Frog Skin Peptides as Inhibitors of Influenza and Zika Viruses

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The Global Influenza Problem

• Seasonal vaccine often ineffective and may not prevent pandemics (H1N1 outbreak)
• Global influenza market is estimated to reach $6.4B by 2021
• Influenza A rapidly develops resistance to current approved therapeutics (Tamiflu® and Relenza®)

In 2008-2009 flu season, 99.4% of H1N1 isolates displayed resistance to Tamiflu® (oseltamivir)
The Emerging Zika Threat

- CDC estimates ~ 4 million ZIKV infections in 2016 (700K in Puerto Rico) and over 100 million dengue virus infections
  - Zika virus infection during pregnancy has been linked to microcephaly in the developing fetus
- ZIKV is mosquito-borne and has no currently approved vaccine or therapeutic
  - Current best practice is to limit the vector (mosquito control)
Peptides are obtained from frog skin secretions

1. Stimulate Frogs
2. Collect secretion
3. Sequence peptides by LC-ESI-MS/MS
4. Generate synthetic peptides in vitro and test for virucidal activity

Identified 2 candidate proteins: Urumin and Yodha
Urumin is virucidal for all H1 influenza

A/PR/8/34 + Urumin (40µM)

Holthausen et al. 2017 Immunity. 46(4) 587-595.
Urumin protects mice from influenza \textit{in vivo}

**Graph:**
- **X-axis:** Days Post Infection
- **Y-axis:** Survival (%)
- Control vs Urumin survival rates
- Comparison marked by * P<0.05

**Text:**
- 70% of mice survive 2X LD$_{50}$ influenza infection

**References:**
Holthausen et al. 2017 Immunity. 46(4) 587-595.
Yodha inhibits ZIKV entry

• Value Proposition
  – Overcomes drug resistant H1 influenza
  – Provides strategy for pandemic intervention

• Next Steps
  – Continue validation of technology in vitro and in mouse models
  – Working to identify additional peptide candidates for other viruses

• Intellectual Property
  – Provisional Patent applications filed for:
    • Urumin (anti-Influenza peptide)
    • Yodha (anti-Zika/Dengue peptide)

• Commercialization
  – Seeking interested parties to discuss business opportunity and funding
Researchers use frog mucus to fight the flu

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Frog Slime Could Prevent the Next Pandemic

The Frog Slime Cure for Flu

The compound seems nontoxic, but it would be useful to know how it works.
Thank you!