0.014° C; if only the first 7 μ were heated, which would probably include most of the nerve endings (*1, 2*), this figure would become 0.05° C. This is probably not small enough to rule out the possibility of mechanism (*b*), but the rather low sensitivity to temperature mentioned before makes this alternative seem unlikely.

With respect to hypothesis (*a*), there seems little possibility of a mechanism based on the usual photochemical reactions, such as those in the eye, since these are notable for their absence in this low-energy region of the spectrum (which is characterized by changes in vibrational and rotational energy levels as opposed to electronic changes, which are produced by absorption in the visible and ultraviolet). However, absorption bands in the infrared are assigned to specific atom groupings in organic molecules (*4*), so that specific activation of some kind may be possible.

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A Virus Possibly Related to the Psittacosis-Lymphogranuloma-Pneumonitis Group Causing a Pneumonia in Sheep

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A considerable number of sheep suffering from pneumonia are brought to this institution for autopsy. The absence of bacteria of etiological significance in many of the pneumonic lungs which were cultured suggested that in such cases a virus might be the cause, a possibility which has been recognized by others with respect to pneumonia of the ovine species. Accordingly, attempts were made to recover such an agent from these cases.

From 2 of 5 pneumonic sheep lungs an agent was recovered which induced a transmissible pneumonia in albino Swiss mice by intranasal inoculation. Impression smears prepared from the cut surfaces of the consolidated mouse lung, and stained according to Macchiavello's method (*1*), revealed the presence of elementary bodies which were morphologically and tinctorially identical to those of the psittacosis-lymphogranuloma-pneumonitis group (Chlamydozoaceae) of viruses. The agent was again recovered from the second sheep lung, which had been held under dry-ice refrigeration in the meantime, 3 weeks subsequent to the initial isolation. Repeated attempts by serial nasal inoculation in mice failed to recover any transmissible agent from the lungs of either the stock experimental mice or normal sheep.

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The mouse-lung-adapted virus was readily propagated in the yolk sac of 5- to 6-day-old embryonating hens' eggs, and was readily transmitted in serial passage. Subsequent to the first several yolk sac transfers, in which only the lower dilutions of inocula regularly proved infective, a 10^{-3} dilution of infected yolk sac regularly killed 100% of the embryos within 4–6 days following inoculation. In yolk sac smears, stained as described above, from moribund and dead embryos, large blue bodies were consistently present; these were assumed to be a developmental stage of the virus. Among them were occasionally observed the small red elementary bodies. A marked pneumonia was induced in mice by the inoculation of infected yolk sac suspension, and typical elementary bodies were regularly demonstrated in lung smears.

An inoculum was prepared from the supernatant obtained by centrifuging a 10% suspension of infected yolk sac at low speed for a short time. A vigorous 9-month-old wether was inoculated with 15 ml of this material, half being given intranasally and the remainder intratracheally. Mice also were inoculated. In addition, 3 kittens from which a transmissible respiratory agent could not be recovered by mouse lung passage of nasal washings, were given a portion of the supernatant by the nasal route. It was considered advisable to include kittens in order to determine whether the agent under study was identical with the feline pneumonitis virus of Baker (*2*) which, it was felt, might reside in the respiratory tract of sheep.

After inoculation the temperature of the sheep rose from a preinjection reading of 38.1° C to 41.2° C and dropped to the former level within 48 hr, where it remained for the next 6 days. Thereafter, until sacrifice of the animal on the 23rd day following inoculation, a fever was recorded which was characterized by intermittent peaks occurring at increasingly frequent intervals, and of progressively greater magnitude. During the 2-day period immediately preceding death the temperature constantly remained between 40.5° C and 41.0° C, and respiratory distress was noted. At autopsy, a pneumonia which, however, was not extensive, was found in the anterior lobes of both lungs, and the agent was readily recovered in mouse lung as described previously. Several of the inoculated mice died of the infection prior to the seventh day following inoculation, at which time the survivors were sacrificed. In all cases an extensive pneumonia had developed, and elementary bodies were readily demonstrated. The kittens, however, remained clinically normal during the 4-week period they were held following inoculation, and lung pathology was absent at autopsy. Attempts to recover the virus from the turbinate bones of these animals by serial passage in mouse lung were unsuccessful.

