Multipurpose Prevention Technologies: New drugs, New Delivery Systems

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What is Multipurpose Technology (MPT)?

An MPT is a single product intentionally designed to prevent a combination of unintended pregnancy, HIV, and/or other STIs.
MPTs for an earlier generation

Margaret Sanger Defends Her Battle For the Right of Birth Control

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Margaret Sanger

Defends Her Battle
For the Right of Birth Control

By MARGARET SANGER.

It is quite natural and consistent with capitalist laws that there should be a heavy penalty for imparting information on birth control among the workers, when we view these laws in the light of our present-day society.

In the Booth, little, pale-faced children are welcomed by society, and given drink. But 10 and 15 years of age, wood their beds and playpens in which to wander, and the mills early in the evening a beautiful childhood instead of winter loneliness before the sun is up, providing their meals and bedding and return, after long hours' work, after it has set. These little ones are just "helpers" to their mothers, who work in the mills also, while the father remains at home, caring for the younger children, and takes the money meals to his wife and children in the mills. There are eight and nine children to a family.

Almost all the stockholders of those mills are capitalists. Congressional men, etc., who have much to do in the making of the laws, are so it is to their interest that child labor be continued. They claim that child labor is the greatest burden to them in all ways.

It is the man with a lifelong family who is most absenteeism in a strike. It is in the interest of child labor to bring out an strike, for it is in the interest of the greater self-interest through the duration of the strike could accommodate various instillations where the social groups of workers have frozen a strike, upon looking back at the cause you inevitably found the men in these groups and could not withstand their or their nationalities and many children. My Nation. The Woman.
### MPTs: Historical Precedents

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>$\text{H}_2\text{O} + \text{fluoride}$</td>
<td><strong>The pill + iron</strong></td>
<td>$\text{Grains} + \text{folic acid}$</td>
</tr>
</tbody>
</table>
# Currently Available MPTs

<table>
<thead>
<tr>
<th>Male Condom</th>
<th>Female Condom</th>
<th>Diaphragm</th>
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</table>

**ADVANTAGES:** Available now in some countries  
**DISADVANTAGE:** Use rates are low, difficult to negotiate
The Epidemiological argument for MPTs
MPT Product Profile: A simple logic

MPT PRODUCTS

HIV/STI Prevention

Contraceptives
MPTs: Many Possibilities

Conditions
- Pregnancy
- HSV
- HPV
- HIV
- BV
- Chlamydia
- Gonorrhea
- Syphilis
- Candida
- Trich

Delivery Methods
- Topical daily
- Topical pericoital
- Systemic sustained
- Topical sustained
- Oral daily
- Oral pericoital

Product Types
- Vaginal film
- Vaginal tablet
- Oral tablet
- Vaginal ring
- Non-IVR device
- Vaginal gel
- Injectable
- Implantable

MPT Product Possibilities

Actions
- HC
- Non-HC
- Barrier
- Pro-biotic
- Antimicrobial
- Antifungal
- Antiviral
Global effort to coordinate MPT development

- Greater *efficiency* in terms of cost, access and delivery of SRH prevention products
- Insufficient resources, research and finance, to develop all possibilities
- Capitalize on the demand in populations using one product type to achieve uptake and use of a second “product”
Surveys to develop Target Product Profiles (TPPs) for MPTs

- SRH researchers and product developers
- US, African and Indian providers:  
  - 593 US providers, 289 African providers, 34 Indian providers
- Identify key attributes/parameters for MPT products that would lead to highest potential public health impact and guide product development and donor investment strategies
### Critical Attributes Considered:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Considered</th>
</tr>
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<tbody>
<tr>
<td>Indications</td>
<td>Target Population</td>
</tr>
<tr>
<td>Efficacy</td>
<td>Adherence</td>
</tr>
<tr>
<td>Route of Administration</td>
<td>Dosage Form &amp; Schedule</td>
</tr>
<tr>
<td>Side Effects</td>
<td>Storage Conditions</td>
</tr>
<tr>
<td>Reversibility</td>
<td>Other Health Benefits</td>
</tr>
<tr>
<td>Contra-indications &amp; precautions</td>
<td>Use by pregnant/lactating women</td>
</tr>
<tr>
<td>Product Provision (Rx vs. OTC vs. ?)</td>
<td>Access Potential &amp; Restrictions (testing?)</td>
</tr>
<tr>
<td>Product Presentation</td>
<td>R&amp;D Costs</td>
</tr>
<tr>
<td>Time to Market</td>
<td>Product Cost</td>
</tr>
<tr>
<td>Product Presentation</td>
<td>Packaging</td>
</tr>
<tr>
<td>Shelf Life</td>
<td>Disposal/Waste</td>
</tr>
</tbody>
</table>

