :—

1. Dr. Bertie A. D'Souza, Principal,
Madras Veterinary College, (Convenor)
2. ,, M. N. Menon, Director of Animal Husbandry, Kerala,
3. ,, D. R. Marwaha, Jt. Director of Veterinary Services,
West Bengal.
4. ,, P. S. Rajulu, Principal, Andhra Veterinary College,
Tirupati.

9. Read the correspondence with the Secretary-Treasurer, World Veterinary Association on the affiliation of the Indian Veterinary Association to the World Veterinary Association. The Secretary was asked to get further clarification on the financial involvement.

10. Read the letter from the Punjab Government about the recognition of the Punjab Veterinary Association. The General

Secretary was requested to communicate a copy of the letter to the Punjab Veterinary Association for taking further action.

11. Read the renewed appeal of the President to the members of the profession for contribution to *I. V. J.* Reserve Fund. It was resolved to remind the State Associations about the earlier communications to them for a collection of a minimum of Rs. 1500/- from each State and to request them to make vigorous efforts towards that end as the response so far was far from satisfactory.

12. The Council ratified the upgrading of the post of the second clerk in the office of the *I. V. J.* to that of an Accountant on a starting salary of Rs. 100/- per month from 2-11-61.

13. Read the correspondence about the ensuing 15th Indian Veterinary Conference. It was decided to consider the report of the General Secretary and that of the Editor, *I. V. J.* intended for presentation at the conference at the next meeting of the Council.

5-12-61 }
Madras }

V. S. ALWAR,
General Secretary.

The Indian Veterinary Association THE RESERVE FUND

An event of great importance to the Veterinary profession in India, took place in August 1924. It was the birth of the *Indian Veterinary Journal*. Circumstances were positively hostile and yet the profession took that bold step and the lion-heartedness of the early pioneers cannot be too highly praised. Ever since then, the *I. V. J.* has toiled hard under very adverse circumstances. The *I. V. J.* lives to-day so that the profession could prosper and Science advance.

And now the hat is sent round so as to place this journalistic venture on a sounder and firmer basis. The *I. V. J.* is a priceless possession of our profession. It has placed the Indian Veterinary Surgeon, on the map of the scientific world. Just pause and ponder over, how much we owe to the *Journal* both individually and collectively. Is it too much then to expect the profession to respond to the appeal issued for a Reserve Fund? We hope not.

Some enquiries have come to us asking us to indicate the extent of help expected. We do not want to put the members of the profession to any undue financial strain in these hard days. At the same time, a

certain amount of sacrifice is needed to make this fund a great success, so as to make it worthy of our profession. So we feel that the following scale of contribution will be quite reasonable. It could even be paid in two or three instalments.

Class I Officers	...	Rs. 100/- and above.
Class II Officers	...	Rs. 50/- and above.
All others	...	Rs. 25/- and above.

It is our ambition that no Veterinary Surgeon in this land should remain without contributing to this fund. Brick by brick, this great edifice of ours should begin to rise higher and higher. On the success or otherwise of this venture, the solidarity of our profession depends. "Pay and Prosper" is the slogan we pass on to the members of our profession.

Jai Hind!

T. VINAYAKA MUDALIAR,
Editor, *The Indian Veterinary Journal*.

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THE 15th INDIAN VETERINARY CONFERENCE AT MATHURA

Bulletin No. II

1. In order to suit the convenience of the President of the Conference, the dates of the Conference have been changed to 29th, 30th and 31st January 1962. Delegates are requested to make a particular note of this change in dates. But there is no change in the venue of the Conference. It will be held at Mathura under the auspices of the U. P. Veterinary Association.
2. Shri Lakshmi Sahai, M.Sc., M.R.C.V.S., Animal Husbandry Commissioner with the Government of India, has once again been requested to preside over the Conference for the third time in succession and he has graciously consented to do so.
3. The time and place of the Conference with other details will be furnished in the invitation to be issued as well as in the January

1962 issue of the Indian Veterinary Journal, which will be released a little in advance of its scheduled date.

