Jobelyn: A Multifunctional Health Formulation

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Health Forever Product, Inc.
Jobelyn: A Sorghum-based Multifunctional Nutritional Formulation

This presentation will discuss:

- Sorghum background & traditional uses
  - Anti-viral properties
  - Modulation of inflammation
  - Additional health benefits
- Safety of Jobelyn
- Research done on Jobelyn
  - Antioxidant properties
  - Anti-inflammatory properties
  - Immune function modulation & enhancement
Sorghum bicolor Traditional Uses

- Sorghum traditional medicinal use
  - Foods
  - Hot teas
  - Fermented beverages (beers)
  - Extracts
Sorghum bicolor

- Parts of the plant that are used for consumption:
  - Leaves, leaf sheaths, stems, seeds, root.
  - These parts have different chemical composition
- Jobelyn: Leaf sheaths
Jobelyn

- *Sorghum bicolor* leaf sheath (SBLS)
- Recently domesticated from a west African wild variety
Jobelyn – Potential As a Food Colorant

- Contains high amounts of an intensely reddish-colored pigment dimeric 3-deoxyanthocyanidin
- Remarkably resistant to pH changes and bisulfite alteration
- Useful as a stable colorant.
Sorghum bicolor Has Anti-viral Properties

- Sorghum contains anti-viral peptides
- These peptides have so far been documented in the seeds but may be present in other plant components
  - Inhibits herpes simplex
  - Inhibits non-enveloped polio virus
  - May provide support to patients with chronic viral illnesses
**Sorghum bicolor** Modulates Inflammation

- **Anti-inflammatory properties**
  - Reduced production or inhibition of IL-1b, and TNF-alpha [Burdette 2010]

- **Pro-inflammatory properties**
  - Water-soluble beta-glucans capable of initiating macrophage activation [Ramesh 2000]

- The dual effect suggests that Sorghum bicolor may modulate inflammatory reactions
THE EFFECT OF EXTRACT OF SORGHUM BICOLOR LEAF SHEATHS (JOBELYN) ON THE HEMATOLOGICAL PARAMETERS OF PATIENTS WITH SICKLE CELL ANEMIA

• There were no significant changes in the blood cell counts. However, there was a significant reduction in the mean cell hemoglobin concentration. There were no significant changes in the blood urea, creatinine, creatinine kinase, transaminase and electrocardiography to suggest toxicity.

• There was no significant changes in the blood cell count which is an indication that the extract is non toxic to the marrow. The significant reduction in the mean cell hemoglobin concentration might contribute to the reduction in sickling episode. There is no evidence of toxicity to the liver, the kidneys nor the heart. Further studies will be required to determine the effect of the extract on the quality of life of sickle cell anemia patients.

• Clinical Trial at Lagos State University Teaching Hospital
Additional Health Benefits of *Sorghum bicolor*

- Hematopoietic effects [Ogwumike 2002]
  - Potential for use in treating anemia patients
  - Shown to increase hemoglobin and RBCs in anemic rats [Erah 2003, Oladiji 2007]

- Hepatoprotective [Akande 2010]

- Antinociceptive properties – pain relief [Nwinyi 2009]
Additional Health Benefits of *Sorghum bicolor*

- **Neuro-protective effect of Jobelyn:**
  - Potential for treatment of Epilepsy [Umukoro 2012]
  - Anti-amnestic effect [Umukoro 2013]
  - Ameliorates symptoms of psychosis [Umukoro 2013]
  - Antiaggressive activity [Umukoro 2013]
  - Antidepressant-like Property of Jobelyn [Umukoro 2013]
COSMECEUTICAL PROPERTIES OF JOBELYN

Assays Performed

<table>
<thead>
<tr>
<th>Assays Performed</th>
<th>Results IC\textsubscript{50}</th>
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</thead>
<tbody>
<tr>
<td>Collagenase Inhibition\textsuperscript{1}</td>
<td>60 µg/mL</td>
</tr>
<tr>
<td>Elastase inhibition\textsuperscript{1}</td>
<td>17 µg/mL</td>
</tr>
<tr>
<td>Anti-glycation\textsuperscript{2}</td>
<td>4 µg/ML</td>
</tr>
</tbody>
</table>

\textsuperscript{1}Wrinkle is a product of aging, smoking, sun exposition, pollution and etc. With the decrement of collagen (which provides skin firmness) and elastin (which supplies skin elasticity and rebound), appearances of roughness, uneven tone, brown patches, thin skin and deep wrinkles will show up. A product’s anti-wrinkle activity can be determined by its inhibitory capacity on collagenase or elastase. Jobelyn was analyzed against common benchmarks that are known for anti-wrinkling. Collagenase inhibition: 15-fold potency of Vitamin C; 8-fold potency of Idebenone; 30-fold potency of ferrulic acid. Elastase inhibition: 22-fold potency of Vitamin C; 8-fold potency of ferrulic acid; 1.5-fold potency of quercetin.

