and aqueous extracts of brain although cross-reactions with liver and heart occur with some antisera. Witebsky and Steinfeld[3] and Kopeloff and Kopeloff[4] found that anti-brain sera react with alcoholic extracts of brain.

Witebsky and Szepsenewol[5] found the Forssmann antigen in chicks at 24 hours incubation. Krichevsky[6] could not detect the antigen before the fourth day of incubation but he used aqueous suspensions whereas the above authors used alcoholic extracts. By the sixth incubation day, the Forssmann antigen can be detected in desanguinated chicks but not in their blood.[7] The antigen occurs in both blood and tissues of the adult.[8] The organ antigen involved in the present study is probably not the Forssmann antigen since the activity of the antisera for tissue extracts was not removed by thorough absorption with adult blood, which contains the Forssmann antigen.

Burke *et al.*[9] presented evidence for two brain antigens, one occurring in embryos from 160 hours to at least 312 hours but not in adult brain, and a second from 260 hours incubation to the adult. Unless we may assume that the antisera used were perhaps too weak to detect the antigen in the earlier stages, it must be concluded that these authors were working with substances different from the ones involved in the present study.

Summary. Substances of common antigenic character occurring in brain, heart, liver, and muscle can also be demonstrated in the primitive streak and neurula stages of the chick embryo. These substances are distinguishable from the antigens of blood and yolk by absorption and precipitin tests and are apparently soluble in saline.

3 Witebsky, E., and Steinfeld, J., *Zentralbl. f. Bakteriol.*, 1927, **104**, 144.

4 Kopeloff, L. M., and Kopeloff, N., *J. Immun.*, 1947, **57**, 229.

5 Witebsky, E., and Szepsenwol, J., *C.R. Soc. Biol.*, 1934, **115**, 921.

6 Krichevsky, I. L., *J. Infect. Dis.*, 1923, **32**, 192.

7 Szepsenwol, J., and Witebsky, E., *C.R. Soc. Biol.*, 1934, **115**, 1019.

8 Boyd, W. C., *Fundamentals of Immunology*, 1945, Interscience Publishers, Inc.,

9 Burke, V., Sullivan, H. P., Petersen, H., and Weed, R., *J. Infect. Dis.*, 1944, **74**, 225.

16452

Infectivity of Murine SK Strain of Poliomyelitis Virus.*

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The history and characteristics of the murine SK strain have been described in several papers by Jungeblut and his associates.[1-5] One outstanding characteristic of the strain is its unusually high infectivity for mice, brain-cord virus suspensions rarely showing an ID_{50} titer under 10^{-7} by the intracranial route. This is in sharp contrast with the titers shown by the Lansing and other mouse adapted strains, but which, unlike the murine SK strain, still are paralytic for monkeys. In addition to its high infectivity by the intracranial route, Jungeblut found it infective

* Aided by the Howard Frost Poliomyelitis Research Fund.

1 Jungeblut, C. W., and Sanders, M., *J. Exp. Med.*, 1940, **72**, 407.

2 Jungeblut, C. W., and Sanders, M., *J.A.M.A.*, 1941, **116**, 2136.

3 Jungeblut, C. W., Sanders, M., and Feiner, Rose R., *J. Exp. Med.*, 1942, **75**, 611.

4 Sanders, M., and Jungeblut, C. W., *J. Exp. Med.*, 1942, **75**, 631.

5 Jungeblut, C. W., Feiner, Rose R., and Sanders, M., *J. Exp. Med.*, 1942, **76**, 31.

by the intranasal, intraperitoneal, intravenous and subcutaneous routes, by "gavage" and by feeding bread soaked in virus suspension.[1,3,4] Old mice proved less susceptible than young mice and virus cultivated in tissue explants less infectious than brain-cord passage virus suspensions.[4]