### Researchers Priorities:

- **Indications:**
  - HIV & Pregnancy
  - HIV & STI
    - HSV, HPV, BV
  - STI & Pregnancy
- **Dosage Forms:**
  - Sustained release
  - Topical over oral
  - On demand over daily
- **Product Related (e.g.):**
  - Concealable presentation
  - 36 month shelf life
  - 40°C storage
Regional Providers’ Priorities

Priority Indications for MPTs

Priority STI (other than HIV)

Priority Dosage Form
## Potential MPT Delivery Methods

<table>
<thead>
<tr>
<th>Devices</th>
<th>Vaginal Rings</th>
<th>Vaginal Tablets</th>
<th>Vaginal Films</th>
</tr>
</thead>
</table>

[Images of vaginal devices and methods]
## Potential MPT Delivery Methods

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<tr>
<th>Drug combinations</th>
<th>Drug/device combinations</th>
<th>Multipurpose vaccines</th>
<th>Bacterial therapeutics</th>
<th>Nanoparticles</th>
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![Drug combinations](image1)

![Drug/device combinations](image2)

![Multipurpose vaccines](image3)

![Bacterial therapeutics](image4)

![Nanoparticles](image5)
On-Demand Products

1% Tenofovir Gel
(FACTS 001)

- 1st Vaginal microbicide: Phase 3 South African study (FACTS 001): results 2015
- From CAPRISA 004, activity against HIV-1 (39% protective) and HSV-2 (51% protective)
- Coitally-dependent (BAT-24)
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SILCS
(PATH, CONRAD, NICHD)

• “One size fits most” silicone diaphragm
• Intended for OTC pregnancy prevention
• 5-year shelf life, re-use for 3 years
• Non-hormonal MPT protection: pregnancy, HIV, HSV-2 up to 24 hrs
Sustained Release Devices: Combination Intravaginal Rings

30-day MZL Combo (Pop Council)

- MIV-150 + Zinc Acetate + LNG
- Demonstrated single-API success
- Pregnancy, HIV, HSV2, HPV

90-day TFV + LNG (CONRAD)

- TFV + LNG
- Testing underway, clinical studies 2013
- HIV, HSV2
Sustained Release Devices: Combination Intravaginal Rings

30-day MZL Combo (Pop Council)
- MIV-150 + Zinc Acetate + LNG
- Demonstrated single-API success
- Pregnancy, HIV, HSV-2

60-day Dapivirine + LNG (IPM)
- DPV + LNG
- Testing underway, clinical studies 2013
- Pregnancy, HIV
### Sustained Release Devices: Combination Intravaginal Rings

<table>
<thead>
<tr>
<th>Duration</th>
<th>Description</th>
<th>Testing</th>
<th>Indications</th>
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<tr>
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Sustained Release Devices: Combination Intravaginal Rings

**Nuvaring Type MPT Technology**
- Novel polymer/co-extrusion IVR
- Multiple API delivery
- Established scale-up manufacturing system

**MZL Combo NFD (Pop Council)**
- MIV-150 + Zinc Acetate + LNG in Nanofiber delivery system (NFD)
- Prevent pregnancy, HIV, HSV-2, HPV
- Up to 24-hrs protection
- Preclinical evaluation underway
Long Acting Injectables

**TMC278LA (rilpivirine; PATH)**

- Injectable nano-suspension of approved NNRTI
- Long acting: 2-3 mos (?)
- Multiple trials:
  - P1 dose ranging PK; SD/MD PK/PD
  - P2 planning

**GSK ‘744 (II; ViiV)**

- Experimental integrase inhibitor
- Dose ranging human safety P1
- NHP model efficacy studies complete
MPTs in the Pipeline

- Small Organic Molecules
- Broad Spectrum Natural Products
- Proteins/Peptides
- Non-Hormonal Contraceptives
Single & Multipurpose Vaccines

• **Today:** *Single* purpose vaccines (HPV & HBV)

• **20 years:** Multivalent vaccines (HSV, HIV, Gonorrhea, Chlamydia, Trichomonas, other STIs), syphilis

• Contraceptive vaccines are not likely
MPT Product Development Timeline

**PRE-CLINICAL**
- Pre-formulation/Formulation
- Phase 1 Manufacture
- API Development/Characterization
- Pre-clinical virology, pharmacology, safety
- Combination Preclinical Studies
- Biocompatibility (Device)

**CLINICAL**
- Phase 1 PK/PD, Safety
- Phase 2 Expanded Safety (International)
- Phase 3 Plan Submission
- Phase 3 Start

**Timeline**
- Q1
- Q2
- Q3
- Q4
- Q5
- Q6
- Q7
- Q8
- Y3
- Y4
- Y5
- Y6
- Y7
So Many Choices,
So Little Time!!!
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