\textsuperscript{2}Collagens are important proteins for the skin, as they are essential for structure and function of the extracellular matrix of the dermis. Thinner and wrinkled skin, the typical signs of normal aging, are the consequences of reduced collagen. Protein glycation contributes to skin aging as it deteriorates the existing collagen by crosslinking. Accelerated skin aging is especially noticeable in diabetic patients, where glycation is increased because of the high serum glucose level. Jobelyn was analyzed in parallel with ascorbic acid and alpha-tocophenol (chose1benchmarks), neither ascorbic acid nor alpha-tocophenol showed significant anti-glycation activity.

Reference:
Generation of Active Oxygen Species from Advanced Glycation End-Products (AGE) under Ultraviolet Light A (UVA) Irradiation Hitoshi Masaki, Yuri Okano and Hiromu Sakurai, Biochemical and Biophysical Research Communications 235 (2) 1997, 306-310.
LET FOOD BE THY MEDICINE
AND
LET THY MEDICINE BE FOOD

HIPPOCRATES
(Father of Medicine)
FACTS ABOUT JOBELYN

1. Jobelyn is developed from African folk medicine and has been in use for centuries as a cure-all.
2. It is Sorghum bicolor leafs formulated, arranged and packaged by nature and presented by Health Forever Product Limited.
3. It is a unique product that conforms with the Hippocrate’s quote
Nutritional Benefits of Jobelyn

Jobelyn is rich in:
- minerals,
- fatty acids,
- fiber and antioxidants

that aid in lowering cholesterol, regulating blood sugar, lowering obesity, preventing hypertension and maintaining a healthy weight.
Jobelyn is anti-inflammatory. It helps in improving brain health and performance. It is rich in omega3, fatty acids and fiber that aid in reducing inflammation and cholesterol levels in the body, thus lowering central obesity.
Jobelyn is rich in manganese, phosphorous, calcium and magnesium.
These nutrients reduce hypertension and boost metabolism. They also help in synthesising DNA and maintaining a healthy weight. The protein and fiber content in Jobelyn results in regulation of satiety between meals.
## JOBELYN NUTRITIONAL ANALYSIS

<table>
<thead>
<tr>
<th>S.#</th>
<th>TEST PARAMETER</th>
<th>TEST RESULTS PER 100 GRAMS</th>
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<tbody>
<tr>
<td>A</td>
<td>MISCELLANEOUS</td>
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</tr>
<tr>
<td>1</td>
<td>Calories</td>
<td>324 Cal</td>
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<tr>
<td>2</td>
<td>Calories From Fat</td>
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<tr>
<td>3</td>
<td>Protein</td>
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<tr>
<td>4</td>
<td>Cholesterol</td>
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<tr>
<td>5</td>
<td>Fluoride</td>
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<tr>
<td>6</td>
<td>Ash</td>
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<tr>
<td>7</td>
<td>Moisture</td>
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<tr>
<td>8</td>
<td>Total Dietary Fiber</td>
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<tr>
<td>9</td>
<td>Total Carbohydrates</td>
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<td>---------------------------</td>
</tr>
<tr>
<td>10</td>
<td>Fructose</td>
<td>0.2g</td>
</tr>
<tr>
<td>11</td>
<td>Glucose</td>
<td>0.1g</td>
</tr>
<tr>
<td>12</td>
<td>Sucrose</td>
<td>0.1g</td>
</tr>
<tr>
<td>13</td>
<td>Lactose</td>
<td>&lt;0.1g</td>
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<tr>
<td>14</td>
<td>Maltose</td>
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<tr>
<td>15</td>
<td>Galactose</td>
<td>&lt;0.1g</td>
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<tr>
<td>16</td>
<td>Total Sugar</td>
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<tr>
<td>C</td>
<td>VITAMINS</td>
<td>100 GRAMS</td>
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<tr>
<td>17</td>
<td>Vitamin A as Retinol</td>
<td>&lt;100IU</td>
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<tr>
<td>18</td>
<td>Vitamin C</td>
<td>&lt;1.0mg</td>
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<tr>
<td>19</td>
<td>Thiamine</td>
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<tr>
<td>20</td>
<td>Riboflavin</td>
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<tr>
<td>21</td>
<td>Niacin</td>
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<tr>
<td>22</td>
<td>Vitamin B12</td>
<td>0.83mcg</td>
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### JOBEYN NUTRITIONAL ANALYSIS

