BUKOLYSIS

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Chinese General Hospital & Medical Center
Quirino Memorial Medical Center
Coconut

- **Scientific name** *Cocos nucifera*
Coconut

- derived from the 16th-century Portuguese and Spanish word coco meaning "head" or "skull", from the three indentations on the coconut shell that resemble facial features
Coconut ... is a fruit.

- Fruit with 3 holes
- 2 eyes and a nose
coconut

- coconut fruit is a drupe, not a true nut

- Drupe: drupe (or stone fruit) is an indehiscent fruit in which an outer fleshy part (exocarp, or skin; and mesocarp, or flesh) surrounds a shell (the pit, stone, or pyrene) of hardened endocarp with a seed (kernel) inside
Other Examples of drupe (stone fruit)

Plum -->

Peach -->

Apricot -->

Nectarine -->

Cherries -->
Coconut is a fibrous drupe not a nut…

- Other examples of drupe:
  - Avocado
  - Mango
Layers of coconut

1 exocarp
2 mesocarp
3 endocarp
4 endosperm
5 embryo
QuickTime™ and a decompressor are needed to see this picture.
QuickTime™ and a decompressor are needed to see this picture.
Coconut -- The Tree of Life

QuickTime™ and a decompressor are needed to see this picture.
Some examples of Coconut uses

• Food
  – Buko pie
  – Coconut milk or “gata”
  – Nata de coco
  – Coconut toddy, palm wine or “tuba”
  – “bukayo”
  – etc
Uses of coconut...

• Coconut oil
  – Cooking oil
  – Baking
  – Cosmetics, etc
Other uses Coconut

- **Coconut palace**
  - Famous place for wedding receptions along Manila Bay
- **Walis Tingting**
- **Bunot**
Medicinal value:

• Coconut virgin/mineral oil
  - to improve digestion, strengthen the immune system and protect against bacterial, viral and fungal infections.
MEDITINAL VALUE:

Coconut water
for
I.V.
(intravenous use)
Historically – medicinal value

- World War II
- Japanese occupation of the Philippines
- Coconut used as Intravenous fluid I.V. therapy for fluid resuscitation
Comparison of Electrolyte composition

- Extracellular fluid: e.g. blood
- Intracellular fluid: e.g. muscle cell
- Coconut water

The diagram illustrates the composition of electrolytes in plasma, cell fluid, and coconut water.
Medicinal value of coconut water
India 1972

• Intravenous administration of coconut water.

• Rao PS, Rao SR, Kumar SV, Murthy KJ, Dussey P.
I.V. coconut water 1965 Indonesia


- Ranti IS, Kwee TIEN BOH, Thio IN LIANG, Tan ENG HOEY.
British journal 1962

• Coconut water for intravenous therapy.

• GOLDSMITH HS.
American Medical Association 1954

- EISEMAN B.
Philippines ?
Urolithiasis

Kidney stones
bladder stones
uterus stones
How do I know if I have kidney/renal stones?

• Clinical History
  – flank pain
  – back pain
  – Dysuria – problems in urination
  – History of stone passage
  – Blood in urine → warrant investigation
Labs:

- Urinalysis
- Ultrasound
- KUB-IVP or intravenous urography
- CT scan
- Urinalysis
- RBC in urine (blood)
- WBC in urine (pus)
Labs:

- ultrasound

Renal stone
Renal ultrasound
• Intravenous Urography
• KUB-IVP
Labs:

- CT Scan stonogram

Cross section view

Coronal view
Stone management:

• Small
  – Medical management/medication/diet
  – ESWL

• Medium
  – Shock wave/ESWL
  – Minimally invasive surgery/endourology

• Large
  – Operation
  – Minimally invasive surgery/endourology
ESWL:
Minimally invasive surgery/endourology

cystoscopy

Ureteroscopy

Percutaneous nephrolithotomy
Laparoscopic surgery:
Open kidney stone surgery:
• Low oxalate diet
  – E.g. peanuts
  – E.g. chocolate
  – strawberry

• Low uric acid /avoid high purine diet
According to the American Medical Association (AMA), purine-containing foods include:

- Beer, other alcoholic beverages.
- Anchovies, sardines in oil, fish roes, herring.
- Yeast.
- Organ meat (liver, kidneys, sweetbreads)
- Legumes (dried beans, peas)
- Meat extracts, consomme, gravies.
- Mushrooms, spinach, asparagus, cauliflower.
Fluid intake:

• U.S.A. – Cranberry Juice for U.T.I.

