of the incorporation of formate into DNA of Ehrlich ascites cells and that the inhibition could be reversed by simultaneous addition of deoxyguanosine. The same authors showed that deoxyadenosine had no effect on DNA synthesis in the Yoshida ascites tumor cells indicating that the inhibition is not an universal phenomenon. Kit and Dubbs(16) showed that deoxyadenosine drastically inhibited the incorporation of thymidine-H^3 into the DNA of L-M suspension cultures and stated that the inhibition could be largely reversed by addition of deoxyguanosine. Vaccinia virus growth was delayed in deoxyadenosine treated cells. Vaccinia failed to enhance thymidine-H^3 uptake by cells treated with deoxyadenosine. It is possible that the results in the present study may be related to these findings since the deoxyribose and ribose containing compounds are interconvertible in the cell. Since interferon has been implicated in nucleotide inhibition of virus synthesis its mode of action may be involved in this type of control mechanism.

Summary. Alkaline hydrolysates of yeast ribonucleic acid were found to inhibit markedly plaque formation by vaccinia and chikungunya viruses in chick embryo fibroblast monolayers. Mononucleotides were subsequently implicated and shown to inhibit vaccinia virus plaque formation. Adenosine monophosphate was the most effective of the nucleotides tested in inhibiting vaccinia virus and the inhibition could be reversed with mixtures of the mononucleotides.

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Pulmonary Lymph: Demonstration of Its High Oxygen Tension Relative to Systemic Lymph.* (30084)

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Lymph is tissue fluid that has entered the lymphatic capillaries(1). Its respiratory gas composition, therefore, probably resembles that of the immediate tissue environment, barring significant changes along the course of the lymphatics. Bergofsky *et al* found low oxygen tension in systemic lymph sampled from the thoracic duct and its tributaries(2). Data on pulmonary lymph Po_2, not available so far, should reflect the influence of extensive and intimate contact with alveolar gas, and may relate to recently described morphologic(3) and biochemical(4) features of lung tissue. We report here the results of a study of pulmonary lymph oxygen tension and its

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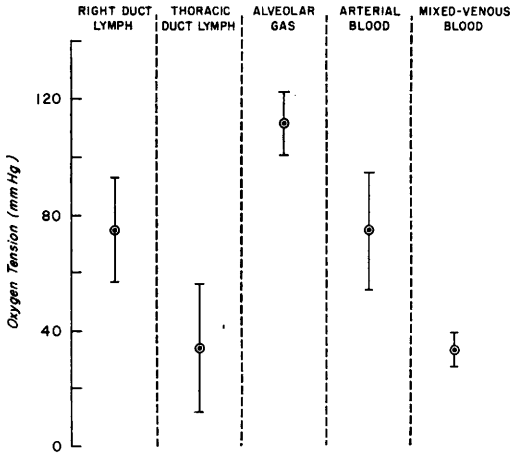

FIG. 1. Means and standard deviations of oxygen tension in right lymph duct, thoracic duct, alveolar gas, systemic arterial and mixed-venous blood of anesthetized dogs, breathing air.

relation to oxygen tension in thoracic duct lymph, alveolar gas, systemic arterial blood and mixed-venous blood.

Methods. Lymph was collected from the right lymph duct in 15 mongrel dogs weighing 9 to 25 kg that had been anesthetized with intravenous pentobarbital (30 mg/kg). In the dog, the right duct carries most of the lymph flow from the lungs(5). A polyethylene catheter was placed either directly into the duct at its entry into the right jugular vein, or, when multiple small ducts were present, into the receiving segment of the vein after tying off its venous tributaries (6). The dogs breathed air, assisted by a Starling pump. The chest remained intact. Systemic arterial blood was sampled through a needle in the femoral artery, and mixed-venous blood through a catheter in the right ventricle. Alveolar gas oxygen tension was calculated from standard equations, using measured expired gas concentrations, or assuming a respiratory exchange ratio of .8. Po_2 in blood and lymph was determined *in vitro* by a polyethylene-covered platinum electrode (Beckman). Measurements were expressed at body temperature, as determined by an esophageal thermistor.

Results and discussion. Mean Po_2 in right duct lymph was 75 $\pm$ 18 mm Hg (S. D.). This was the same as the mean Po_2 in arterial blood (75 $\pm$ 20 mm Hg, Fig. 1) and considerably higher than in thoracic duct lymph (34 $\pm$ 20 mm Hg, $p<.001$). The latter value was close to mean Po_2 in mixed-venous blood (33 $\pm$ 6 mm Hg) and similar to recent data by Bergofsky *et al,* although higher and more variable than in their initial report(2).