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<tr>
<td>23</td>
<td>Calcium</td>
<td>352mg</td>
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<tr>
<td>24</td>
<td>Potassium</td>
<td>500mg</td>
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<tr>
<td>25</td>
<td>Magnesium</td>
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<tr>
<td>26</td>
<td>Iron</td>
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<tr>
<td>27</td>
<td>Zinc</td>
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<tr>
<td>28</td>
<td>Phosphorus</td>
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<tr>
<td>29</td>
<td>Sodium</td>
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<tr>
<td>30</td>
<td>Copper</td>
<td>0.115mg</td>
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<tr>
<td>31</td>
<td>Selenium</td>
<td>15.40mcg</td>
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## JOBELYN NUTRITIONAL ANALYSIS

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<tr>
<th>S.#</th>
<th>TEST PARAMETER</th>
<th>TEST RESULTS PER 100 GRAMS</th>
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<tr>
<td>E</td>
<td><strong>FATTY ACIDS</strong></td>
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</tr>
<tr>
<td>32</td>
<td>Saturated Fatty Acids (Acid Form)</td>
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<tr>
<td>33</td>
<td>Total Cis Unsaturated Fatty Acids (Acid Form)</td>
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<tr>
<td>34</td>
<td>Monounsaturated Fatty Acids (Acid Form)</td>
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<td>Polyunsaturated Fatty Acids (Acid Form)</td>
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<td>36</td>
<td>Trans Fatty Acids (Acid Form)</td>
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<tr>
<td>37</td>
<td>Omega 3 Fatty Acids</td>
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<tr>
<td>38</td>
<td>Omega 6 Fatty Acids</td>
<td>0.110g</td>
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<tr>
<td>39</td>
<td>Omega 9 Fatty Acids</td>
<td>0.034g</td>
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<tr>
<td>40</td>
<td>Total Fatty Acids</td>
<td>0.344g</td>
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TOTAL BIOFLAVONOIDS IN JOBELYN

Jobelyn sample Lot#11

Total bioflavonoids \(^1\) 254.27 (mg/g)

\(^1\) The total bioflavonoids result is expressed as milligram rutin equivalent per gram

- Testing performed by Y. Kou & H. Ji. At Brunswick Laboratory, USA
PHENOLICS IN JOBELYN

- Jobelyn Sample 21/07/2006
- Phenolics¹ 106.86 (mg/g)

¹ The phenolic result is expressed as milligram gallic acid equivalent per gram.

- Testing performed by Y. Kou & H. Ji. At Brunswick Laboratory, USA
Nutrition Glossary

- **Calcium**: Calcium helps prevent osteoporosis; of the two to three pounds of calcium contained in the human body, 99% is located in the bones and teeth.
- Calcium also seems to play a role in lowering blood pressure, and has been shown to reduce the risk of cardiovascular disease in postmenopausal women.
- **Calorie**: Calorie is a unit of measurement for energy. One calorie is formally defined as the amount of energy required to raise one cubic centimeter of water by one degree centigrade. For the purpose of measuring the amount of energy in food, nutritionists most commonly use kilocalories (equal to 1,000 calories), and label the measurement either as "kcal" or as "Calories" with a capital "C." One kcal is also equivalent to approximately 4.184 kilojoules.
- **Carotenoids**: Carotenoids are natural fat-soluble pigments found in certain plants. Carotenoids provide the bright red, orange, or yellow coloration of many vegetables, serve as antioxidants, and can be a source for vitamin A activity.
- **Cholesterol**: Cholesterol is a soft, waxy substance present in all parts of the body including the nervous system, skin, muscles, liver, intestines, and heart. It is both made by the body and obtained from animal products in the diet. Cholesterol is manufactured in the liver for normal body functions including the production of hormones, bile acid, and vitamin D. It is transported in the blood to be used by all parts of the body.

  In the bloodstream, cholesterol combines with fatty acids to form **chum**: Of all the essential minerals in the human body, calcium is the most abundant. Calcium helps the body form bones and teeth and is required for blood clotting, transmitting signals in nerve cells, and muscle contraction.

  high density (HDL) and low density (LDL) lipoproteins. LDLs are considered the "bad cholesterol," since they can stick together to form plaque deposits on the walls of your blood vessels, leading to atherosclerosis.

