

from the femoral artery, through the intact skin. Ether or chloroform was administered by the drop method, and further samples of blood were drawn at various intervals up to one hour after the induction of the surgical stage of anesthesia. These were prepared for determination as soon as drawn.

After about 10 minutes of ether anesthesia, an apparent increased resistance was noted on the part of the erythrocytes to the hemolyzing action of the different strengths of hypotonic Simmel's fluid. This may have been due either (a) to destruction of weaker cells, leaving only the more resistant ones in the circulation, or (b) to an influx of cells, from such reservoirs as the spleen, resulting from struggling or partial asphyxiation during induction. Studies are in progress to determine which is the more likely. After 30 minutes of ether anesthesia, the osmotic resistance of the red cells was much below the normal level, indicating injury to the stroma of all cells following prolonged contact with the ether.

With chloroform, there was a prompt and marked lowering of the osmotic resistance of the erythrocytes, giving evidence of immediate damage to the stroma, both of cells already in circulation and of any which may have entered circulation after anesthesia was started.

Experiments *in vitro* are in progress.

¹ Simmel, H., *Deutsch. Arch. f. kin. Med.*, 1923, cxlii, 252.

² Leake, C. D., and Pratt, H., *J. Am. Med. Assn.*, 1925, lxxxv, 899.

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Effects of Anesthetics on Osmotic Resistance of Erythrocytes: II. Nitrous-oxide or Ethylene with Oxygen.

C. D. LEAKE, HARRY LAPP, JANE TENNEY AND R. M. WATERS.

(Introduced by C. L. A. Schmidt.)

From the Pharmacological Laboratories of the University of Wisconsin and the University of California.

Nitrous-oxide or ethylene in combination with oxygen were administered to dogs by the rebreathing technique developed by Dr. Ralph M. Waters, in which the carbon-dioxide produced by the body is removed by soda-lime. Nitrous-oxide with oxygen caused a slight reduction in the osmotic resistance of the red cells to hypotonic Simmel's fluids, which even after an hour's anesthesia, was not nearly as marked as that noted under ether or chloroform. Ethy-

lene with oxygen had about the same effect on the erythrocyte fragility. When ethylene was pushed to asphyxiation after 20 minutes without oxygen, the osmotic resistance of the red cells was reduced to a considerable extent in the lower dilutions of the hypotonic Simmel's fluid (0.4%), but in the higher dilutions (0.7% and 0.6%) it was only slightly below the normal levels.

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**Effects of Anesthetics on Osmotic Resistance of Erythrocytes:
III. Carbon-Dioxide with Oxygen.**

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A mixture of 25% carbon-dioxide with 75% oxygen was administered to dogs without rebreathing. This greatly increased the

TABLE I.
Showing sample but typical effects of general anesthetic agents on the osmotic resistance of erythrocytes to hypotonic saline solutions as tested by Simmel's technique.

Anesthetic status of animal	Percentage of total red blood cells remaining after 1 hour's exposure to:			
	70% of isotonic Simmel's fluid	60% of isotonic Simmel's fluid	50% of isotonic Simmel's fluid	40% of isotonic Simmel's fluid
Dog 3: Normal, before anesthesia 15 minutes under ether 40 minutes under ether	90	73	36	30
	90	82	41	30
	78	66	28	8
Dog 11: Normal, before anesthesia 15 minutes under chloroform 35 minutes under chloroform	87	80	62	12
	84	58	23	3
	70	63	21	5
Dog 16: Normal, before anesthesia 20 minutes under nitrous-oxide administered with oxygen	94	66	53	22
	88	59	44	12
Dog 19: Normal, before anesthesia 15 minutes under ethylene administered with oxygen 5 minutes later, during which interval 25% carbon-dioxide with 75% oxygen were administered	84	79	61	57
	74	73	50	46
	86	86	80	47