

A1115

**TITLE:** *IN VIVO* ERYTHROCYTE SURVIVAL STUDIES AFTER IN-LINE MICROWAVE WARMING  
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This study evaluates the warming of erythrocytes (RBC) using a new in-line microwave heating method. Using this method RBC are warmed to a desired temperature while flowing through normal IV tubing. The warming is controlled, rapid, uniform and reduces exposure of the cells to foreign surfaces.

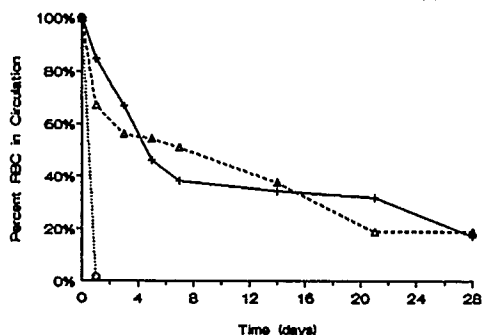
Studies were conducted in a cohort of 3 baboons which were not used in any other studies. RBC, isolated by differential centrifugation, were labeled with Cr<sup>51</sup>. The cells were mixed with the plasma from which they had been separated and cooled to 4°C in an ice bath. In one series of experiments the blood was returned to the baboon after passing it through the microwave warmer, warming it to between 37° and 40°C. In a second paired series the blood was passed through the warmer without warming and collected in a syringe for warming to 37°C in a water bath before returning it to the animal. In one study the blood was warmed to 49°C for 30 min. to deliberately damage the blood as a positive control.

Blood samples were collected regularly for 28 days and counted in a gamma well counter to assess the circulating cell associated activity. Typical survival curves are shown in the graph below.

The mean RBC survival times for the three animals studied with both microwave and water bath heating ranged from 20.3 days to 26.7 days with survival consistently but not significantly longer in the microwave warmed samples.

This study is a most sensitive test of cellular damage from warming since the ability of the body's own reticulo-endothelial system to identify and remove damaged cells is exquisite. The positive control results confirm detection of RBC damage due to thermal effects. Normo-thermic microwave heating is equivalent to water bath heating of RBC.

RBC SURVIVAL (BABOON C)  
Effect of Microwave vs Water Bath



RBC survival curves for blood heated to 37°-40°C with the microwave blood warmer (solid line); for blood heated to 37°C in a water bath (dashed line); for blood heated to 49°C in a water bath (dotted line).

This study was supported in part by the US ARMY MEDICAL RESEARCH Acquisition Agency under SBIR Contract #DAMD17-87-C-7214

A1116

**Title:** POTENTIAL RISKS OF HIGH DOSES OF EPINEPHRINE DURING CPR AFTER SHORT TERM CARDIAC ARREST IN A PORCINE CPR-MODEL

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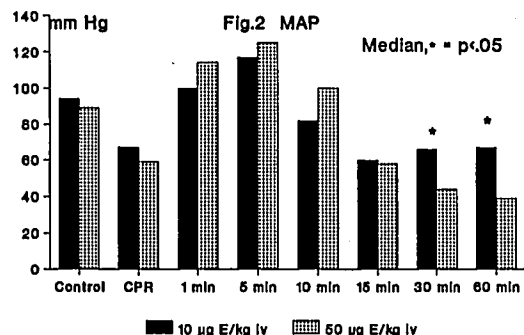
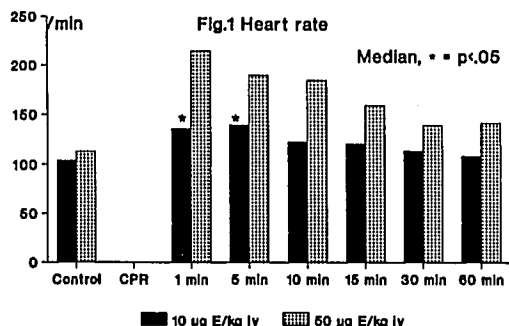
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**Introduction:** Higher doses of epinephrine (E) than currently recommended by the AHA (1) improved myocardial blood flow when compared to standard doses during CPR (2). We compared the effects of 10 µg E/kg (standard dose) and 50 µg E/kg (high dose) given intravenously (iv) in a porcine CPR-model.

**Methods:** 16 pigs in iv-anesthesia were subjected to cardiac arrest by ventricular fibrillation (VF). Resuscitation started after 3 min with resumed ventilation and internal cardiac compression. Simultaneously 8 animals received 10 or 50 µg E/kg iv. Internal defibrillation was attempted at earliest 2 min after initiating CPR. ECG, CO, MAP and LVSP were continuously recorded. Resuscitation was considered successful when restitution of spontaneous circulation (ROSC) was achieved within 20 min. Significance of results (p-value < .05) was verified by analysis of variance.

	10 µg/kg	50 µg/kg	
Survival rate:	8/8	6/8	
Time until ROSC:	4.9 ± 2.8	1.8 ± 1.0	min
Defibrillations:	2.8 ± 1.6	4.0 ± 1.6	p < .05

The two non-survivors after 50 µg E/kg were caused by occurrence of a stone heart after 10 min in one case, and intractable VF in the other case. Heart rate (HR) and MAP are illustrated in Fig. 1-2.



We observed no differences in hemodynamics during CPR. After ROSC, however, highly dosed E resulted in a pronounced hyperdynamic circulation in particular concerning HR.

**Conclusions:** In a short term cardiac arrest model, E given in standard doses seems to be more effective than given in higher doses, whereby highly dosed E is capable in producing potentially dangerous prolonged arrhythmias during CPR and tachycardias after ROSC. This may be caused by an increased coronary oxygen extraction (3).

**References:** 1. JAMA 255:2905 (1986). 2. Circulation 75:491 (1987). 3. Ann. Emerg. Med. 18:336 (1989)