

Horses and Mules

by WILLIAM JACKSON

IN 1947 Americans owned 8 million horses, the smallest number in 75 years. Nevertheless, those of us who believe there will always be a place for horses in the rural scene have gone ahead with tests and experiments to breed better horses and to learn more about them. Institutions that have taken the leadership are the agricultural experiment stations in California, Michigan, Mississippi, Missouri, Indiana, Montana, Tennessee, Wisconsin, Utah, Kentucky, and Minnesota; the Army Remount Service; and the Department of Agriculture, chiefly at the United States Morgan Horse Farm at Middlebury, Vt., and its Range Livestock Experiment Station at Miles City, Mont.

Interesting experiments have been started at the Michigan station to produce a handy-size farm horse for comparison with heavy draft horses in adaptability to general farm work, market demand, and size. Mares of draft breeding, mainly Percheron and Belgian, are being bred to Arabian, Thoroughbred, and Morgan stallions. The fillies from these crosses will be bred back to stallions of the same light breeds, respectively, and later mated with draft stallions.

Another aim of the work in Michigan is to find cheaper ways to produce horses by using pastures as much as possible and eliminating feeding of grain, chore labor, and housing. Results indicate that both draft and light-type colts can be raised satisfactorily by keeping them out-of-doors on pasture in summer, and on uncut meadows and stacked hay in winter. Such colts reach full mature weights, and have better legs and feet than similar colts housed in stalls. When sold as yearlings or 2-year-olds, they are in somewhat rougher condition than stall-fed colts, and consequently tend to sell at slightly lower prices, but bring a higher net profit because of their lower cost to produce. Four fillies

raised outdoors have produced 12 colts in the 3 years since they were first bred as 3-year-olds, thus giving 100-percent colt crops for three successive seasons—an achievement in any stud.

Attention also has been given to developing practical means of measuring equine performance and utility. A series of preliminary tests with light horses at the Morgan Horse Farm developed a useful background of experience for such measurements, which Ralph W. Phillips, G. W. Brier, and W. V. Lambert have summarized in this way: The tests of speed and length of stride demonstrated significant differences between horses; horses tend to increase the length of stride during a test, indicating that records must be taken under similar conditions if individuals are to be compared; normal respiration and heart rates are difficult to obtain. A slight disturbance resulted in an increase. If normal rates at rest are to be obtained, they will probably have to be taken in the stall, at complete rest, and by someone with whom the horse is familiar. The extent to which respiration and heart rates rise during exercise and the rate of return to normal vary with the amount of exercise and also with the individual horse.

Tests at Middlebury

Based upon these observations, a series of tests has been devised through which all progeny of the Department's Morgan stud are measured in harness and under saddle at 3 years of age. Speed of walking and trotting and length of stride are recorded over a measured mile when the animal is pulling 60 percent of its body weight under harness and hitched to a two-wheel training cart, and again under saddle carrying 20 percent of its body weight. Endurance is measured by a trot over a 5-mile course, the horse being hitched to the cart, and, on another day, over an 11½-mile cross-country ride under saddle, during which each animal covers measured and marked portions of the ride at three different gaits, which add up to 4.7 miles at a walk, 5.7 miles at a trot, and 1.1 miles at a canter. For the 5-mile test, respiration and heart rates are taken before removing animals from their stalls, at the end of the test, and 5, 10, and 15 minutes thereafter. After these endurance tests, the animals are scored for signs of fatigue, ease of gaits from the standpoint of the rider, and other factors.

These tests should help us discover some correlation between characteristics like temperament and conformation, on the one hand, and speed, endurance, and other important performance qualities on the other; and help us to use the geneticist's tools of inbreeding and rigid selection to produce animals that can perform as we want them to.

The tractive dynamometer, an electrical instrument in which the pointer is deflected as a result of a force exerted between fixed and moving coils, is still the most practical instrument for measuring performance

in draft animals. It was first developed at Iowa State College. Its use has shown that the weight of a team is the most important factor in determining how much it can pull. But no reliable specific correlation has been found between body type and the animal's pulling ability.