4. As already announced the Delegation fee for ordinary members is Rs. 5/- each and for the Reception Committee Rs. 10/- each for ordinary members and a minimum of Rs. 25/- each for special class of members.
5. Free accommodation is being arranged for all the Delegates; but the actual boarding charges will have to be met by them. Delegates who intend attending the Conference with families are requested to intimate the Conference Secretary sufficiently early for necessary arrangements.
6. The necessary Railway concession forms are expected to be ready for release in the first week of January 1962. They can be obtained either from this office or the office of the Conference Secretary or from the Secretary of their respective State Veterinary Association.
7. The session promises to be a great success. With New Delhi, Haridwar, Lucknow, Brindavan, Agra and even Varanasi (Banares) so closeby, this is a chance which should not be missed. The old City of Mathura born and brought up from an epic age, is calling. Let us respond to her call.

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V. S. ALWAR,
General Secretary,
The Indian Veterinary Association.

THE XXI U. P. VETERINARY CONFERENCE and THE XV INDIAN VETERINARY CONFERENCE

NOTICE

Members are requested to note the slight change in the dates of the Conference. Both the above Conferences will be held at Mathura on the 29th, 30th and 31st January 1962.

Shri L. Sahai, M.Sc., M.R.C.V.S., Animal Husbandry Commissioner with the Government of India has kindly consented to preside.

The time and place of the Conference at Mathura and other details will be intimated in due course through special bulletins and through the Indian Veterinary Journal.

Professional papers and Resolutions to be moved at the Conference are to be sent sufficiently early so as to reach the undersigned not later than 15th January 1962.

All remittances are to be made to Sri K. A. Raza, Treasurer, Veterinary Conference, Biological Products Section, Badshabagh, Lucknow, U. P.

Mathura will just then be getting out of its chill weather; but it is better to come prepared with warm clothes and rug.

Arrangements for visits to places of interest are under way and the Delegates will duly be notified about the details on arrival.

Volunteers will meet the Delegates arriving by all important trains but previous intimation will be helpful.

Lodging is free for all Delegates; but boarding charges will have to be met by the Delegates.

H. P. KAPOOR,
General Secretary,
U. P. Veterinary Association.

Review

A Laboratory Manual of Milk Inspection. By A. C. Aggarwala, B.Sc. Hons. (PB), M.R.C.V.S., (Lond.), Lt. Col. A. I. R.O., F.V.S.I., (Rtd.) and Radhey Mohan Sharma, L.V.P., P.G. (Weybridge, U.K.), P.V.S. 1961. 345 pages. Rs. 6. Publishers. Asia Publishing House, Bombay.

The Laboratory Manual of Milk Inspection by Aggarwala and Sharma is one of the few books written by Indian authors on this subject. The fact that the Manual had gone through four editions marks its usefulness. The present edition is an improvement in its content and presentation over the previous ones and will serve as a useful reference book both to the graduate and under-graduate students.

Although milk is important in human diet, it can also be a positive danger to public health if its quality is not controlled and its freedom from pathogens is not ensured. In these days of rapid dairy development in India, milk assumes a national importance, requiring urgent and accurate supervisory measures to ensure its wholesomeness to consuming public. The Manual, by affording complete working methods of such measures, serves eminently to fulfill this task. The first eight chapters on general dairy husbandry and physiology of lactation provide necessary prelude to the students for the more explicit understanding of the experiments described subsequently. Chapters nine and ten incorporate different available methods including Official tests. However, full justice within the limited space of the Manual cannot be met with to a vast and growing subject as Milk Inspection. The Manual will be more useful, if tests on Microbiology of milk and its products are expanded in number and in details with a special emphasis on the detection of pathogens. While detailing the experimental procedure, if explanatory notes are given, it will greatly help the student to understand the test and appreciate its significance. The Manual may more fittingly be redesignated as "A Laboratory Manual for Inspection of Milk and Milk products" since it includes tests on products also. Further, the theoretical details which have usurped the much needed space of the Manual, may profitably be deleted to incorporate additional tests and expand the existing ones.