It was of interest to us to extend these observations and to attempt to determine the tissue relationships of the strain following given types of exposure. Its high ID_{50} suggested that its relationships might differ from those of low titer strains, in portal demands and tissue cell requirements for growth. Moreover, the extent of damage that a given strain may inflict on the nervous tissue of a given host appears to be related to a considerable degree to the number of virus particles it is able to generate within that particular host.[6] This present strain, for example, which is high titer for mice, induces in this animal a highly acute encephalomyelitic type of infection. In guinea pigs, however, in which it becomes a low titer virus, it induces a characteristic poliomyelitic infection without noteworthy cerebral involvement.[2,5,7] In other words, its inability to reproduce itself as freely in guinea pigs as in mice becomes associated with a distinguishable difference in CNS involvement. Such quantitative differences in virus production growing out of individual host factors suggest that there may be little relationship between the ID_{50} of passage strains for individual kinds of laboratory animals and the amount of virus generated in terms of the natural host—man. Although the murine SK strain has failed to show either immunological or pathogenic relationships to the initial monkey passage SK strain,[7] thus leaving its true identity uncertain, it was of interest to make the following experimental observations on it.

Part of these studies relate to its transmissibility to animals other than mice. Those carried out with mice include experiments in which the animals were variously exposed to the virus, observations on the possible portals of entry in certain types of exposure, on possible sites of extraneural propagation of the virus, and on the distribution and character of the lesions induced. Virus assays and histological examinations were carried out on a number of animals. Those examined histologically were embedded *in toto* and sectioned transversely. More specifically, after removal of the skin and extremities, the body of each animal was placed in fixing solution, decalcified, cut into 3 parts (head, thorax and abdomen) and then processed for paraffin sections. Representative sections were stained by gallocyanin, Lentz A or the Giemsa method.

Most of the experiments relate to relatively natural modes of exposure, such as exposure to virus-contaminated food and drinking water, contaminated mouse jars, etc., and a few only to inoculations. Preliminary chemical blockade of the olfactory mucosa with zinc sulphate solution was employed in certain of the experiments. In some, virus grown in fertile eggs[8] was employed in place of brain-cord virus suspensions. Mice of known ages were employed throughout.

Infectivity by the intranasal route in mice of different ages. Six experiments were carried out in which the virus was instilled intranasally into mice of different ages. Five drops of a virus suspension were placed in slow succession on each nares of the etherized animal. In 2 experiments, the animals were instilled with a 10% mouse brain-cord virus suspension; in 4, with egg passage virus.[8] The results are shown in Table I.

These results confirm the observation by Jungeblut that young mice can be easily infected with this virus by the intranasal route. This holds also for the strain after it has been cultivated in eggs. Adult mice, however, showed themselves considerably more resistant to the egg passage virus, and more so to the latter than to the mouse passage

6 Schultz, E. W., and Gebhardt, L. P., PROC. SOC. EXP. BIOL. AND MED., 1939, **40**, 577.

7 Schultz, E. W., and White, S. C., unpublished observations.

8 Schultz, E. W., and Enright, J. B., PROC. SOC. EXP. BIOL. AND MED., 1946, **63**, 8.

TABLE I.
Incidence of Infection in Mice Instilled Intranasally with Mouse Brain-cord and Egg Passage Virus Suspensions.

Exp.	Virus suspension	ID_{50} of virus susp.	No. of mice	Age, wks	% infection	Avg incubation period	Range of incubation period, days
1	Brain-cord virus	10^{-7}	10	3	100	4.0	3-5
2	" "	10^{-7}	10	8	80	6.5	5-8
3	12th egg passage	10^{-5}	10	3	90	8.0	6-16
4	13th " "	10^{-5}	32	3	90	6.0	4-19
5	24th " "	10^{-6}	10	3	90	6.0	4-11
6	25th " "	10^{-6}	10	10	20	8.0	8

virus (cf. experiments 2 and 6).

Sections were made of 11 paralyzed mice inoculated with brain-cord virus suspensions by the intranasal route, and of 4 inoculated with the 13th egg passage virus by this route. Lesions were observed in the olfactory bulbs in only 2 of the first group and in only 1 of the second. These consisted of areas of necrotic mitral cells in one or both bulbs, with a sparse scattering of PMN cells. Those which showed lesions in the bulbs also showed involvement of the brain. On the other hand, brain lesions were observed in 3 animals which showed no lesions in the bulbs. Cord lesions were observed in all but 2 of the series. These animals had been infected with egg passage virus. Both had shown paralysis before they were sacrificed for histological examination. It should be added, however, that the lesions produced by this strain tend to be very acute, often with little cellular reaction, and that neurocytological changes in the absence of definite neurophagocytic or inflammatory reactions were not counted as positive observations. No changes were observed in the visceral or extranervous tissues.