• Singapore – Barley Juice

• Philippines – Sambong Leaf
  - buko juice
WATER AND FLUIDS

- daily intake of 2.5 to 3 litres/DAY

- urine output of at least 2 litres daily

- Fluid helps to wash chemical salts or crystals through the kidneys before any stone formation can take place.
QuickTime™ and a decompressor are needed to see this picture.
QuickTime™ and a decompressor are needed to see this picture.
Stages of coconut maturity

e.g. bukayo & gata

malanit

gumaan

niyog

malauhog

pangatre

malakanin

malakatad

e.g. Buko salad

e.g. buko pie
Green coconut water for intravenous use: Trace and minor element content

Georg A. Petroianu 1 *, Melita Kosanovic 1, Ibrahim Saad Shehatta 2, Bahaa Mahgoub 2, Ayman Saleh 1, Wolfgang H. Maleck 3
Philippines 1987

- Macalalag EV Jr, Macalalag AL.
Coconut water is sterile (350-700 ml/coconut)

Puncture site
For venous set
Coconut water is sterile

Puncture site
For venous set
Kidney stone

DR. MACALALAG’s BUKOLYSIS
Dr. Macalalag’s Bukolysis ~ 4 days
Effect of Bukolysis on different kidney stones (4 days)

% Stone dissolution

- cystine stones
- calcium oxalates
- calcium carbonate
- calcium phosphorus
- amorphous urates
- uric acid
- mixed stones
Stone dissolution

Stone passage
With Urine
Before and After
stone exposed to Coconut water
DECREASED MATRIX OF THE STONE
Dissolution of Urinary Tract Stones Through Buko Water Oral Therapy: A Preliminary Trial

Myra Michelle L. Macalalag
Eufemio V. Macalalag
Michael Eufemio L. Macalalag
(PHILIPPINES)

Presented at the PhilippineAmerican Urological Society
Anaheim California June 2002
QuickTime™ and a decompressor are needed to see this picture.
"Bukolysis", as it is also called, is the medical process of reducing or dissolving urinary stones of the urinary tract systems using buko water from 7 to 9 months old coconuts. Bukolysis is the brainchild of Dr. Eufemio Macalalag Jr., a urologist.
Experimental Study On Oral Ingestion Of Coconut Water For Urinary Stone Dissolution: A Preliminary Report
Section of Urology, Armed Forces of the Philippines, V. Luna Hospital, Quezon City, Philippines
&
Department of Chemistry, Ateneo de Manila University, Quezon City, Philippines
• By gel electrophoresis, it has been confirmed that proteases are present in coconut water.
• These proteases are thought to be responsible for breaking down the protein matrix responsible for adhesions of crystals in stones.
Crystals in Urine

QuickTime™ and a decompressor are needed to see this picture.
Kidney stones
These proteases are thought to be responsible for breaking down the protein matrix responsible for adhesions of crystals in stones.

