中文題目：急性環境溫度變化對門脈高壓大鼠血流動力學的影響及其機轉探討

英文題目：The effects of acute environmental temperature change in portal hypertensive rats and the mechanism survey

作　　者：潘俊傑[1]　許劭榮[2,3]　黃惠君[2,3,4]　黃怡翔[2,3]　侯明志[2,3]　李發耀[2,3]

服務單位：[1]台北榮民總醫院內科部，[2]台北榮民總醫院內科部肝膽腸胃科，[3]國立陽明大學醫學系，[4]台北榮民總醫院內科部一般內科

Background: Portal hypertension leads to lethal complications such as gastroesophageal varices bleeding. Variceal bleeding correlates positively with portal pressure and it had been noticed that the incidence rate of variceal bleeding in cirrhotic patients is higher in cold days. However, whether environmental temperature affects portal hypertension-related hemodynamic factors has not been surveyed or clarified. The preliminary study in our lab disclosed that low environmental temperature exposure induced peripheral vasoconstriction in cirrhotic rats. The blood flow was thereafter shifted to portal system then elevated portal pressure. However, it is mandatory to exclude the potential influence derived from liver cirrhosis-related factors, such as endotoxemia. This study, therefore, aimed to disclose the mechanism by which the environmental temperature affects systemic and/or portal hemodynamics in portal hypertensive rats without liver cirrhosis.

Methods: Portal hypertension was induced in male Spraque-Dawley rats with partial portal vein ligation (PVL). Two weeks after PVL, the following experiments were performed. In the first part, effects of acute environmental temperature changes on portal hypertension relevant hemodynamic parameters were evaluated. Four series of environmental temperature changes were conducted, including 1. 25 ℃ to 32 ℃; 2. 25 ℃ to 25 ℃; 3. 25 ℃ to 15 ℃; 4. 25 ℃ to 5 ℃. The changes of portal hypertension-related hemodynamic parameters were recorded and calculated, including portal pressure, mean arterial pressure, heart rate, cardiac index, systemic vascular resistance, superior mesenteric arterial flow, superior mesenteric arterial resistance, portal venous blood flow and portal vein resistance. In the second part, the role of alpha adrenergic receptor in portal hypertension relevant hemodynamic parameters affected by acute environmental temperature change was determined. Vehicle (normal saline), phentolamine 0.25 mg/kg, 0.5 mg/kg, and 0.5 mg/kg

respectively was intravenously injected sequentially. The relevant hemodynamic parameters change was recorded whenever the environmental temperature decreased from 25℃ to 15℃. In the third part, the role of beta adrenergic receptor in portal hypertension relevant hemodynamic parameters affected by acute environmental temperature change was determined. Vehicle (normal saline), propranolol 0.25 mg/kg, 0.5 mg/kg, and 0.5 mg/kg respectively was intravenously injected sequentially. The relevant hemodynamic parameters change was recorded whenever the environmental temperature decreased from 25℃ to 15℃. After the experiments, the data was analyzed and compared.

Results: The elevated or steady environmental temperature did not affect the hemodynamics of the portal hypertensive rats. But low temperature exposure significantly elevated the portal pressure, mean arterial pressure, heart rate, systemic vascular resistance, superior mesenteric artery flow, SMA resistance and hepatic vascular resistance. Phentolamine dose dependently inhibited the portal pressure surge. On the other hand, propranolol did not block the low temperature exposure-related portal pressure surge.

Conclusion: Low environmental temperature exposure induced transient portal pressure surge. The low environmental temperature caused peripheral vasoconstriction. Such a re-distribution of blood flow thus went toward the splanchnic system and resulted in worsening of portal hypertension. The adverse effect of low temperature exposure was attenuated by alpha adrenergic blockade. This finding adds knowledge to the temperature-related modulation of portal hypertension and may have impacts on clinical treatment strategy.