Effect of chemical blockade on infectivity of the virus by the intranasal route. Seven experiments were carried out to determine whether infection by the intranasal route could be prevented by earlier intranasal instillations of a 1% solution of zinc sulphate.[9] In the first experiment, this solution was instilled only once by slowly placing 5 drops of the solution on each nostril of the anesthetized animal, in the second, the instillation was repeated at the end of 5 days, and in the remaining 5 experiments, the nasal passages were forcibly irrigated with the aid of a small pipette fit snugly into the nasal orifices. All of the subsequent virus instillations consisted of 10% virus tissue suspensions, either of mouse brain-cord material or of egg passage virus material. The results are given in Table II.

It will be noted that there was little difference in the incidence of infection between the zinc sulphate-treated groups and the controls. The more noticeable difference was observed in the 2 groups challenged with egg passage virus suspensions which had a considerably lower virus content (ID_{50} at 10^{-5}) than the brain-cord virus suspension (10^{-7}) employed, but even in these 2 groups the difference is not great enough to suggest that the virus depends upon the integrity of olfactory mucosa for its passage to the CNS.

Sections were prepared from 5 of the infected zinc sulphate-treated mice. All but 1 showed that the olfactory mucosa had been fully contacted by the zinc sulphate solution. This was evidenced by the extensive replacement of the normally thick and characteristic epithelium by one less thick, with cells in abnormal arrangement, and which could be easily recognized as a mucosa of the "reparative type." No involvement of the olfactory bulbs was observed in 4 of these animals. One animal showed mitral cell necrosis in a limited area in one of the bulbs. This happened to be in the one animal which showed much less extensive damage of the olfactory mucosa. All 5 animals showed lesions in the brain, but definite cord lesions, associated with inflammatory cells were

[9] Schultz, E. W., and Gebhardt, L. P., *J. Infect. Dis.*, 1942, **70**, 7.

TABLE II.

Infection in Groups of Intranasally Inoculated Mice Previously Treated Intranasally with Zinc Sulphate Solution, Compared with Incidence in Untreated Control Groups.

	Control group				Zinc sulphate-treated group				
s suspen.	No. of mice	% infection	Avg incubation period, days	Range of incubation period, days	No. of animals	No. of days $ZnSO_4$ treatment preceded virus instillation	% infection	Avg incubation period, days	Range bation d
BV*	10	100	3.0	2-6	10	3	100	3.0	2
BV	10	100	3.8	3-6	10	6	100	5.7	5
BV	10	100	4.5	4-7	10	2	90	4.0	3
BV	10	80	6.0	4-10	10	5	90	7.5	4
BV	10	90	5.0	4-6	10	10	80	7.0	5
EP14†	10	100	5.0	4-6	7	7	71	6.0	4
EP26	10	100	5.5	4-7	10	5	80	7.0	5

* Mouse brain-cord virus suspension.
† Egg passage virus, 14th (and 26th) passage.

TABLE III.

irus Assays on Olfactory Bulbs and Brains of Mice Instilled with Virus Intranasally. To Reduce the Tabulation, Only the End Obtained with the Individual Dilutions of the Tissues Are Given Here.

		End of 24 hr				End of 48 hr				End of 72 hr		
		Bulbs		Brain		Bulbs		Brain		Bulbs		Brai
f mice tilled anasally	Incidence of infection controls	Dilution	Infectivity	Dilution	Infectivity	Dilution	Infectivity	Dilution	Infectivity	Dilution	Infectivity	Dilution
										10^{-3}	1/3	10^{-3}
20	4/5*	10^{-1}	0/3*	10^{-1}	0/3	10^{-1}†	3/3	10^{-1}†	3/3	10^{-4}	1/3	10^{-4}
						10^{-2}	2/3	10^{-1}	0/3	10^{-6}	2/3	10^{-6}
20	2/5	10^{-1}	0/3	10^{-1}	0/3	10^{-3}	1/3	10^{-2}	0/3	10^{-7}	2/3	10^{-7}
		10^{-1}	0/5	10^{-1}	0/5	10^{-1}	3/5	10^{-2}	2/5	10^{-1}	5/5	10^{-6}
20	5/5	10^{-2}	0/5	10^{-2}	0/5	10^{-2}	0/5	10^{-3}	0/5	10^{-2}	0/5	10^{-7}

nator = number of mice inoculated; numerator = number which became infected.
ried to high dilutions.

observed in only 1 of the animals.

