**Title:**
Effects of Nitroprusside on Cerebral Microcirculation

**Authors:**

**Affiliation:**
Department of Anesthesiology, Albert Einstein College of Medicine of Yeshiva University, Bronx, New York 10461

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**Introduction.** Induced hypotension by Sodium Nitroprusside (SNP) has become a frequently used technique for various surgical procedures and during clinical treatment for hypertensive crisis. Information on the effect of SNP hypotension on cerebral blood flow is accruing. However, there is disagreement over the effect of SNP (1,2); some of the studies find no significant changes in CBF while others report a decrease during the SNP period. It is readily apparent from the literature that no study has been undertaken to evaluate the effect of SNP hemodynamics of cerebral microcirculation. The present experiments were designed to demonstrate the action of SNP during i.v. infusion and topical application by relating diameter and cell velocity (Vrbc) changes in single pial microvessels to changes in volumetric blood flow (Q) and cerebral microcirculation transit time (TTC). Method. Rats, 150-200 g (n 20) were anesthetized with pentobarbital (30 mg/kg). Femoral arterial BP was recorded, blood gases and pH, were maintained by controlled ventilation via a tracheostomy. A left parietal craniotomy with an encapsulated cranial window was done for microscopy. Changes in the internal diameter of three orders of arterioles (50-14 μm) and of venules (30-80 μm) were measured by image shearing. In selected arterioles (n 17) Vrbc (mm/sec) was measured by the dual-slit photometric method and correlation technique and Q (μL/min) calculated (18-30 μm/sec) (3). Colloidal carbon injected via the jugular vein signalled the TTC from penetrating arteriole to emerging venule.

**Results.** Infusion of SNP 20 μg/kg/min and moderate hypotension (BP 70-75 mmHg), were accompanied by 13.5% (P<0.05) arteriolar dilation, and TTC was prolonged 46% (P<0.001). Infusion of 35 μg/kg/min of SNP caused severe hypotension (BP 45-50 mmHg), greater (43%, P<0.001) arteriolar dilation and a prolongation of TTC 96% (P<0.001).

Topical SNP (0.01%, 0.2 ml) resulted in 63.2% (P<0.01) arteriolar dilation, a two-fold increase in Vrbc 103.2% (P<0.01) and a decrease in TTC 14.6% (P<0.05). The correlation between mean percent increase in Q of single arterioles and mean percent decreased TTC was high (r=0.87). Venular dilation changes were not significant in either group and the BP was not decreased with topical SNP.

**Discussion.** The effect of SNP infusion in the rat resulted in dose-related hypotension, pial arteriolar dilation, TTC prolongation but without any significant change in venular diameter. Topical application of 0.01% SNP was followed by arteriolar dilation increased Q and decrease in TTC but no change in BP and venular diameter. The study confirmed the strong vasodilator action of SNP on brain microcirculation. The vascular smooth muscle relaxant effect is highly selective in the precapillary segment of the microcirculation, with minimal or no effect on the postcapillary segment. The arteriolar dilation and increase in regional blood flow (Q) can occur without systemic BP changes when SNP is applied topically. In conclusion, the present observations relating to arteriolar Vrbc and Q changes may provide further insight into cerebral hemodynamic response to SNP administration.

This study was supported in part by USPH-NIH Grant HL 06736 and Department Funds.

**References.**

**Changes Expressed as % of Control During SNP**

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<thead>
<tr>
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<th>i.v. 0.02% SNP</th>
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<tbody>
<tr>
<td>BP</td>
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<tr>
<td>Art. id</td>
<td>113.5±8.5*</td>
<td>143.2±11.6**</td>
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<tr>
<td>Ven. id</td>
<td>104.3±5.2</td>
<td>103.2±6.1</td>
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<tr>
<td>TTC</td>
<td>146.1±2.8**</td>
<td>196.2±20.9***</td>
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<tr>
<td>Vrbc</td>
<td>106.3 ++</td>
<td>50.2 ++</td>
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<tr>
<td>Q</td>
<td>171.1 ++</td>
<td>239.2 ++</td>
</tr>
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</table>

**Remarks:** Data presented as mean ± S.E.

* P<.05; ** P<.01; *** P<.001; ++ Initial Studies