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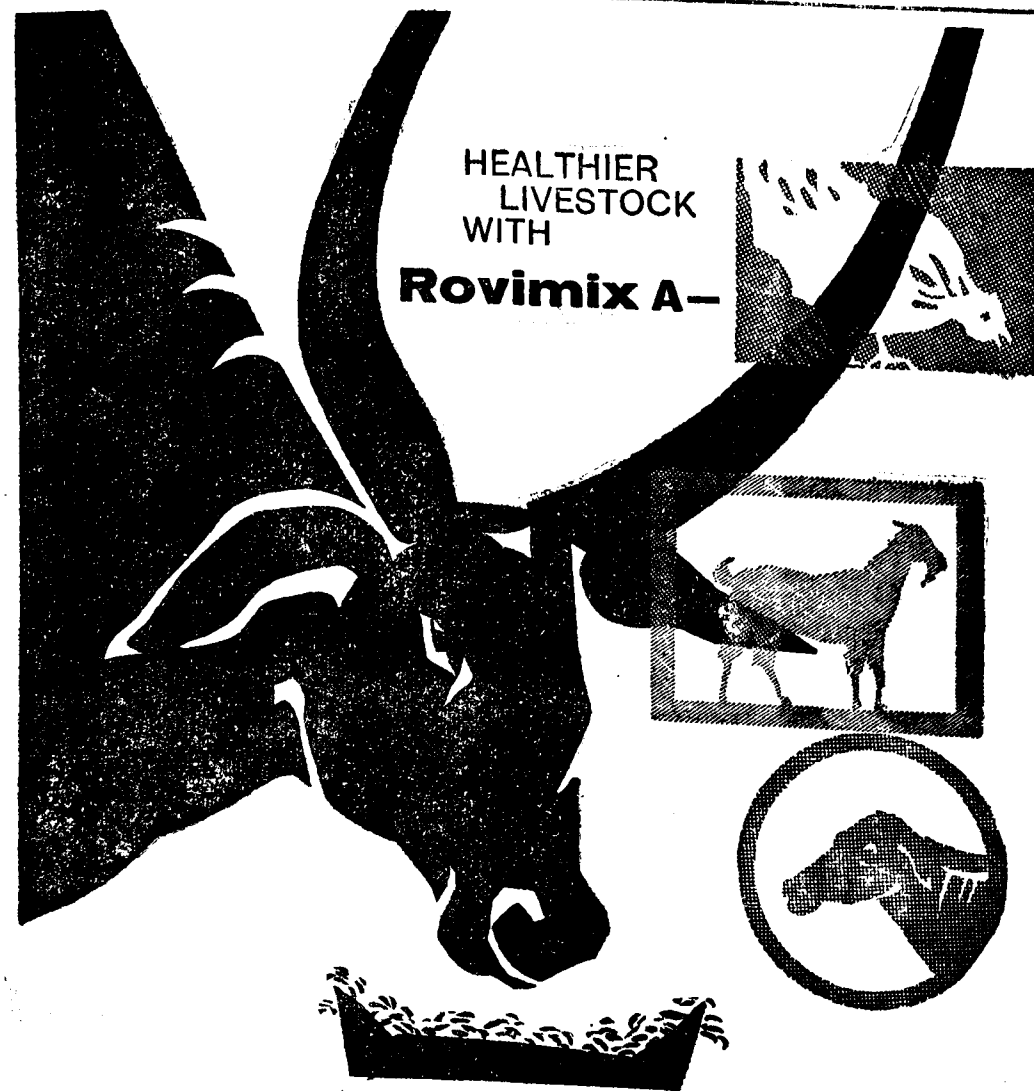
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