Time when virus becomes demonstrable in the olfactory bulbs and brain after it is instilled intranasally. Three experiments were carried out to determine how soon after intranasal instillation the virus makes its appearance in the olfactory bulbs and in the brain. In all, 3 groups of twenty 3 to 4 week old mice were instilled with a 10% mouse brain-cord virus suspension as previously described. Five animals were then taken from the particular groups at the end of 24, 48 and 72 hours respectively, sacrificed by exsanguination while under ether anesthesia, and the olfactory bulbs removed, pooled and titrated. The brains were removed last and made into separate pools. Five mice in each major group were held as controls. Ten percent suspensions of these pools were tested first. When these proved positive, further dilutions were tested. The results are given in Table III.

It will be noted that the bulbs and brains did not show the presence of virus at the end of 24 hours. Although it was demonstrable at the end of 48 hours, the results do not point definitely to an olfactory bulb to brain sequence. While in Experiment 2 the olfactory bulbs did show virus in 48 hours and the brain not, the results obtained in the other 2 experiments fail to support a bulb to brain type of spread. In other words, these 3 experiments failed to throw light on the question of whether the bulbs following intranasal instillation are the first to become involved or become involved as a secondary extension from the brain. An attempt was made to obtain the answer by histological examinations.

Twenty young mice were instilled intranasally with a 10% brain-cord virus suspension. Five of these were sacrificed for histological examination at the end of 24 hours, 5 at the end of 48, 5 at the end of 72 hours and 5 were held as controls. All of the latter developed paralytic infections, so that the entire group appears to have been adequately exposed. The sacrificed animals were embedded *in toto* and sectioned as described earlier. In none of the 15 animals were lesions observed in the olfactory bulbs, brain or cord, nor were any lesions observed elsewhere which could not be explained on other grounds. The fact that there were no lesions observed in the bulbs as late as 72 hours after inoculation might appear to constitute strong evidence against the olfactory route being in any real sense a preferred pathway following intranasal inoculation. On the other hand, the fact that virus had been readily demonstrable in pools of olfactory bulbs from other groups of mice similarly instilled with virus, and this within 48 hours after its intranasal instillation (Table III), suggests that it may exist in the bulbs, even in high concentrations, without evident lesions in the bulbs.

While the 5 controls in this particular group of animals were not included in these histological examinations, 11 infected mice similarly inoculated were examined at other times and the results on these are described in an earlier section of this paper. However, as a further means of determining whether involvement of the bulbs commonly results from a secondary spread of virus from the brain, sections were prepared from a small number of mice which had been infected by extranasal routes, including inoculations by the "clipped tail method," to be described in a later paper. Of 7 mice inoculated by such extranasal routes, 1 had been infected by the intracerebral route, 2 by the intraperitoneal route and 4 by the clipped tail method. All showed involvement of the brain. Four of these showed in addition involvement of the olfactory bulbs. One of these 4 had been inoculated by the intracerebral route, 1 by the intraperitoneal route and 2 by the clipped tail method. The most extensive involvement of the bulbs was observed in 1 of the latter animals, in which most of the mitral cells in both bulbs had become necrotic. From these results then it is evident that the virus spreads readily from the brain to the bulbs.

Infectivity of virus incorporated in the drinking water of mice. Thirteen experiments were carried out in which virus was incorporated in the drinking water of mice. A

TABLE IV.
Incidence of Infection in Mice Given Mouse Brain-cord Virus, or Egg Passage Virus, in Drinking Water.

