

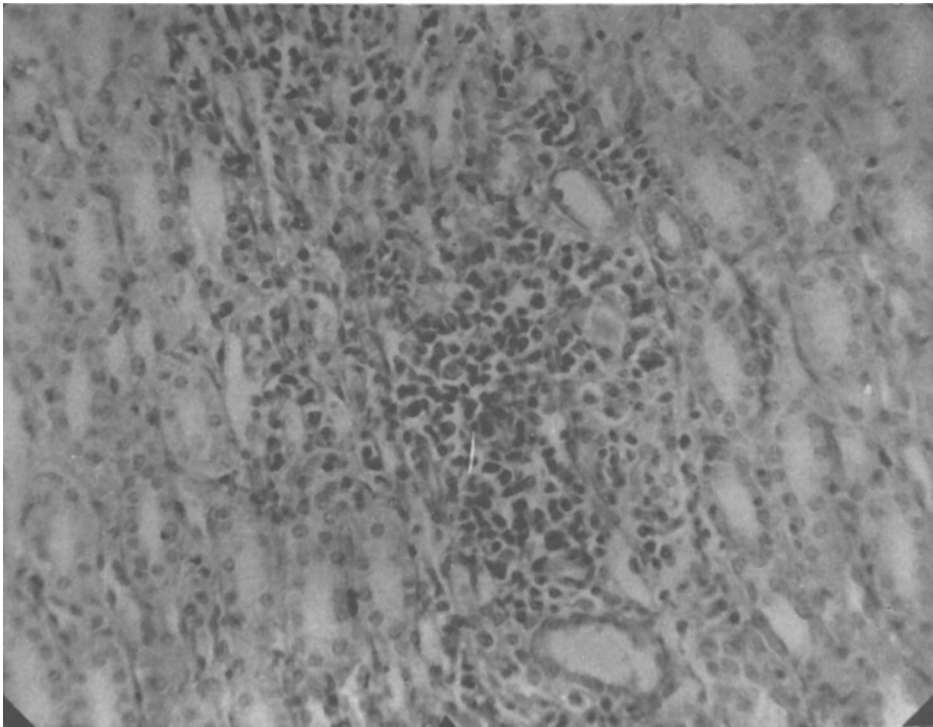


FIG. 2. Kidney from dog after recovery from infectious hepatitis. Note cellular infiltration.

seen between tubules normally occupied by peritubular capillaries (Fig. 2). No evidence of collagen formation or fibrosis was found.

Conclusions. The virus of infectious hepatitis of dogs has been recovered from the urine at intervals of time extending from 3 days after inoculation to at least 161 days afterwards. Inasmuch as blood, saliva, nasal wash-

ings and feces from apparently recovered dogs did not contain virus, it appears that infected urine is important in the spread of the disease. Finding a focal interstitial nephritis indicated that the source of virus eliminated in the urine is the kidney.

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Cutaneous Sarcoma-like Lesions of the Horse Caused by the Agent of Bovine Papilloma.* (18750)

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While studying the transmissibility of a

cutaneous papilloma of the horse(1) it was found that the horse would respond to the agent of bovine papilloma. The response involved connective tissue rather than epithelial tissue and a sarcoma-like tumor was produced

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1. Cook, R. H. and Olson, C., *Am. J. Path.* in press.

in the skin of the horse. This unusual result constitutes the basis for this report. Papillomas or warts of the skin and oral mucosa occur in a number of different animals(2). Transmission of the disease from animal to animal occurs in nature and virus-like agents have been demonstrated in experimental animals(3). These agents have been regarded as active only in the same species of animals from which the material was obtained. While a number of the common laboratory animals have been exposed to infective material from different types of papillomas, we find no record in the available literature of exposure of the horse to bovine papilloma material.

The bovine papilloma material was obtained by biopsy from active spontaneous cases in cattle. The material came from 4 different outbreaks of the disease. In each instance the material was tested on susceptible calves and found capable of producing typical bovine papillomas. The inoculums were prepared by grinding papilloma tissue with saline solution (approximate ratio: 1 to 15). The supernatant fluid was used for inoculation after the coarser particles of tissue had settled. Both fresh and glycerinated material was used. Eleven horses (6 mares, 2 geldings, and 3 stallions) varying in age from 1 to 3 years were exposed. Inoculations, in duplicate, were made intradermally with about .01 ml of the prepared inoculum. Exposures were also made on scarified skin of 5 of the 11 horses.