  One-fourth of the adult population in the U.S. has high blood cholesterol levels. More than half of the adult population has blood cholesterol levels that exceed the desirable range, as specified by the medical community. 1 cup = 8 fl oz
- **Copper**: Copper is a trace element that is essential for most animals, including humans. It is needed to absorb and utilize iron. The influence of copper upon health is due to the fact that it is part of enzymes, which are proteins that help biochemical reactions occur in all cells. Copper is involved in the absorption, storage, and metabolism of iron. The symptoms of a copper deficiency are similar to iron deficiency anemia. Copper may be absorbed by both the stomach and small intestinal mucosa, with most absorbed by the small intestine. Copper is found in the blood bound to proteins.
- **Daily Values (DV)**: Daily Values are the dietary reference values that are used on all current U.S. Nutrition Facts labels. These values were determined by the FDA to best represent the minimum needs of the general population. For many nutrients, DVs will exceed your actual minimum needs, since they conservatively allow for the minimum needs of more demanding conditions, such as pregnancy or lactation. Most DVs are derived from Dietary Reference Intakes (DRI) and other recommendations made by the Food and Nutrition Board, Institute of Medicine (IOM).

  For use on food labels, Daily Values formally replace all other previously used references, including Daily Reference Values (DRV), Reference Daily Intakes (RDI), and Recommended Dietary Allowances (RDA).
- **Dietary Fiber**: Dietary fiber comes from the thick cell walls of plants. It is an indigestible complex carbohydrate. Fiber is divided into two general categories: water soluble and water insoluble.

  Soluble fiber has been shown to lower cholesterol. However, in many studies, the degree of cholesterol reduction was quite modest. For unknown reasons, diets higher in insoluble fiber (mostly unrelated to cholesterol levels) have been shown to correlate better with protection against heart disease in human trials. Soluble fibers can also lower blood sugar levels, and some doctors believe that increasing fiber decreases the body's need for insulin—a good sign for diabetics.

  Insoluble fiber acts as a stool softener, which speeds digestion through the intestinal tract. For this reason, insoluble fiber is an effective treatment for constipation. The reduction in "transit time" has also been thought to partially explain the link between a high fiber diet and a reduced risk of colon cancer.
• **Fatty Acids**: Fatty acids are individual isomers of what we more commonly call "fats". There are potentially hundreds of different fatty acids, but just a few dozen that are commonly found in the foods we eat.

• **Flavonoids (bioflavonoids)**: Flavonoids are a class of water soluble pigments that are found in many plants. A few thousand different flavonoids have so far been identified. While not labeled as essential nutrients, many of these compounds serve as antioxidants or play other important roles in maintaining the health of your body.
Some researchers break flavonoids down into subclasses that include isoflavones, anthocyanidins, flavans, flavonols, flavones, and flavanones. However, these sub classifications are not universally recognized.

• **Iron**: Iron is one of the human body’s essential minerals. It forms part of hemoglobin, the component of the blood that carries oxygen throughout the body. People with ironpoor blood tire easily because their bodies are starved for oxygen. Iron is also part of myoglobin, which helps muscles store oxygen. With insufficient iron, adenosine triphosphate (ATP; the fuel the body runs on) cannot be properly synthesized. As a result, some iron deficient people can become fatigued even when they are not anemic.

• **Magnesium**: Magnesium is an essential mineral for the human body. It is needed for protein, bone, and fatty acid formation, making new cells, activating B vitamins, relaxing muscles, blood clotting, and forming adenosine triphosphate (ATP). The production and use of insulin also requires magnesium.
Under certain circumstances magnesium has been found to improve vision in people with glaucoma. Similarly, magnesium has demonstrated an ability to lower blood pressure.

• **Manganese**: Manganese is an essential trace mineral that is required in small amounts to manufacture enzymes necessary for the metabolism of proteins and fat. It also supports the immune system and bloodsugar balance and is involved in the production of cellular energy, reproduction, and bone growth.
Manganese works with vitamin K to support normal blood clotting. Working with the B complex vitamins, manganese helps promote a positive outlook when faced with stress, frustration, and anxiety.