Exp.	No. of mice	Age, wks	Virus suspension	Virus tissue suspen., in %	No. of days animals were fed virus	% infection	Avg. incubation period, counted from 1st day of feeding	Range of incubation period counted from 1st day of feeding
1	10	3	BC*	1	5	80	5.5	4-6
2	10	4	BC	1	1	50	6.5	5-9
3	12	4	BC	1	2	50	8.0	6-14
4	10	8	BC	1	5	10	5.0	5
5	10	3	BC	1	5	90	4.5	3-8
6	30	3	BC	1	5	73	5.0	3-7
7	20	3	BC	10	2	75	6.0	4-8
8	20	3	BC	10	2	100	7.0	5-13
9	20	3	11th EP†	10	2	10	8.5	6-11
10	20	3	12th EP	10	2	30	6.0	2-12
11	20	3	14th EP	10	2	25	8.0	7-11
12	20	4	15th EP	10	1	5	11.0	11
13	10	3	26th EP	10	5	20	11.5	11-12

* BC = Mouse brain-cord virus suspension.
† EP = Egg passage virus suspension.

total of 210 mice was so exposed to virus. Part of the experiments were carried out with 1% virus suspensions, part with 10% suspensions, both made up in sterile distilled water. Two of the feedings with the 10% suspensions were carried out with mouse brain-cord virus suspensions and 4 with suspensions of egg passage virus. Each ml of the prepared water contained no less than 40,000 MID's, for mice. With one exception only (Experiment 4) 3 to 4 weeks old mice were employed. These were kept on the contaminated water from 1 to 5 days. They were placed on it in groups of 10 and these consumed about 100 ml of the water per day. It was supplied in bottles which delivered the water through a glass tube in drops which formed at the end of the tube and remained attached until removed by the animal. All of the animals were kept under observation for at least 2 weeks after the feeding period was ended. The results are given in Table IV.

The average incidence of infection in the 210 mice employed in these experiments was 47.5%. The average length of time the animals were fed virus was 3 days, and the average incubation period, counted from the first day of feeding, was 6.3 days. If we group the experiments in which mice 3 or 4 weeks of age were employed, and in which only a 1% brain-cord virus suspension was employed (Experiments 1, 2, 3, 5, 6), the incidence of infection then becomes 68.6% and the average incubation period 5.9 days. With 10% brain-cord virus suspensions (Experiments 7 and 8), the incidence of infection rose to 87%. A marked decrease in the incidence was observed in 8 weeks old mice (Experiment 4), in which only 1 out of 10 developed infection. Ten percent suspensions of egg passage virus proved less infectious than 1% suspensions of mouse brain-cord virus, the average incidence of infection in 90 mice so fed being 18%. Only 20% infection was realized on feeding the 26th egg passage virus over a period of 5 days. These results therefore suggest that the infectivity of the virus for mice was definitely decreased by its passages in eggs.

Sections were prepared from 9 mice infected by feeding the virus. All showed lesions in the brain and all but 2, well-defined lesions in the cord. Only 1 failed to show mitral cell necrosis in one or both olfactory bulbs. This could be regarded as evidence that the infection had taken place in most cases via the olfactory pathway. However, none of a number of mice removed from the feeding test within 1 to 2 days before symptoms should have developed showed lesions in the bulbs. This together with the observations mentioned earlier makes it seem probable that the bulbs in this series also had become involved by secondary extension from the brain. No lesions were observed in extranervous tissues of these mice.

Effect of zinc sulphate solution intranasally on the incidence of infection in mice later fed virus in drinking water. An experiment was carried out in which ten 3 weeks old mice were instilled intranasally with a 1% solution of zinc sulphate and 5 days later were placed on a 1% mouse brain-cord virus suspension in water for 5 days, along with 10 untreated mice as controls. Seventy percent of the treated group became infected as compared with 80% of the controls. This again suggests that the virus does not depend on the olfactory pathway for its access to the CNS.

Infectivity for newborn mice of mammary contamination. Two experiments were carried out in which a 10% mouse brain-cord virus suspension was applied to the mammary area of a nursing mother. In the first experiment this was applied to a mother of 8 newborns, 2 days of age, 3 applications of the virus being made on 1 day. All of the animals remained well up to the 5th day. On the morning of the 5th day, 1 newborn was sick, 1 was normal and 6 were missing, probably eaten by the mother. The remaining newborn succumbed on the 6th day and the mother herself developed paralysis soon after. In the second experiment, the virus was applied to a mother of 8 newborns, 4 days of age, with similar results. On the 3rd day, the partial remains of 1 newborn were found and 3 were missing. On the morning of the 4th day, 1 newborn showed paralysis. Three survived but the mother herself was found dead on the morning of the 9th day.