Results. A small firm fibrous nodule could be detected at the point of intradermal inoculation in 12 to 27 days. These nodules increased in size at variable rates (Fig. 1 and 2). The nodules attained their maximum size (2 to 3 cm in diameter) in 30 to 50 days. The hair covering tended to disappear as these grew larger and sometimes the surface was devoid of epithelium, leaving a raw area. The nodules disappeared 100 to 150 days after

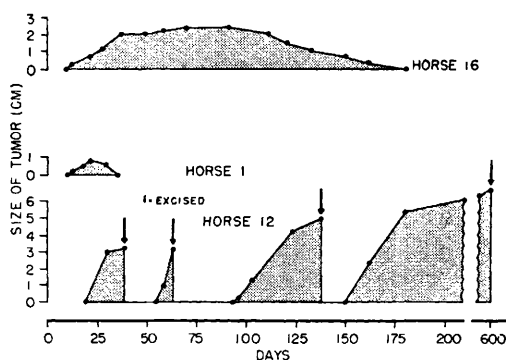


FIG. 1. Diagrammatic representation of rate of growth of sarcomas induced in skin of experimental horses. Each dot represents a point of observation. The record for horse 16 is typical of the results obtained. The record for horse 1 indicates a very small short-lived tumor in the skin of this animal, which was an unusual result. The record for horse 12 indicates unusually large size of the sarcoma induced in this animal and recurrence of growth following excision of the mass at 3 different times.

their appearance in most horses. The tumor lasted for more than 600 days in one horse (Fig. 1, horse 12). The other extreme was a horse in which the tumor lasted only 25 days and attained a maximum size of 1 cm in diameter (Fig. 1, horse 1). Only one horse (a 2-year-old female) failed to respond to the inoculation.

Attempts to inoculate onto scarified skin were generally negative. Small wart-like growths of brief duration occurred in only one of 5 horses thus exposed. Bacteria-free filtrate through a Mandler filter at about 10-lb pressure produced sarcoma-like tumors in one horse. These were smaller and of shorter duration than the tumors produced with unfiltered bovine wart material. Both fresh and glycerinated bovine wart material were active. Some glycerinated material that had been stored for 2 years was still active.

The sarcoma-like tumor induced in horse 12 grew rapidly. The 2 sites of exposure were close to each other and soon coalesced into one tumor mass (Fig. 3). The entire tumor was excised 3 times and rapidly recurred, each time growing a little larger than formerly (Fig. 1). A fourth attempt at surgical removal was made about 600 days after inoculation. This was again by simple excision. Examination of the removed tumor indicated

2. Feldman, W. H., *Neoplasms of domesticated animals*. W. B. Saunders Co., Phila., 1932, pp. 269-274.

3. Merchant, I. A., *Veterinary Bacteriology and Virology*, Iowa State College Press, 4th Ed., 1950, pp. 752-759.

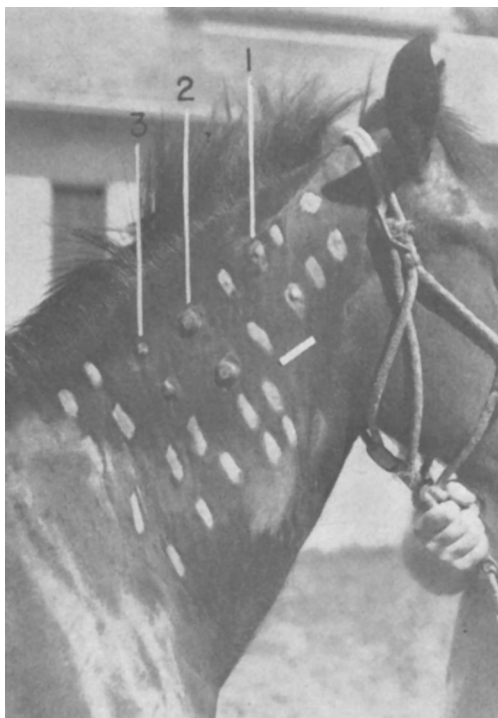


FIG. 2. Photograph of the sites of inoculation on skin of horse 16, 72 days after inoculation, at the points indicated by 1: the pair (vertical) of inoculations with filtrate from bovine papilloma material, 2: the pair of inoculations with ground bovine papilloma material, and 3: the pair of inoculations with experimentally produced material from horse 12. The other shaved areas were sites of inoculations with other materials.

that some active growth was present at the edges of the mass. Within a week there was some evidence of recurrence of the growth and debridement of the entire wound area was done with an electro-cautery. There was no recurrence following the last operation. Material from this growth was used to inoculate other horses and a similar tumor was reproduced. Generally, these nodules were somewhat smaller than the lesions induced with bovine wart material. The tendency to recur following surgical removal was noted in four other experimental horses. There was no evidence of acquired immunity since the horses have been susceptible to repeated exposure.

The sarcoma-like nodules were extremely firm and made up of irregular interlacing bundles of connective tissue fibers (Fig. 4). The appearance of the connective tissue cells varied somewhat from nodule to nodule and

also in different parts of the same tumor. In some areas they were stellate and rather loose. In other areas the nuclei were smaller, fewer in number, with relatively more collagenous cytoplasm in the cells. Mitotic figures were quite numerous in the more rapidly growing parts of the tumor and the tissue had a definite anaplastic appearance. In some sections there was an irregular infiltration with polyblasts and polymorphonuclear leukocytes due to a superimposed secondary bacterial infection. Growth of the tumor probably began where the inoculum had been placed. Growth was confined to the corium. It extended upward to the basement membrane of the epithelium and sometimes caused its destruction. There was no evidence of spread of the growth either as internal metastases or to other points of the skin of the experimental animals.

