Therapeutic effect of Sung Yod rice bran hydrolysates in L-NAME-induced hypertensive rats

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Hypertension

• Primary or essential hypertension (90-95%)
  – A condition which is characterized by high BP not associated with any identifiable underlying cause.

• Secondary hypertension (5-10%)
  – Hypertension results from an underlying identifiable cause.
Oxidative stress in hypertension

- Increased resistance
- Fibrosis
- Remodeling

- Increased Ang II level

Increased vascular resistance

Increased blood pressure
L-NAME-induced hypertensive rats

Acetylcholine, serotonin, thrombin, bradykinin
NADPH, BH₄, L-arginine
Ca⁺⁺, CaM, Caveolin
L-citrulline
eNOS
L-NAME
NO
Shear stress
Endothelial cell
Vascular smooth muscle cell
GTP, GC, cGMP, Relaxation

Oxidative stress
Endothelial dysfunction
Vascular resistance
Hypertension
Management of hypertension

Lifestyle modification

Food
Exercise
Manage Stress
Cut Salt
Manage Weight
Stop Smoking

The new Hypertension Guideline 2017

Initial Drugs of Choice for Hypertension

- Angiotensin converting enzyme (ACE) inhibitor (ACEI)
- Angiotensin receptor blocker (ARB)
- Thiazide diuretic
- Calcium channel blocker (CCB)
Rice (Oryza sativa L.) and milling process

Rice milling process

Paddy Rice → Brown Rice → White Rice

Rice Bran

25%  

Rice Hulls

>> Phytochemicals & Nutritional values in rice bran

- Carbohydrate, fibers and protein
- Minerals
- Vitamin B and E
- Gamma-oryzanol
- Phytosterols
**Nutritional and antioxidant compounds in Sungyod rice bran**

- Vitamin B and E
- Carbohydrate, fibers and protein
- Minerals e.g. iron, calcium, phosphorus
- Anthocyanin
- Phenolic compounds
- Gamma-oryzanol

Sungyod rice bran

(Phatthalung, Thailand)

Antioxidant and Anti-inflammation

Sompong et al., 2011, Itharat et al., 2016
Rice bran hydrolysates and hypertension

Rice bran protein hydrolysates reduce arterial stiffening, vascular remodeling and oxidative stress in rats fed a high-carbohydrate and high-fat diet

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- Anti-hypertension
- Anti-oxidation
- Reduced endothelial dysfunction
- Reduced vascular remodeling

Peptides-Derived from Thai Rice Bran Improves Endothelial Function in 2K-1C Renovascular Hypertensive Rats

Aim: To evaluate the therapeutic effect of sungyod rice bran hydrolysates in L-NAME-induced hypertensive rats
Methods

how to ...
Experimental design

**Therapeutic regimen (6 weeks)**

- **Hypertensive group**
  - L-NAME in drinking water for 6 weeks

  1. L-NAME + DI
  2. L-NAME + SRH (500 mg/kg)
  3. L-NAME + Lis (1 mg/kg)
  4. L-NAME + SRH (500 mg) + Lis (1 mg)

- **Normotensive group** (treatment week 3-6)
  - Deionized water or DI (2 ml/kg BW)

**Week**

- 0
- 3
- 6

**L-NAME**

**SRH / Lis**
Hemodynamics measurement

Femoral artery

Femoral vein

HBF in 100 g tissue unit = \( \frac{HBF \times 100}{HLW} \) (\( ml/100g \) tissue/min)

\( HVR = \frac{MAP}{HBF} \) (\( mmHg/min/100g/ml \))

- HLW; hindlimb weight
- HVR; hindlimb vascular resistance
- MAP; mean arterial pressure
- HBF; hindlimb blood flow

BIOPAC System
Rats were anesthetized with pentobarbital sodium (60 mg/kg, i.p.)

- Hemodynamic measurement (SBP, DBP, MAP, HBF and HVR)
- Oxidative stress markers
  - Vascular superoxide (O$_2^-$) production
  - Plasma MDA
  - Plasma ACE activity
Results
Effect of SRH on hemodynamic parameters

Results are expressed as mean ± S.E.M., n = 8-10/group.

* p<0.05 vs. controls; # p<0.05 vs. L-NAME, † p<0.05 vs. L-NAME+Lis, ‡ p<0.05 vs. L-NAME+SRH500
Effect of SRH on hemodynamic parameters

Antihypertensive effect of SRH and Lis. is associated with the improvement of blood flow and the reduction of vascular resistance.

* $p < 0.05$ vs. controls; # $p < 0.05$ vs. L-NAME, † $p < 0.05$ vs. L-NAME+Lis, ‡ $p < 0.05$ vs. L-NAME+SRH500

Results are expressed as mean ± S.E.M., n = 8/group.
Effect of SRH on oxidative stress parameters

**O$_2^-$ production**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Vascular superoxide production (Counts/min/mg dry weight)</th>
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</thead>
<tbody>
<tr>
<td>Control</td>
<td>[Data]</td>
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<tr>
<td>Vehicle</td>
<td>[Data]</td>
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<tr>
<td>SRH500 mg</td>
<td>[Data]</td>
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<tr>
<td>Lis 1 mg</td>
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<tr>
<td>SRH+Lis</td>
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**Plasma MDA**

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Results are expressed as mean ± S.E.M., n = 5/group.
Effect of SRH on plasma ACE activity

Results are expressed as mean ± S.E.M., n = 5/group.

*p<0.05 vs. controls;  # p<0.05 vs. L-NAME, † p<0.05 vs. L-NAME+Lis
Summary

Overall results suggest that SRH can help reduce the risk of developing hypertension.
Combination of SRH and Lis is showed more effective than treatment with SRH or Lis alone.
34th academic meeting at Faculty of Medicine Khon Kaen university Thailand 8-10, August 2018

Europhysiology 2018 at Queen Elizabeth II center, London, United Kingdom 14-16, September 2018
What’s Next

Work plan

- Data collection and analysis
- Manuscript writing and submission
- Thesis writing and thesis defense
Acknowledgements

Advisory committee

- Assoc. Prof. Dr. Upa Kukongviriyapan
- Prof. Dr. Veerapol Kukongviriyapan
- Assoc. Prof. Dr. Poungrat Pakdeechote
- Dr. Weerapon Sangartit

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Sungyod rice bran hydrolysates (SRH)

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Thank you for your attention