Infectivity of virus-contaminated mouse jars. Three experiments were carried out to determine how readily a contaminated environment serves to transmit infections. In the first experiment, the floor and lower portion of a clean battery jar was wet with a 10% brain-cord virus suspension. After the material had air dried, a small amount of sawdust was put into the jar, along with a supply of dry biscuits and drinking water, the latter in a bottle provided with a glass tube which delivered it as clinging drops. Five 3 weeks old mice were then placed into the jar. Four of these developed paralysis between the 6th and 8th day. In a repetition of this experiment, 6 out of 6 mice succumbed between the 5th and 12th days. In the second experiment, in which a jar was contaminated with a 1% suspension of infected brain-cord tissue, only 1 out of 6 mice developed infection. A repetition of this experiment yielded 2 infections out of 6 mice employed. In the third experiment, a jar was contaminated with a 0.1% suspension of infected brain-cord tissue. In this none of the animals developed infection during the 21 day period of observation—the period set for all of these experiments. This experiment was repeated with 10 mice. Again, none of the animals developed infection. These observations suggest therefore that while infections can be induced in this way, it requires a rather heavy contamination of the environment to bring this about. The possibility that latent infections may have been induced in some of these animals was not investigated.

Infectivity by the corneal and conjunctival routes. Ten mice were inoculated by placing one drop of a 10% brain-cord virus suspension into the conjunctival sac of one eye after a light scarification of the cornea. Seven became infected. However, of 20 mice similarly inoculated, but without scarification of the cornea, only 2 developed infection. Whether this low incidence was due to a re-

ported "poliocidal" constituent in tears[10] or to some other factor was not determined.

Infectivity by the skin route. Two groups of 10 mice each were inoculated by applying a 10% suspension of brain virus to a small area of the skin on the abdomen and then introducing the virus into the skin by the multiple puncture method. Six in the 1st group and 7 in the 2nd group developed infections.

Relative infectivity by the intraperitoneal and intracranial routes. An experiment was carried out in which the infectivity of mouse brain-cord virus by the intraperitoneal route was compared with its infectivity by the intracranial route. Using a uniform dose of 0.03 ml and 6 mice for each of these 2 routes, its ID_{50} by the intracranial route was 10^{-7}, and 10^{-6} by the intraperitoneal route. With a dose of 0.1 ml by the latter route, in 6 mice, its ID_{50} remained at 10^{-6}.

Infectivity by the rectal route. Three groups of 10 mice each were inoculated by instilling 0.2 ml of a 10% mouse brain virus suspension into the rectum of each mouse with the aid of a Pasteur capillary pipette. The pipette employed was made with a well-rounded point to avoid injury to the tissues and the instillation was carried out in a way that would minimize trauma. Four to 6 weeks old animals were employed. Thirty percent became infected in each of the 3 groups, with an average incubation period of 6 days. In a preliminary experiment in which the instillations were less carefully carried out and some bleeding was induced, 8 out of 10 mice became infected.

Infectivity by the intravenous route. Ten 3 weeks old mice were inoculated by the tail vein, chiefly to determine the relative length of the incubation period following intravenous inoculation. All were injected with 0.1 ml of a 10^{-4} dilution of mouse brain-cord virus tissue. Nine of the group developed infection, with incubation periods ranging from 4 to 8 days and averaging 6.5 days.

Infectivity for animals other than mice. Shortly after reporting the adaptation of the original monkey passage SK strain to cotton rats and mice, Jungeblut and his associates reported the successful transmission of the mouse-adapted or "murine" strain to the guinea pig.[2,5,11] We have been able to confirm this observation and the fact that a typical poliomyelitic syndrome is induced in this animal; also the fact that the ID_{50} titer in mice of guinea pig passage material is much lower (10^{-3}) than that of mouse passage material (10^{-7}). Ten percent suspensions of both the murine and cavian passage virus proved infectious for hamsters by the intracranial route, but not for rabbits.