- These “proteases” are thought to be helpful in dissolving the “glue” that sticks the crystals and stones together.
Before and After
stone exposed to Coconut water
DECREASED MATRIX OF THE STONE
XRD
ANATOMY

Kidneys

Ureters

Bladder
KUB – ABDOMEN XRAY
Kidney Stone
BLADDER STONE
Stones were sectioned

Patient A
Kidney Stone

Patient B
Bladder Stone
• Stones were weighed before and after treatment

• Specimen for Stone Analysis
# STONE ANALYSIS

<table>
<thead>
<tr>
<th></th>
<th>KIDNEY</th>
<th>BLADDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARBONATE</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>CALCIUM</td>
<td>5%</td>
<td>15%</td>
</tr>
<tr>
<td>OXALATE</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>AMMONIUM</td>
<td>0%</td>
<td>0.5%</td>
</tr>
<tr>
<td>PHOSPHATE</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>MAGNESIUM</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>URIC ACID</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>CYSTINE</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Stones sectioned into different pieces

For irrigation of urine of patient while:

a) Adequate hydration >2L fluid/day
b) Potassium citrate 60 meq/day (anti-\textit{urolithiasis} agent)
c) Coconut water 1500 ml/day
Urine

Sectioned Stone sample

Urine Irrigation at 10ml/min flow rate
• Stones weighed before and after the irrigation
**Results:**

<table>
<thead>
<tr>
<th></th>
<th>&gt;2L fluid hydration - Urine</th>
<th>Potassium Citrate - Urine</th>
<th>Oral coconut water – Urine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before</strong></td>
<td>Before</td>
<td>After</td>
<td>Before</td>
</tr>
<tr>
<td><strong>Kidney stone</strong></td>
<td>1.0</td>
<td>0.88</td>
<td>0.92</td>
</tr>
<tr>
<td>(wt in gms)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bladder stone</strong></td>
<td>1.9</td>
<td>1.67</td>
<td>2.52</td>
</tr>
<tr>
<td>(wt in gms)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1

WEIGHT OF STONE BEFORE & AFTER URINE IRRIGATION TREATMENT
Bladder Stone Weight (gms)

1 pre-treatment  2 post-treatment

- hydration
- K+citrate
- coconut
• Atomic Absorption Spectrophotometry
  – Nitrogen
  – Phosphorus
  – Calcium
  – Magnesium
  – Sulfur
Results:
Atomic Aborption Spectrophotometry for Kidney Stones

<table>
<thead>
<tr>
<th>Element</th>
<th>Hydration</th>
<th>K+Citrate</th>
<th>Coconut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>33.37</td>
<td>17.537</td>
<td>19.933</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>20.14</td>
<td>0.752</td>
<td>0.418</td>
</tr>
<tr>
<td>Calcium</td>
<td>55.3</td>
<td>2.21</td>
<td>1.91</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.463</td>
<td>0.097</td>
<td>0.136</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.036</td>
<td>0.07</td>
<td>0.074</td>
</tr>
</tbody>
</table>
ATOMIC ABSORPTION SPECTROPHOTOMETRY FOR KIDNEY STONE

- Nitrogen
- Phosphorus
- Calcium
- Magnesium
- Sulfur

- hydration
- K+citrate
- coconut
### Atomic Absorption Spectrophotometry for Bladder Stone

<table>
<thead>
<tr>
<th></th>
<th>hydration</th>
<th>K+citrate</th>
<th>coconut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>0.594</td>
<td>1.959</td>
<td>0.716</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>20.114</td>
<td>7.083</td>
<td>9.062</td>
</tr>
<tr>
<td>Calcium</td>
<td>55.3</td>
<td>24</td>
<td>26.75</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.463</td>
<td>0.348</td>
<td>0.378</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.036</td>
<td>0.03</td>
<td>0.022</td>
</tr>
</tbody>
</table>
ATOMIC ABSORPTION SPECTROPHOTOMETRY FOR BLADDER STONE

- Nitrogen
- Phosphorus
- Calcium
- Magnesium
- Sulfur

Legend:
- Blue: hydration
- Red: K+citrate
- Yellow: coconut
Conclusion:
• Stones irrigated with urine with intake of coconut water had the highest stone dissolution rate by comparison of weight.
Atomic absorption spectrophotometry show significant decrease in elemental components

