Content is KING....
Content is CRUCIAL
Why vitamin K2?

Vitamin K2 is an essential fat-soluble vitamin with proven bone and heart health benefits
Vitamin K2 activates the proteins, MGP and Osteocalcin, that remove calcium from arteries and binds calcium into bone.

Too much calcium leads to blockages & hardening

Bones need calcium for growth & strength
Some degree of arterial calcification may be common, even having been demonstrated in otherwise healthy adolescents (Newman 2008)
K2 – Ideal Combinations & synergy with other Nutrients

CALCIUM
MAGNESIUM
OMEGA-3

WARNING – CONTENT DANGER- STABILITY RISK
2012 Kappa discovers unprotected/fermented K2 is unstable. Solution: microencapsulated Delta – double coated Beadlet

3 months recovery DELTA vs unprotected/fermented K2
Kappa Conducts Market Testing
Objective: inform market + protect Category

Global Testing Program: initiated in 2014
• Selected K2 mineral combinations, 3rd Party Verified (by Eurofins)
• Annual Contribution to DS Industry (Market Education)
• Published results in 2016, 2017, 2018 (pending)

Valid: USP HPLC Analysis (content) + Isomeric Purity (cis & trans)

Replicable: Products from Stores

Free participation testing to industry
K2 Market Testing
Hundreds of commercial Finished supplements tested

2017: 119 Products Tested:

8 of 94 (9%) K2-plus-minerals products met label claim

2/3rds mono-K2 products missed claim, 25% had Zero K2

K2 ordered online had problems, including isomeric purity
**Kappa Actions: Stewardship**

Provides input to USP on testing standards

Particularly important on Cis vs Trans ratios

### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>USP</th>
<th>K2VITAL*</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>trans</em>-Menaquinone-7</td>
<td>96.0%</td>
<td>99.0%</td>
</tr>
<tr>
<td><em>cis</em>-Menaquinone-7</td>
<td>2.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Menaquinone-6</td>
<td>NMT</td>
<td>2.0%</td>
</tr>
<tr>
<td>Residue on ignition</td>
<td>NMT</td>
<td>0.2%</td>
</tr>
<tr>
<td>Arsenic</td>
<td>NMT</td>
<td>2.0 µg/g</td>
</tr>
<tr>
<td>Cadmium</td>
<td>NMT</td>
<td>1.0 µg/g</td>
</tr>
<tr>
<td>Lead</td>
<td>NMT</td>
<td>3.0 µg/g</td>
</tr>
<tr>
<td>Mercury</td>
<td>NMT</td>
<td>0.1 µg/g</td>
</tr>
<tr>
<td>Total molds and yeast</td>
<td>NMT</td>
<td>1x10²</td>
</tr>
<tr>
<td>Salmonella sp.</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Staphlococcus aureus</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>absent</td>
<td>absent</td>
</tr>
</tbody>
</table>

*USP method*

*K2VITAL* typical analysis USP

**ISSUE: HIGH CIS PRODUCTS – ONE METHOD NEEDED**
Kappa Actions: Stewardship
Continued testing & informing; USP monograph on Microencapsulation;
Advocate industry Transparency & Ethical Labeling