• **Phosphorus**: Phosphorus is an essential mineral that is usually found in nature combined with oxygen as phosphate. Most phosphate in the human body is in bone, but phosphate containing molecules (phospholipids) are also important components of cell membranes and lipoprotein particles, such as good (HDL) and bad (LDL) cholesterol. Small amounts of phosphate are engaged in biochemical reactions throughout the body. The role of phosphate containing molecules in aerobic exercise reactions has suggested that phosphate loading might enhance athletic performance, though controlled research has produced inconsistent results.
Potassium: Potassium is an essential mineral that helps regulate heart function, blood pressure, and nerve and muscle activity. Potassium is also required for carbohydrate and protein metabolism and helps maintain the proper pH within the body. Those with higher potassium intakes tend to have lower blood pressure and people with low blood levels of potassium who are undergoing heart surgery are at an increased risk of developing heart arrhythmias and an increased need for cardiopulmonary resuscitation. Excessive sodium intake can increase your body’s requirements for potassium.

Protein: Protein is one of the basic components of food and makes all life possible. Amino acids are the building blocks of proteins. All of the antibodies and enzymes, and many of the hormones in the body, are proteins. They provide for the transport of nutrients, oxygen, and waste throughout the body. They provide the structure and contracting capability of muscles. They also provide collagen to connective tissues of the body and to the tissues of the skin, hair, and nails.

Saturated Fat: A saturated fat is a fat or fatty acid in which there are no double bonds between the carbon atoms of the fatty acid chain. Saturated fats are usually solid at room temperature. Diets high in saturated fat have been shown to correlate with an increased incidence of atherosclerosis and coronary heart disease. Dehydrogenation converts saturated fats to unsaturated fats, while hydrogenation accomplishes the reverse.

Common saturated fats include butter, lard, palm oil, coconut oil, cottonseed oil, and palm kernel oil. Saturated fat is found in dairy products, especially cream and cheese, and in meat, as well as in many prepared foods. Some studies suggest that replacing saturated fats in the diet with unsaturated fats will increase one’s ratio of HDL to LDL serum cholesterol.

Alternatives to saturated fats include monosaturated fats such as olive oil and polyunsaturated fats such as canola oil and corn oil.

Selenium: Selenium is an essential trace mineral. Selenium activates an antioxidant enzyme called glutathione peroxidase, which may help protect the body from cancer. Yeast derived forms of selenium have induced "apoptosis" (programmed cell death) in cancer cells in test tubes and in animals. One study found that men consuming the most dietary selenium developed 65% fewer cases of advanced prostate cancer than did men with low levels of selenium intake.

Selenium is also essential for healthy immune functioning. Even in a non deficient population of elderly people, selenium supplementation has been found to stimulate the activity of white blood cells. Selenium is also needed to activate thyroid hormones.

In a placebo controlled study, selenium supplementation indicated a reduction in disease activity in people with autoimmune thyroiditis (thyroid inflammation). In a double blind trial, selenium supplementation of infertile men improved the motility of sperm cells and increased the chance of conception.
• **Sodium:** Sodium is a mineral, an essential nutrient. It helps to maintain blood volume, regulate the balance of water in the cells, and keep nerves functioning. The kidneys control sodium balance by increasing or decreasing sodium in the urine. One teaspoon of salt contains about 2,300 milligrams of sodium, more than four times the amount the body requires per day. Most Americans consume far more sodium than their bodies need. Many foods contain sodium naturally, and it is commonly added to foods during preparation or processing or as a flavoring agent. Sodium is also found in drinking water, prescription drugs, and over-the-counter medications.

In the United States, about one in four adults have elevated blood pressure. Sodium intake is only one of the factors known to affect high blood pressure, and not everyone is equally susceptible. The sensitivity to sodium seems to be very individualized. Usually, the older one is, the more sensitive one is to salt.

• **Unsaturated Fat:** An unsaturated fat is a fat or fatty acid in which there are one or more double bonds between carbon atoms of the fatty acid chain. Such fat molecules are monounsaturated if each contains one double bond, and polyunsaturated if each contains more than one. Hydrogenation converts unsaturated fats to saturated fats, while dehydrogenation accomplishes the reverse. Unsaturated fats tend to melt at lower temperatures than saturated fats, which tend to be solid at room temperature. Both kinds of unsaturated fat can replace saturated fat in the diet. Substituting unsaturated fats for saturated fats helps to lower levels of total cholesterol and LDL cholesterol in the blood.

• **Vitamin A (Retinol):** Vitamin A is a fat soluble vitamin with multiple functions in the body. It helps cells differentiate, an essential part of cell reproduction. Cells that are not fully differentiated are more likely to undergo precancerous changes. It is a central component for healthy vision; vitamin A nourishes cells in various structures of the eye and is required for the transduction of light into nerve signals in the retina. It is required during pregnancy, stimulating normal growth and development of the fetus by influencing genes that determine the sequential growth of organs in embryonic development. It influences the function and development of sperm, ovaries, and placenta and is a vital component of the reproductive process.