The pathological similarity between the experimental condition and the condition re-

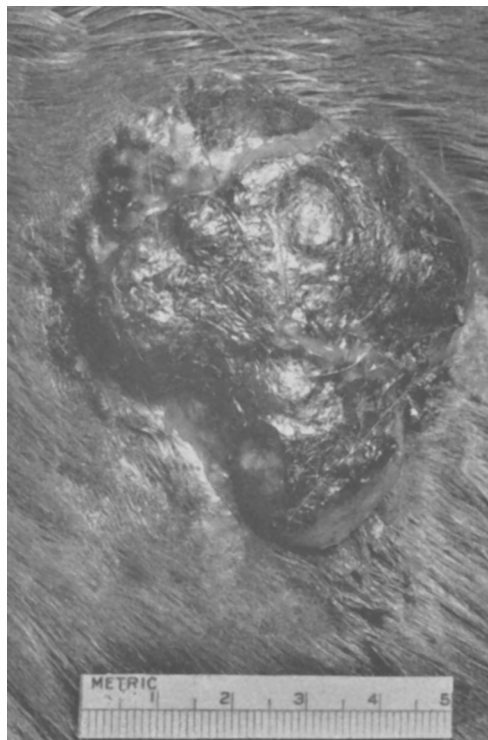


FIG. 3. The sarcoma induced on the skin of the neck of horse 12 with bovine papilloma material. This was the growth which recurred and was present 6½ months after inoculation and 50 days following last of three surgical removals of the mass.

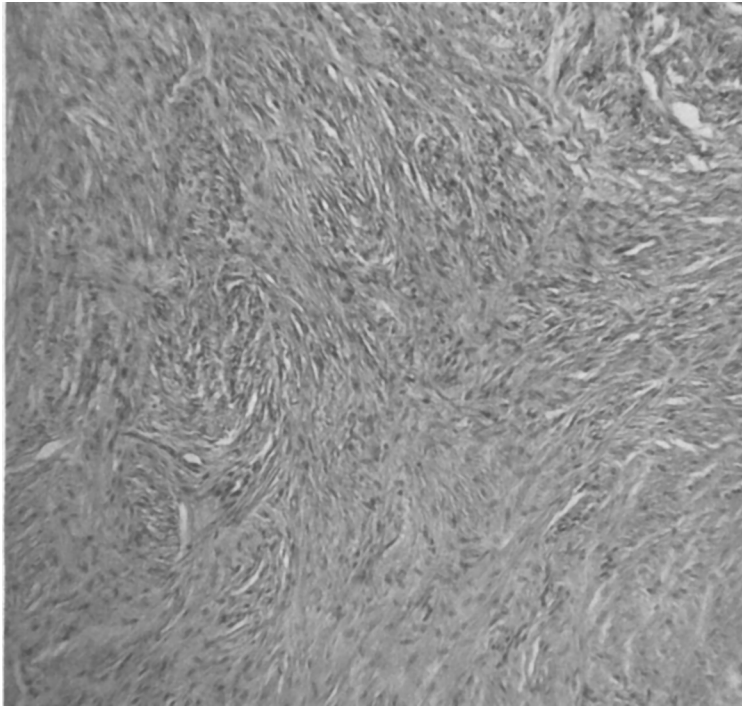


FIG. 4. Photomicrograph of tumor removed from horse 12, 600 days after inoculation with bovine papilloma material. The fibroblastic character of the growth with considerable collagenous cytoplasm is illustrated. Magnification $\times 120$.

ported as equine sarcoid(4,5) and "Schwann tumor"(6) is striking. Glycerinated material from one field case of equine sarcoid was placed on 4 "susceptible" horses. Growth like that from bovine wart material developed in only one horse at the 2 sites of intradermal inoculation. This is additional evidence of

similarity of the two conditions.

Summary. Material derived from spontaneous field cases of bovine papilloma of the skin was capable of causing a sarcoma-like lesion in the skin of the horse. The tumors so induced have some characteristics resembling equine sarcoid. The ability of an oncogenic agent to induce an epithelial tumor in one animal and to cause a new growth of connective tissue cells in another species is unique.

4. Jackson, C., *Onderstepoort J. Vet. Sci. and Animal Ind.*, 1936, v6, 1.

5. Olson, C., *Am. J. Vet. Res.*, 1948, v9, 333.

6. Montpellier, J., Badens, P., and Dieuzeide, R., *Rev. Med. Vet. (Toulouse)* 1937, v89, 216.

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Serologic Cross-Reactivity of Some Enterobacteriaceae Isolated in the United States with Cholera Vibrios. (18751)

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The identity of a microorganism is usually determined by morphologic, physical, biochemical and serologic studies. Especially in

the practical diagnosis of cholera vibrios fast serologic identification is much desirable, due to the character of the disease. Colonies