Urea-treated (*3*) infected and normal crude yolk sacs were used as antigens in complement fixation tests carried out with both homologous and feline pneu-

TABLE 1

COMPLEMENT-FIXING REACTIONS OF THE SHEEP PNEUMONIA VIRUS WITH HOMOLOGOUS AND FELINE PNEUMONITIS ANTISERA

Serum	Highest dilution of antigen in which complement was fixed in presence of serum		Highest dilution of serum in which complement was fixed in presence of antigen	
	Infected yolk sac	Normal yolk sac	Infected yolk sac	Normal yolk sac
Sheep serum				
Preinfection	1–20	1–10	< 1–4	< 1–4
Postinfection	1–50	1–10	1–32	< 1–4
Feline pneumonitis antiserum				
Kitten "S"	1–40	1–10	N.T.*	N.T.
Kitten 236	1–50	1–10	1–16	< 1–4
Normal kitten serum	1–10	1–10	< 1–4	< 1–4

* N.T. = Not tested.

monitis antisera. Sera of the 3 kittens mentioned above were also tested for complement fixing antibodies to the sheep lung agent. These results were negative and do not appear in Table 1.

In the qualitative test, undiluted through eightfold dilutions of the 10% antigen suspensions were incubated in a water bath for 2 hr at 37° C with a constant (1–8) dilution of each serum specimen and 2 units of complement. After adding a sheep red blood cell suspension which had been sensitized by the addition of 2 units of hemolysin, the tubes were reincubated and the tests read when the control series exhibited the appropriate reaction. Readings were again made after the tests had been held overnight at 4° C. The quantitative test was conducted according to the above procedure, using serial twofold dilutions of each serum specimen and 2 units of antigen. Complete, rather than partial fixation, was selected as the end point. The titers shown in Table 1 refer to the initial dilution of the antigens and the sera, respectively, before the addition of the other reagents.

An elementary body agent has recently been incriminated as the cause of enzootic abortion in ewes in Scotland (*4*). It was demonstrated subsequently that this virus is related antigenically to both the psittacosis and the lymphogranuloma venereum viruses (*5*). The sheep pneumonia virus and the virus of enzootic abortion in ewes are, therefore, undoubtedly related antigenically. However, the agent described in this paper was isolated from individuals in flocks in which there was no evidence of the existence of enzootic virus abortion. Furthermore, the fact that the sheep abortion virus was found incapable of producing pneumonia in either sheep or calves (*4*) is evidence that the two agents isolated from sheep are distinct viral entities.

On the basis of our observations on its host specificity, tropism, and antigenic relationship with the feline pneumonitis virus, it is tentatively concluded that the agent isolated from sheep lung is a new member of the psittacosis-lymphogranuloma-pneumonitis group of viruses.

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Some Aspects of the Phenomenon of Coacervation

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The name coacervation was given by Kruyt (*1*) to the phenomenon of limited solution observed with a large number of colloids and colloid mixtures. A coacervate is thus regarded as a colloidal solution which is immiscible with excess solvent. Bungenberg de Jong (*2*) made an extensive series of investigations along this line and attributed this phenomenon to the separation of extensively solvated colloidal particles out of the solution by the addition of some nonsolvent or precipitant, solvation being due to the electrostatic attraction of the charged colloidal particles. This idea was widely prevalent till 1940, since the recorded data on coacervation were confined mostly to the electrically charged colloidal particles in aqueous solution—e.g., gelatin, gum arabic, starch, etc. In 1942 Dobry (*3*) showed that coacervation can take place in nonaqueous media with high molecular weight substances, which are generally molecular colloids. Thus, in precipitating cellulose acetate and polystyrene out of a good solvent by the addition of a suitable nonsolvent as precipitant, Dobry many times obtained separation of coacervates rather than granular precipitate. We have also observed that in precipitating polymethyl acrylate out of methyl ethyl ketone by the addition of methyl alcohol a viscous liquidlike mass separated out, which on prolonged standing shrank and left a film of polymeric substance at the bottom of the container. Thus it became evident that an explanation based on the electrical charge of the particles should be revised in order to accommodate within its purview cases of uncharged particles as well.

Bungenberg de Jong (*4*) has recently put forward a more general explanation of the phenomenon of coacervation. It is to be noted that until now almost all the substances that can form coacervates are high

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