Nitrogen, Phosphorus and Calcium show the highest decrease for kidney stones

Phosphorus and Calcium show significant decrease for bladder stones
Urology Fair 2006
16 to 19 February 2006, Singapore

Announcement

Theme:
- Urinary Stone Disease
- Endourology & Oncology - An Asian Perspective
- Kidney Cancer and Oncology
- Kidney Transplantation

Other Highlights:
- Pre Congress Endourology & Laparoscopy
- Live Surgery Workshop
- Urinary Continence and Stoma Nursing Course

www.sua.org.sg

Organised by
Singapore Urological Association

Presented
Singapore Urology Association Convention
Winner
Best Poster
Category – Urolithiasis
Asian Congress of Urology
August 22-26, 2006
Medications for stone dissolution

• Potassium citrate
  - citrate stone inhibiting formation

• Rowatinex
  – Pinene, Camphene, Cineol, Menthone, Menthol, Borneol
Medicines for stone dissolution

- Sodium bicarbonate
  - Change the urine pH (acid to base)
Medicines for stone dissolution

• Sambong
  – Blumea balsamifera
  – is used as an herbal treatment for the common cold and as a diuretic in Philippine medicine, where it is most commonly known as sambong
Drink buko water
Possible Research of making it into a tablet?
QuickTime™ and a decompressor are needed to see this picture.
THANK YOU (“,)”
Thank you
Table 2

ATOMIC ABSORPTION SPECTROPHOTOMETRY

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Kidney Stone</th>
<th>Bladder Stone</th>
</tr>
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<tbody>
<tr>
<td>Hydration</td>
<td>&gt;2L fluid</td>
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</tr>
<tr>
<td>Urine</td>
<td>33.37</td>
<td>0.594</td>
</tr>
<tr>
<td>Potassium</td>
<td>17.53</td>
<td>1.959</td>
</tr>
<tr>
<td>Citrate</td>
<td>19.9</td>
<td>6</td>
</tr>
<tr>
<td>Nut</td>
<td>7</td>
<td>9.06</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0</td>
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<td>0.036</td>
</tr>
<tr>
<td>Sulfur</td>
<td>4</td>
<td>0.036</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.07</td>
<td>0.37</td>
</tr>
<tr>
<td>Sulfur</td>
<td>2</td>
<td>8</td>
</tr>
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Figure 10. Flowchart of protein analysis used to study the proteins present in coconut water. (Note: SDS-PAGE: Sodium Dodecyl Sulfate-Polyacrylamide Gel Electrophoresis, IEC: Ion Exchange Chromatography, GFC: Gel Filtration Chromatography)
Figure 10. Flowchart of protein analysis used to study the proteins present in coconut water. (Note: SDS-PAGE: Sodium Dodecyl Sulfate-Polyacrylamide Gel Electrophoresis, IEC: Ion Exchange Chromatography, GFC: Gel Filtration Chromatography)
Bukolysis:

- Renoclysis of
Coconut water is a health drink.

• Works as a diuretic – makes a person urinate
• Anti-urolithiasis drink – helps dissolve urine stones
An ounce of prevention is worth a pound of cure

2.5 – 3 liters of fluid or water a day keeps the urologist away

American Urological Association
Bukolysis: young coconut water renoclysis for urinary stone dissolution.

Coconut water is healthy and an effective treatment for urinary stones.
Uses for coconut

• Coconut
  – Edible coconut
  – Coconut water
  – Coconut flour
• Coconut oil (virgin oil)
• Bunot
• Ropes from coconut husk
• Broom Walis tingting
• Walis tambo
• Wood fire : copra? Oil
• Lambanog
• Pickles ubod
Introduction:

• Coconut (cocos nucifera) water
  – is tropical health drink in tropical countries
  – good for kidneys
    • Hydration
    • Enzymes? Nutrients?
Philippines 1987


• Macalalag EV Jr, Macalalag AL.
Coconut water is sterile

- Historically, during the war
- Coconut water was used for intravenous therapy