After 9 years of observing pulling contests in Utah and southern Idaho, Milton A. Madsen, Harry H. Smith, and Ralph W. Phillips reported that the average body weight of all teams performing in nearly 2,500 entries was 2,872 pounds, and their average tractive pull was 2,385 pounds. These workers also summarized data from various sources on the amounts of tractive pull required to do different jobs on the farm, and discussed the relationship of results of the study to the ability of the horse to do farm work. Since dynamometer contests are almost all conducted for teams, to measure maximum pull rather than ability to work day after day, and are participated in by relatively few highly trained teams, these men concluded that the results now available are of little use in guiding breeding operations. They suggested that tests should measure walking speed, length of stride, and increase in heart and respiration rates of horses while doing definite amounts of work.

At the Missouri station, H. H. Kibler and Samuel Brody, working in cooperation with the Department, are attempting to establish indices for obtaining those measures. They are based on the assumption that heart and lung capacity are important factors, that temperament and will to work make a big difference, and that—on a given day—temperature, humidity, air movement, feeding, and handling vitally influence the animal's ability to work. The men at Missouri, using mules for experimental animals, have constructed an ergometer with a weight and pulley system mounted on a trailer. It measures the amount and speed of work done and eliminates the variables of grade and irregularities of surface on which the animal performs. Within the automobile pulling this trailer is mounted an open-circuit respiration apparatus that enables the animal being tested to breathe normal outdoor air and at the same time to be measured with respect to significant physiological responses.

New Knowledge About Feeding

Studies at a number of stations provide new information on the feed horses need. In tests with Percheron geldings, A. L. Harvey, B. H. Thomas, C. C. Culbertson, and E. V. Collins, of the Iowa station, showed that horses weighing about 1,700 pounds at light, medium, or heavy work probably do not receive enough calcium and phosphorus either in a maintenance ration of 3 pounds of oats and 20 pounds of timothy hay, or in the same ration plus sugar and dextrinized starch, which give energy.

At the University of California, C. E. Howell, G. H. Hart, and N. R. Ittner found that rations commonly fed to horses in areas where yellow

corn is not available are apt to be deficient in vitamin A, a deficiency that leads to night blindness. Accompanying that condition they also found a joint ailment that causes lameness, which they later discovered is not due to vitamin A deficiency. In speculating on the significance of that finding, Dr. Hart pointed out that green feed may contain a vital dietary factor that helps prevent lameness. He recalls that in the days of horse cars, the car horses had to be taken out of regular service for a rest on summer pasture from 2 to 7 weeks, and that British horse trainers provide green feed near their training stables to prevent lameness, which is so fatal to success in racing.

Tests at the Army Remount Veterinary Research Laboratory at the Front Royal Remount Depot in Virginia showed that the use of riboflavin in rations effectively prevented periodic ophthalmia, or moon blindness, a malady responsible for more blindness in horses than all other causes combined. Forty milligrams of crystalline riboflavin, a member of the vitamin B complex, was fed to each horse daily with the grain ration, at a cost of a cent a day. From November 1943 to June 1944 no cases of moon blindness occurred among 130 horses that received the supplement, but new cases occurred annually at the rate of 109 per thousand horses among those not receiving it. Riboflavin is now given all horses at the depot. Whether ophthalmia is purely a nutritional disease is still an open question, however. Further research is needed.

We have also learned a great deal about reproductive processes in stallions and mares. V. R. Berliner, at the Mississippi station, reported that stallion and jack sperm cells stay alive inside the female for only a day or so, and for only a matter of hours in storage without the addition of some life-prolonging and diluting medium known as a diluter. Bull sperm survive 2 days or more in the female, and longer outside. The differences in longevity between the stallion or jack sperm cells and bull sperm cells are apparently due to the high glucose content of bull semen that the sperm convert into lactic acid. The acid depresses the life processes of the spermatozoa and brings about a resting stage from which they can later be restored to motility. Semen of stallions has a relatively high salt content, which acts as an overstimulant to the sperm and causes their rapid exhaustion and death.