• **Vitamin B1 (Thiamin):** Vitamin B1 is a water soluble vitamin that the body requires to break down carbohydrates, fat, and protein. Every cell of the body requires vitamin B1 to form adenosine triphosphate (ATP). Vitamin B1 is also essential for the proper functioning of nerve cells.

• **Vitamin B2 (Riboflavin):** Vitamin B2 is a water soluble vitamin that helps the body process amino acids and fats, activate vitamin B6 and folic acid, and convert carbohydrates to adenosine triphosphate (ATP). Under some conditions, vitamin B2 can act as an antioxidant.

• **Vitamin B3 (Niacin):** Vitamin B3 is required for cell respiration and helps release the energy in carbohydrates, fats, and proteins. It also supports proper circulation and healthy skin, functioning of the nervous system, and normal secretion of bile and stomach fluids. It is used in the synthesis of sex hormones, treating schizophrenia and other mental illnesses, and as a memory enhancer. Nicotinic acid (but not nicotinamide) supplementation improves the blood cholesterol profile, and has been used to flush the body of organic poisons, such as certain insecticides. People report more mental alertness when this vitamin is in sufficient supply. A shortage of niacin may be indicated with symptoms such as canker sores, depression, diarrhea, dizziness, fatigue, halitosis, headaches, indigestion, insomnia, limb pains, loss of appetite, low bloodsugar, muscular weakness, skin eruptions, and inflammation.
• **Vitamin B12 (Cobalamine):** Vitamin B12 is a water soluble vitamin needed for normal nerve cell activity, DNA replication, and production of the mood affecting substance SAMe (SadenosylLmethionine).

Vitamin B12 acts with folic acid and vitamin B6 to control homocysteine levels. An excess of homocysteine has been linked to an increased risk of coronary disease, stroke, and other diseases such as osteoporosis and Alzheimer’s. Vitamin B12 deficiency causes fatigue. A small trial reported that even some people who are not deficient in B12 showed a marked increase in energy after vitamin B12 injections. However, the relationship between B12 injections and the energy level of people who are not vitamin B12 deficient has been rarely studied. Oral B12 supplements are unlikely to achieve the same results as injectable B12, because the body has a relatively poor absorption rate for this vitamin.

**Vitamin C (Ascorbic Acid):** Vitamin C is an essential watersoluble vitamin that has a wide range of functions in the human body. One of vitamin C’s important functions is acting as an antioxidant, protecting LDL cholesterol from oxidative damage. When LDL is damaged, the cholesterol appears to lead to heart disease, but vitamin C acts as an important antioxidant protector of LDL. Vitamin C may also protect against heart disease by reducing the stiffness of arteries and the tendency of platelets to coagulate in the vein. The antioxidant properties also protect smokers from the harmful effects of free radicals. Small doses of vitamin C taken by nonsmokers before being exposed to smoke have been shown to reduce the free radical damage and LDL cholesterol oxidation associated with exposure to cigarette smoke.

Vitamin C has a range of additional functions. It is needed to make collagen, a substance that strengthens many parts of the body, such as muscles and blood vessels, and plays important roles in healing and as an antihistamine. Vitamin C also aids in the formation of liver bile, which helps to detoxify alcohol and other substances. Evidence indicates that vitamin C levels in the eye decrease with age and that vitamin C supplements prevent this decrease, lowering the risk of developing cataracts.

Vitamin C has been reported to reduce activity of the enzyme aldose reductase, which theoretically helps protect people with diabetes. It may also protect the body against accumulation or retention of the toxic mineral lead.

People with recurrent boils (furunculosis) may have defects in white blood cell function that are correctable with vitamin C supplementation.

• **Zinc:** Zinc is an essential mineral with a wide variety of functions within the human body. Zinc is a component of over 300 enzymes needed to repair wounds, maintain fertility in adults and growth in children, synthesize protein, help cells reproduce, preserve vision, boost immunity, and protect against free radicals, among other functions.

In some trials, zinc lozenges have reduced the duration of colds in adults, though they have not been demonstrated to be effective in children. The ability of zinc to shorten colds may be due to a direct, localized antiviral action in the throat. A small, preliminary trial has also shown zinc sulfate to be effective for contact dermatitis, a skin rash caused by contact with an allergen or irritant.