Four rhesus monkeys injected with large doses of a 10% suspension of the mouse passage virus by a combination of the intracranial and intraperitoneal routes failed to develop symptoms.

Brutsaert, Jungeblut and Knox[12] have recently reported attempts to adapt the MM strain to chicks. Soon after we had established that the murine SK strain can be cultivated in developing eggs,[8] several attempts were made by us to adapt egg passage virus, as well as mouse passage virus, to baby chicks. Chicks ranging from 2 days to 1 month of age were employed. These were inoculated with about 0.03 cc of a 10% suspension of either mouse brain or egg passage virus. Although suggestive clinical manifestations were induced in a few instances, we were unable to transmit the disturbance to new chicks, nor able to transmit any virus that might have been present in the brains of these chicks back to mice. Enright and Schultz[13] later observed that while murine SK virus can be readily propagated in fertile eggs containing embryos ranging from 5 to 14 days of age, embryos above 15 days of age no longer afford the pabulum necessary for growth of the virus. Attempts to gradually adapt the virus to

10 Jungeblut, C. W., PROC. SOC. EXP. BIOL. AND MED., 1935, **32**, 1534.

11 Jungeblut, C. W., PROC. SOC. EXP. BIOL. AND MED., 1945, **58**, 177.

12 Brutsaert, P., Jungeblut, C. W., and Knox, Alice J., *Pediat.*, 1946, **29**, 350.

13 Enright, J. B., and Schultz, E. W., PROC. SOC. EXP. BIOL. AND MED., 1948, **66**, 541.

older embryos proved unsuccessful.

Summary. Observations are reported on the infectivity of the murine SK strain for mice based on certain types of exposure to the virus. Some of the infected mice were embedded *in toto,* sectioned, and examined histologically for evidence of virus multiplication in non-nervous as well as nervous tissue. Although infections occurred readily under various types of exposures to the virus, no lesions suggestive of virus activity were observed in any tissues or organs apart from the CNS. Infections by the intranasal route could not be prevented by prior intranasal instillations of zinc sulphate solution used to block the olfactory pathway as a portal of entry. Mice could be readily infected with virus-contaminated drinking water. Virus cultivated in developing eggs proved less infectious for mice when supplied to the animals in drinking water or food than mouse brain-cord virus suspensions. Old mice showed themselves less susceptible than young mice to certain types of exposure, but to other types of exposure the difference was less marked. Young mice could be readily infected by housing them in battery jars contaminated with virus, but it required a heavy contamination to bring this about. While a virus suspension dropped into the conjunctiva after light scarification of the cornea induced infection in 70% of mice, only 10% infection resulted when this procedure was not preceded by scarification of the cornea. Infection was induced in 60% of mice by applying the virus to the skin and then introducing it by the multiple puncture method. Infection was induced in 30% of mice on introducing the virus into the rectum. Young mice can be easily infected by the intraperitoneal route, this route being only slightly less sensitive than the intracranial route. The average incubation period following intravenous inoculation did not differ significantly from that observed following inoculations by other routes with similar amounts of virus. The virus induced a typical poliomyelitic syndrome in guinea pigs. In these animals it became a low titer virus. It proved infectious for hamsters but not for rabbits or monkeys. Attempts to adapt it to baby chicks were unsuccessful.

16453 P

Effect of Desoxypyridoxine on Reproduction in the Rat.*

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It has recently been possible to show that an upset in the reproductive mechanism is quickly produced when normal adult female rats are shifted to purified diets deficient in pantothenic acid[1] or in pteroylglutamic acid.[2] The same purified diets in which the missing vitamins were present enabled normal reproduction to be evidenced. Such results induced inquiry as to the rapidity with which reproductive impairment might be evidenced by shifting similar healthy adult female rats to similar purified diets from which pyri-

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1 Nelson, M. M., and Evans, H. M., *J. Nutrition,* 1946, **31**, 497.

2 Nelson, M. M., and Evans, H. M., PROC. SOC. EXP. BIOL. AND MED., 1947, **66**, 289.