MedicalXpress

MZC microbicide gel outperforms Tenofovir 1% gel in preclinical evaluation of microbicide candidates

November 25 2015

New data from a preclinical safety and efficacy study of the candidate microbicide gel MZC, which targets HIV, herpes simplex virus (HSV-2) and human papillomavirus (HPV), shows that the gel performs as well as, or in many cases, better than, tenofovir (TFV) 1% gel, a leading microbicide candidate.

The study, led by Population Council researchers with the participation of CONRAD, was published in the online edition of *Antimicrobial Agents and Chemotherapy* on Tuesday, November 24, 2015, and will be featured in the February 2016 print edition of the journal.

MZC gel, which is also known as PC-1005, contains the non-nucleoside reverse transcriptase inhibitor (NNRTI) MIV-150 (M), a highly potent antiretroviral that is formulated in MZC gel at a much lower concentration (0.002%) than tenofovir 1% gel. In addition, MZC gel contains zinc acetate dihydrate (Z), which protects against HSV-2 and HIV, and 3% carrageenan (C). Carrageenan is among the most potent anti-HPV agents tested to date. And previously published research shows that the carrageenan and zinc acetate combination enhances each compounds' antiviral properties (in vitro and in vivo) against HIV and HSV-2, which could result in a product that requires lower doses, produces fewer side effects and reduces manufacturing costs.

Developing a safe and effective microbicide for women and men is

considered to be a key step in reducing the global epidemics of HIV and other sexually transmitted infections (STIs). Researchers are particularly interested in developing multipurpose prevention technologies or MPTs, single products that can address multiple sexual and reproductive health needs.

"HIV infects 2 million people per year, and hundreds of millions more are impacted by HSV and HPV annually," said José Fernández-Romero, scientist I at the Population Council's Center for Biomedical Research and lead investigator of the study. "Development of products like as MZC offers real hope for our efforts to reduce non-curable STIs and improve sexual and reproductive health worldwide."

Key findings

In this analysis, MZC and TFV gels were tested in cell-based assays and in an ex vivo rhesus macaque vaginal explant model; the anti-HSV-2 activity of MZC and TFV 1% gels was explored in a murine (mouse) model.

While both gels showed good antiviral therapeutic indexes, MZC demonstrated a number of potential advantages over TFV 1% gel. Among these:

- MZC showed greater anti-SHIV-RT activity than TFV 1% gel in rhesus macaque vaginal explants.
- MZC gel protected mice from vaginal HSV-2 challenge (100% protection), while TFV 1% gel did not.
- MZC gel was more potent than TFV 1% gel in blocking HIV-1 infection in cell-based assays.

This study did not measure the impact of the gels on HPV. However, previous studies have shown that carrageenan-based formulations like

MZC provide significant in vitro and in vivo HPV inhibition.

MZC recently completed a safety, pharmacokinetics, and acceptability Phase I study - results will be released in the first quarter of 2016. Its development pathway is being evaluated, which includes plans to formulate MZC or some of its components in novel delivery systems, including a 90-day intravaginal ring. The addition of hormonal contraceptives to prevent unintended pregnancy is also being explored, as is the potential of MZC for use as a rectal microbicide gel.

"This first side-by-side evaluation of two lead microbicide candidates show that MZC holds great promise for development as an MPT that could prevent three non-curable viral STIs simultaneously: HIV, HSV, and HPV," said Naomi Rutenberg, PhD, vice president and director, HIV and AIDS Program at the Population Council. "Developing products with different prevention profiles and delivery approaches may increase demand for these products, help reduce the burden of STIs, and lessen the stigma associated with products that prevent HIV alone."

Council researchers are pursuing multiple active agents, combinations, and delivery systems to prevent HIV, other STIs, and unintended pregnancy. A Phase I study of another gel that contains griffithsin, a naturally occurring algae protein, which inhibits HIV and other pathogens including HSV-2, will begin in 2016. Griffithsin is the most potent anti-HIV agent described in the literature to date and can be produced relatively easily and inexpensively in tobacco plants.

More information: *Antimicrobial Agents and Chemotherapy*, aac.asm.org/content/early/2015 … d=aac;AAC.02468-15v1

Provided by Population Council