The anti-proliferative effect of turmeric and rooibos extracts on human Hodgkin lymphoma cells

Emily G. Kogel
University of Windsor, kogel@uwindsor.ca

Follow this and additional works at: https://scholar.uwindsor.ca/uwilldiscover

This work is licensed under a Creative Commons Attribution-Noncommercial 4.0 License

Kogel, Emily G., ”The anti-proliferative effect of turmeric and rooibos extracts on human Hodgkin lymphoma cells” (2016). UWill Discover Undergraduate Conference. 3.
https://scholar.uwindsor.ca/uwilldiscover/2016/session4/3

This Event is brought to you for free and open access by the Conferences and Conference Proceedings at Scholarship at UWindsor. It has been accepted for inclusion in UWill Discover Undergraduate Conference by an authorized administrator of Scholarship at UWindsor. For more information, please contact scholarship@uwindsor.ca.
The Anti-proliferative Effects of Turmeric and Rooibos Extracts on Human Hodgkin Lymphoma Cells

Emily Kogel

March 29, 2016
Hodgkin Lymphoma

- Immune system support
- Lymph
  - Lymphocytes + other white blood cells
  - Antibodies
  - Nutrients
Apoptosis

Cancer Treatment: Options

• Surgery

Hodgkin Lymphoma:
• Radiation therapy

• Chemotherapy

http://www.joshgitalis.com/pre-and-post-surgery-nutrition/
http://www.dailymail.co.uk/health/article-1177248/New-scans-reveal-chemotherapy-working.html
Turmeric & Rooibos

- Natural health products - new cancer treatment options?

**Turmeric**
- Strong anti-inflammatory agent
- Supports immune system
- Activates intrinsic apoptosis

**Rooibos**
- Inhibitor of x-ray-induced cell transformation
- Anti-oxidant activity
- Free-radical scavengers, like flavonoids, induce apoptosis in cancerous cells

http://www.healingthebody.ca/healing-benefits-of-turmeric/
http://www.medicinehunter.com/sites/default/files/rooibos_main.jpg?1332955889
Methods of Extraction

• 3 solvents
• Whole, complex mixture
Do the anti-proliferative properties of turmeric and rooibos extracts in cancer cells translate to Hodgkin lymphoma cells, and if they do, is the mechanism of action selective?

- Assess toxicity and efficacy \textit{in vivo}
- Discover the mode of action
- Determine selective cytotoxicity
Do the **anti-proliferative properties of turmeric and rooibos extracts** in cancer cells translate to **Hodgkin lymphoma cells**, and if they do, is the mechanism of action **selective**?

**OBJECTIVES**

1. Determine if turmeric and rooibos extracts, both individually and in combination, exhibit cytotoxic effects against Hodgkin Lymphoma cells *(WST-1 assay)*

2. Quantify cytotoxicity *(Trypan blue exclusion assay)*

3. Determine permanency of the drugs’ effects *(Revival assay)*
1. Determining cytotoxicity

- WST-1 Assay

Lower absorbance = Lower viability
Cytotoxicity of Turmeric Extracts (KM-H2)

Absorbance at 450 nm

Cold Water

Hot Water

Ethanol (Unfiltered)

Ethanol (Filtered)
Cytotoxicity of Turmeric Extracts (KM-H2) - ROUND 2

**Cold Water**
- Absorbance at 450 nm (% of Control)
- Concentration (mg/mL)
- 48 Hours
- 96 Hours

**Ethanol (Unfiltered)**
- Absorbance at 450 nm (% of Control)
- Concentration (mg/mL)
- 48 Hours
- 96 Hours

0.1
Cytotoxicity of Rooibos Extracts (KM-H2)

**Cold Water**

**Hot Water**

**Ethanol (Unfiltered)**

**Ethanol (Filtered)**

<table>
<thead>
<tr>
<th>Concentration (mg/mL)</th>
<th>Absorbance at 450 nm % of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concentration (mg/mL)</th>
<th>Absorbance at 450 nm % of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concentration (mg/mL)</th>
<th>Absorbance at 450 nm % of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concentration (mg/mL)</th>
<th>Absorbance at 450 nm % of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>

* denotes significant difference from control.
Cytotoxicity of Rooibos Extracts (KM-H2) – ROUND 2

Cold Water

Hot Water

Ethanol (Unfiltered)
2. Quantify cytotoxicity

- Trypan blue exclusion assay
2. Quantify cytotoxicity:

Effect of ethanolic turmeric extract on the viability of KM-H2 cells
2. Quantify cytotoxicity:

Effect of rooibos extracts on the viability of KM-H2 cells

Cold water rooibos

Hot water rooibos

![Graph showing the effect of rooibos extracts on the viability of KM-H2 cells](image-url)
2. Quantify cytotoxicity:

Effect of extracts in combination on the viability of KM-H2 cells

Cold water combination

Hot water combination

![Graph showing the effect of extracts in combination on the viability of KM-H2 cells over time.](image)

- **Turmeric EtOH 0.05**
- **Rooibos 0.1**
- **Turmeric EtOH 0.05 + Rooibos 0.1**
- **VP16 (0.05)**
- **Control**
3. **Determine permanency of the drugs’ effects**

- **Revival assay**

<table>
<thead>
<tr>
<th>Drug Type</th>
<th>48h</th>
<th>24h</th>
<th>48h</th>
<th>72h</th>
<th>96h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ineffective drug/ Control</td>
<td><img src="happy_face" alt="emoji" /></td>
<td><img src="happy_face" alt="emoji" /></td>
<td><img src="happy_face" alt="emoji" /></td>
<td><img src="happy_face" alt="emoji" /></td>
<td><img src="happy_face" alt="emoji" /></td>
</tr>
<tr>
<td>Semi-effective drug</td>
<td><img src="sad_face" alt="emoji" /></td>
<td><img src="sad_face" alt="emoji" /></td>
<td><img src="sad_face" alt="emoji" /></td>
<td><img src="happy_face" alt="emoji" /></td>
<td><img src="happy_face" alt="emoji" /></td>
</tr>
<tr>
<td>Effective drug</td>
<td><img src="sad_face" alt="emoji" /></td>
<td><img src="sad_face" alt="emoji" /></td>
<td><img src="sad_face" alt="emoji" /></td>
<td><img src="sad_face" alt="emoji" /></td>
<td><img src="sad_face" alt="emoji" /></td>
</tr>
</tbody>
</table>
Growth of KM-H2 cells in various treatment groups:

**PRELIMINARY RESULTS**

48 hours (with drug)

24-72 hours (without drug)
Conclusions

• Turmeric: ethanolic extracts exhibit anti-proliferative effects on Hodgkin lymphoma cells that are likely long-lasting

• Rooibos: hot water extracts show cytotoxicity against Hodgkin lymphoma cells

• A combinatorial effect exists when low doses of ethanolic turmeric and cold/hot water rooibos extracts are used together

These natural health products show potential to be studied further for the development of more effective chemotherapeutic agents.
Future Work

• Assess selectivity of extracts by studying cytotoxicity in normal lymphocytes

• Evaluate the mode of cell death induction

• Assess toxicity and efficacy alone and in combination in animal models
Dedication

- Dedicated to the memory of Kevin Couvillon, who lost his battle against Leukaemia in 2010.
Acknowledgments

• Dr. Pandey
• Members of Dr. Pandey’s Lab
• Funding
Thank you!