Zinc can reduce the body’s ability to utilize copper, another essential mineral. The ability to interfere with copper makes zinc an important therapy for people with Wilson’s disease, a genetic condition that causes copper overload. In healthy individuals, however, this effect is best offset by copper supplementation.
Current Science Behind *Jobelyn*
Study Design Overview

Safety testing

- ORAC: Chemical antioxidant capacity
- CAP-e: Cellular antioxidant protection
- Anti-inflammatory Assays
- Immune Assays

Human clinical testing
Jobelyn – Safety/ Toxicology Research:

- Tested for safety in mice (Eniojukan 2009)
  - Very high oral LD50 of 250 mg/kg
  - No significant pathology at sub-lethal doses
  - No significant behavioral changes at sub-lethal doses
  - The most significant side effect from high but non-lethal doses was a mild degree of sedation.

- *Jobelyn* is considered safe for oral consumption in quantities well above the recommended dosage level of 1.5g per day.
Jobelyn Contains High Levels of Antioxidants
Antioxidant Background

- Oxygen is essential, but reacts in our body in many ways to produce free radicals, which are harmful electrically charged ions.

- Antioxidants are compounds capable of neutralizing free radicals that would otherwise potentially damage cells and tissues.

- Antioxidant protection provides multifaceted health benefits.
Antioxidant Data: Chemical vs. Cellular

• Sequential testing strategy:
  ▫ Oxygen Radical Absorbance Capacity (ORAC):
    A measure of chemical antioxidant capacity
    • Does not tell us if a compound gets into cells
    • Not always relevant in biological systems
  ▫ Cellular Antioxidant Protection (CAP-e)
    • Directly measures antioxidant uptake and protection at the cellular level
Jobelyn Has Antioxidant Properties

• ORAC results:
  ▫ Jobelyn demonstrated a high ORAC score.

• Antioxidant power against (per gram of product):
  ▫ peroxyl free radicals 3,549
  ▫ hydroxyl free radicals 18,387
  ▫ peroxynitrite 269
  ▫ superoxide anion 11,417
  ▫ singlet oxygen 4,000
  ▫ **Total ORAC** 37,622
Jobelyn – Strong Antioxidant Properties

- ORAC comparison (inhibition of peroxyl free radicals per gram of product)
  - Jobelyn: 3,549 µmoleTE/g
  - Acai berry*: 997 µmoleTE/g
  - Cherry, tart*: 68 µmoleTE/g
  - Blueberry*: 24 µmoleTE/g
  - Strawberry*: 15 µmoleTE/g
  - Oranges*: 8 µmoleTE/g
  - Grapes, red*: 7 µmoleTE/g

*[Source USDA 2010]*
Jobelyn – contains biologically active antioxidants

- Cellular Antioxidant Protection assay in erythrocytes (CAP-e):
  - Cellular model for antioxidant protection
  - Protection was seen both in the water extract and in the ethanol extract
  - This suggests a complex range of biologically active antioxidants in Jobelyn

- Foundation for further testing:
  - The CAP-e data serve as a baseline, that helps to discern and interpret more complex biological effects in other cellular models
Inflammation
Inflammation Plays A Key Role In Numerous Pathologies

- Cardiovascular disease
- Autoimmune disorders
- Allergies
- Metabolic disorders & obesity
- Arthritis
- Neurological disorders (depression, dementia)
- Potential role in cancer
- Role in HIV
Inflammation Involves Multiple Pathways

Free radical oxidative damage

Migration / infiltration of inflammatory cells

Antioxidants

Inflammation

Pain

Inflammatory enzymes
Jobelyn – Anti-inflammatory Properties

- Effect on production of Reactive Oxygen Species (ROS)
- Effect on migration or infiltration of cells in response to the Leukotriene B4.
Jobelyn Reduces Free Radical Production in Inflammatory Cells

Reactive Oxygen Species formation under conditions of oxidative stress

% change

Aqueous extraction
Ethanol extraction

0.01 mg/L  0.1 mg/L  1 mg/L  10 mg/L
Jobelyn Inhibits Infiltration of Inflammatory Cells In Lab Tests

LTB4-directed PMN cell migration

% change

Aqueous extraction

Ethanol extraction
Jobelyn May Reduce Inflammation By Several Parallel Mechanisms

- **Jobelyn** reduces the amount of free radicals produced by inflammatory cells

- **Jobelyn** reduces the attraction and migration of pro-inflammatory cells

- These results were seen in response to both aqueous and ethanol extract of **Jobelyn**
Jobelyn Modulates Immune Function
Types of Immune Cells: Review
Immune Cells