Right duct lymph is a mixture of lymph from the gas-exchanging portion of the lung, as well as from systemic (nonrespiratory) tissues, including the heart, pleura and bronchial tree(5). If the oxygen tension in this systemic component was like that in systemic lymph from the thoracic duct, the oxygen tension in respiratory tissue lymph had to be higher than in the right duct itself. Since alveolar gas Po_2 is the highest Po_2 possible around alveolar cells, the mean Po_2 in the respiratory component of right duct lymph was between 75 and 112 mm Hg.

Since the total flow of oxygen in right duct lymph equals the sum of the flows in its respiratory and systemic components, and since oxygen is carried in lymph solely in physical solution, a relation can be derived to estimate the relative flow from the two sources:

$$\dot{Q}RD \cdot \alpha \cdot {}^{P}RDo_2 = (\dot{Q}Resp\ L \cdot \alpha \cdot {}^{P}Resp\ Lo_2) + (\dot{Q}Nonresp\ L \cdot \alpha \cdot {}^{P}Nonresp\ Lo_2) \quad (1)$$

where $\dot{Q}$ is flow, Po_2 is oxygen tension, α is O_2 solubility coefficient in lymph, and the subscripts refer to the right duct and its two (respiratory and nonrespiratory) components. The solubility factor cancels out and the equation can be rearranged as:

$$\dot{Q}Resp\ L/\dot{Q}RD = ({}^{P}RDo_2 - {}^{P}Nonresp\ Lo_2)/({}^{P}Resp\ Lo_2 - {}^{P}Nonresp\ Lo_2) \quad (2)$$

Using measured values for ${}^{P}RDo_2$, the estimated range of 75-112 mm Hg for ${}^{P}Resp\ Lo_2$, and assuming ${}^{P}Nonresp\ Lo_2$ to be the same as ${}^{P}TDo_2$, the contribution of the respiratory portion of the lung to right duct lymph flow under our experimental conditions must be at least 53%. No direct measurement of either component of lymph flow is available, but Miller *et al*(7) have re-

ported a mean flow of 3.2 ml/hour of cardiac lymph—the major constituent of the non-respiratory portion(5)—in dogs averaging 17.7 kg in body weight. Their figure is 45% of the mean flow rate we measured in the right duct (7.1 ml/hour) in dogs of nearly identical (17 kg) mean body weight, and is thus generally in agreement with the relative distribution of flow we estimated above.

The markedly higher Po_2 in lymph from the lung, compared to lymph from other organs, lends support to a correlation between respiratory gas tensions in "tissues" and in lymph derived from these tissues.

A particularly high oxygen tension in respiratory tissue could help explain its relative vulnerability to the toxic effects of high inspired oxygen tension(8).

Summary. Po_2 in right lymph duct of 15 anesthetized dogs averaged the same as in arterial blood (75 ± 18 mm Hg); Po_2 in thoracic duct lymph was close to that in mixed-venous blood (34 ± 20 mm Hg). Allowing for admixture of systemic lymph in the right duct, Po_2 in lymph from the respiratory portion of the lung must fall between alveolar gas and arterial blood. The marked difference from thoracic duct lymph Po_2 ($p<.001$) supports the concept of lymph as a useful measure of Po_2 in interstitial fluid and tissues. Use of mixing equations shows that during air breathing respiratory (*i.e.*, gas-exchanging) tissues contributed at least 53% of right duct lymph flow.

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The Effect of X-Irradiation on Renal Damage Secondary to Ischemia. (30085)

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Several groups performing renal transplantation have reported beneficial results from local radiation to the transplanted kidney(1, 2). The actual effects of radiation have been suggested to be either effects on the lymphocytes or the well known but vaguely understood anti-inflammatory effects of X-irradiation. In our own transplantation experience, we have seen what we believe to be an effect of local radiation characterized by onset of diuresis and changing of the renogram tracing from that of an obstructive pattern to a normal tracing(3). We have observed radiohippuran renograms in acute rejection with the typical delay in the secretory peak extending over half an hour. In one patient, whom we had a unique opportunity to study because exploration was deemed necessary, the kid-

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