Dr. Berliner evolved a gelatinized glucose-tartrate egg-yolk diluter with which it was possible to effect pregnancies in mares with 48-hour-old semen. However, he advocates the use of semen preferably not more than 6 to 8 hours old. The requirement that semen be fresh would limit the practice of artificial insemination of mares to relatively small areas, or to points having good air-transport connections.

Dr. Berliner points out further that artificial insemination, although sometimes useful, cannot increase pregnancies over the natural capacities of the mare and the stallion, and that the highest percentages of

pregnancies are probably obtained by turning stallions and mares together on pasture or range. He found also that sperm production by stallions and jacks declined when the animals became overfat, and that sperm produced by sires fed on corn were of low viability, thus verifying an old saying, "There are no foals in corn." In his experiments, good pasturage overcame the bad effects of an overfattening grain ration, which was also low in vitamin content and in mineral balance.

Experiments at the Michigan station throw light on at least one of the qualities of pasture that make it a valuable feed for breeding animals. It was found that blood ascorbic acid values for good breeders, in mares of both heavy and light breeds, were significantly higher than those of poor breeders, and that the ascorbic acid content of the blood of mares varied directly with their access to good pasturage. In the spring before the mares were turned on pasture, .09 mg. of ascorbic acid was found per 100 ml. of blood plasma. This value rose to .17 mg. on spring pasture, fell to .11 mg. on summer pasture, rose again to .14 mg. on fall pasture, and fell to .11 mg. during the winter. Injections of ascorbic acid (vitamin C) into a 3-year-old Belgian stallion whose semen showed almost an absence of sperm and no sperm motility, raised the sperm count to between 2 billion and 4 billion and the motility to approximately 70 percent activity. Later this same stallion was fed ascorbic acid by capsule, at the rate of one gram daily, with equally good results.

Good results were had at the Mississippi station from using the synthetic estrogen stilbestrol in inducing heat in mares that were shy breeders. The treatment induced heat 5 days after injection. Ovulation followed in 4 or 5 days. The treated mares were bred on the second and fourth day of heat, and became pregnant.

Many horse breeders believe that the surest time to get a mare with foal is to breed her during foal heat, which occurs on about the ninth day after foaling, and lasts 1 day. Dr. Berliner strongly advises against this practice on premises where breeding diseases resulting in abortions and losses of newborn foals have occurred. At this time, the mare's uterus usually has not had time to recuperate from parturition, and is much more vulnerable to infection. Records kept at large breeding farms show higher percentages of navel ill, joint ill, and other prenatal diseases in newborn foals when the pregnancies occur during foal heat than when the mares are bred at later heat periods.

Other findings also confirm that only strong, healthy mares should be bred during foal heat. Dr. Hart and his colleagues in California learned that pregnancies that required a large number of services per conception were followed by long gestations and resulted in high percentages of foals born dead—another indication that the mare's sex organs may not be entirely sound for some time after parturition. A competent veterinarian should examine the placenta of each foaling

mare to determine the best time to mate her, especially if there are any signs of infection or other abnormal conditions.

Foalings in winter and early spring were found to follow longer gestation periods than did summer and fall foalings, probably because of the lower nutritive value of feed during the seasons of scant pasturage at the time the fetus is at a rapidly growing stage. A healthy foaling mare is one that shows no important necrotic lesions of the placenta, has not retained her placenta longer than 6 hours, has a healthy vigorous foal, and has not carried her foal longer than 340 days when foaling from December to May, nor longer than 334 days for June-to-November foalings.

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FOR FURTHER READING

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ALSO, IN THIS BOOK

- Breeding Better Livestock, by Ralph W. Phillips, page 33.
- New Ideas in Feeding, by N. R. Ellis, page 95.
- Artificial Breeding, by Ralph W. Phillips, page 113.