1. Express receptors on cell surface to receive signals
2. Secrete compounds to send signals to other cells
Jobelyn – Effect on CD69 Cell Surface Receptor

- **Water extract**
  - Upregulation of CD69 on CD3-CD56+ NK cells

- **Ethanol Extract Components:**
  - Upregulation of CD69 on CD3+CD56+ NKT cells
  - Upregulation of CD69 on CD3+ T lymphocytes
  - Upregulation of CD69 on monocytes
Jobelyn Induces Expression of CD69 Activation Receptor on the Cell Surface of Killer Cells

Expression of CD69 on NK cells

Expression of CD69 on NKT cells

- Baseline
- Aqueous extraction
- Ethanol extraction
Jobelyn Activates T cells and Monocytes

**Expression of CD69 on T cells**
- Baseline
- Aqueous extraction
- Ethanol extraction

**Expression of CD69 on monocytes**
- Baseline
- Aqueous extraction
- Ethanol extraction
Jobelyn Alters Cytokine / Chemokine Secretion by Activated Immune Cells
Importance of Cytokines and Chemokines

• **Cytokines:** intercellular communication
• **Chemokines:** subclass of cytokines that induce chemotaxis (directed cell migration)

• The present data focuses on a subset of cytokines and chemokines linked to anti-viral defenses
Jobelyn Alters Cytokine / Chemokine Secretion by Activated Immune Cells

- Human mononuclear blood cells were exposed to *Jobelyn* in cultures.
- The secretion of a broad array of cytokines was determined using a sensitive Luminex array
- Jobelyn affected the production and secretion of cytokines that are linked to anti-viral defenses
## Altered Cytokine / Chemokine secretion

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Upregulation of specific cytokines/chemokines by *Jobelyn*

- MIP-1a/ CCL3
- MIP-1b/ CCL4
- RANTES/CCL5

- These three chemokines have been shown to suppress replication of HIV [Cocchi 1995, Coffey 1997]
- This data is interesting in light of unpublished data on immune status in HIV patients (next slides)
Effect of *Jobelyn* on the Cellular Immunity of Persons Living With HIV/AIDS

- Study conducted by Dr. Godwin Ayuba, Department of Pathology, Navy Reference Hospital, Lagos, Nigeria
- Purpose of Study:
  - To evaluate the effects of *Jobelyn* on cellular immunity in HIV infected patients
- Twelve week study involving 64 patients
Clinical Protocol

- Patients were divided into 3 groups:
  - **Group A**: CD4 T cell count >300/µl → Jobelyn
  - **Group B**: CD4 T cell count <300/µl → Jobelyn + ARVD treatment
  - **Group C**: CD4 T cell count <300/µl → ARVD treatment

- Patients’ CD4 T cell counts were determined at 0, 6, and 12 weeks.

The anti-retroviral drug (ARVD) treatment consisted of: Nevirapine (200 mg bd), Lamivudine (150 mg bd) and Stavudine (40 mg bd)
CD4 T cell counts of HIV+/AIDS Patients.

Jobelyn alone
(n=7)

Jobelyn + ARVD
(n=40)

ARVD alone
(n=17)
Jobelyn – summary of anti-viral effects

- Activates NK cells and killer T cells, involved in anti-viral immune defense reactions
- Increases the production of anti-viral chemokines in cultured mononuclear blood cells
- Appears to support healthier CD4 T cell count in some HIV-positive patient populations
Jobelyn - Balancing Pro-inflammatory Immune Activation With Anti-inflammatory Support
Conclusions

- The data supports that Jobelyn has the following biological mechanism of action in laboratory tests:
  - Antioxidant protection
  - Reduction of Inflammatory conditions
  - Immune modulation
Further Studies

• Further clinical investigation is warranted for the use of Jobelyn:
  ▫ As a potential support for people with anemia
  ▫ As health support for people with chronic inflammatory conditions
  ▫ As a potential immune modulating adjunct in the treatment of chronic viral diseases such as HIV and herpes simplex
The Future for Jobelyn

- Our goal is to advance Jobelyn from a traditional medicinal product to be accepted as a modern nutraceutical product
- Science-based support of Jobelyn’s effects will help gain credibility and increased acceptance of this important bioactive product
References 1


References 2


References 3


References 4

• Thermal stability of 3-deoxyanthocyanidin pigments Liyi Yang, Linda Dykes, Joseph M. Awika Journal of Food Chemistry http://dx.doi.org/10.1016/j.foodchem.2014.03.105
