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POPULATION BRIEFS

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The Population Council has conducted research aimed at reducing maternal and newborn deaths in Pakistan. See story, page 2.

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The Potential Role of Community-based Pregnancy and Delivery Care in Reducing Maternal and Newborn Mortality in Rural Pakistan

Pakistan's maternal and newborn mortality and morbidity rates are high despite an extensive health service network. Most deliveries occur at home without a skilled health provider attending. As part of the five-year USAID-funded Pakistan Initiative for Mothers and Newborns (PAIMAN)—which began in 2005—the Population Council conducted operations research aimed at finding the best ways to improve the outcomes of those deliveries, and thus reduce maternal and newborn deaths.

Maternal and neonatal mortality in Pakistan

The Pakistan Demographic and Health Survey 2006–07 confirmed that rural areas, where most Pakistanis live, have the highest rates of pregnancy-related death. The maternal mortality ratio is 319 per 100,000 live births in rural areas, where 74 percent of deliveries occur at home and only 30 percent are attended by a skilled provider. This is significantly higher than the maternal mortality ratio of 175 per 100,000 live births in urban areas, where 43 percent of deliveries occur at home and 60 percent are attended by a skilled provider.

In this context, Pakistan is faced with the problem of how to improve the outcomes from home deliveries, while the proportion of facility-based deliveries increases over the longer term. Either or both of two solutions are available: to train a cadre of community midwives (CMWs) recruited from rural areas to return to their villages and/or to upgrade the knowledge and performance of traditional birth attendants, or *dais*.

The government of Pakistan introduced a National Maternal, Neonatal & Child Health Program in 2006, including a program aimed at deploying 12,000 trained community

midwives to improve access to skilled birth attendants in rural communities. The government is publicly silent on the topic of dais, and

“We recommend a constructive partnership between all midwives—trained and untrained dais and community midwives.”

has avoided steps to encourage the practice of women who are in competition with them. As part of PAIMAN, an eight-partner consortium led by John Snow, Inc., the Population Council has conducted several studies to address issues around the introduction of this new cadre of community midwives and to assess improvements in the capabilities of traditional birth attendants.

Training traditional birth attendants

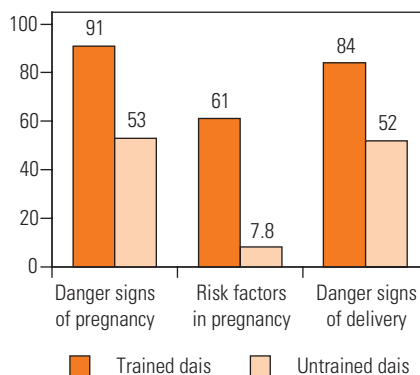
One approach to improve pregnancy and delivery care at home has been to train existing traditional birth attendants (TBAs) in skills that will make their services safer. Such an approach has been tried in many parts of the world with mixed results.

The Population Council implemented the Safe Motherhood Applied Research and Training (SMART) Project between 2002 and 2006.

(See *Population Briefs* 13(2), October 2007, page 6.) The project demonstrated a 22 percent decline in perinatal mortality—that is, infant death within the first week—attributable to the training of dais and community mobilization in southern Punjab. (For sample size reasons, maternal mortality could not be estimated.) As a follow-up, the Council conducted a study under PAIMAN to assess whether dais retained the knowledge they received during training (in this case, 19 months earlier), whether they had incorporated that knowledge into their daily practice, and whether their knowledge and practices were superior to those of untrained dais.

Council researchers found that in all areas—antenatal, delivery, postpartum, neonatal care, and referrals—trained dais have better knowledge, skills, usual practices, and client responses than untrained dais. (See Fig. 1.) Trained dais were more aware than untrained dais of danger signs during pregnancy, delivery, the postpartum period, and for newborns. One

Figure 1 Percentage of dais who knew about different topics of pregnancy and delivery care (knowledge demonstrated by knowing three or more items within each topic) (n = 106)



of the most significant improvements was that trained dais reported referring about 40 percent more cases to the nearest health facilities than untrained dais. However, while the practices of the trained dais were better than those of the untrained dais in important ways, they were still inadequate in some areas. For example, further improvement is needed in the use of clean delivery kits, in discontinuing the use of substances that stimulate uterine contractions during the second stage of labor, and in reducing pelvic examinations, especially those done without gloves.

These results show that proper training can help dais improve their skills and practices and can lead to better maternal and neonatal health outcomes. It is important to know whether such results can be replicated, at scale and at low cost.

Dais have important strengths. They are independent entrepreneurs rooted in their communities. As the recognized experts on childbirth in their communities, they are indispensable in providing essential messages about routine maternal and newborn care, such as initiation of breastfeeding, cleanliness at delivery, and cleaning and warming babies. In many ways it is easier to upgrade dai skills using the SMART methodology than it is to teach a new trainee from scratch.

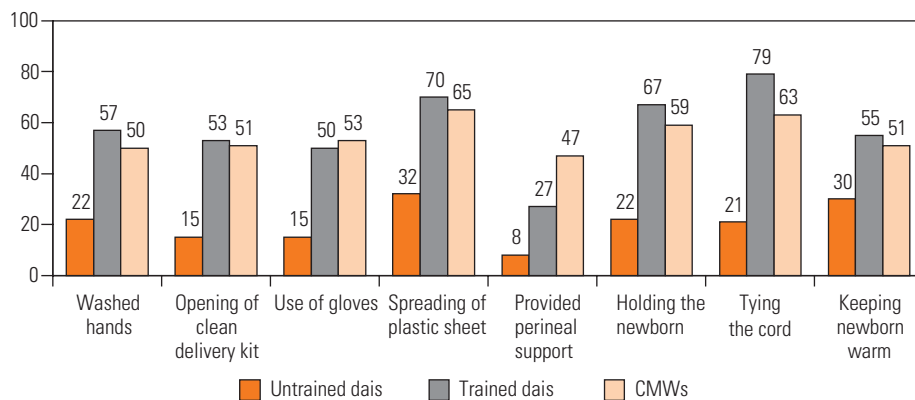
Community midwives

The Population Council also carried out two studies focused on community midwives (CMWs), for whom initial training and deployment were carried out under PAIMAN.

One of the Council's studies on CMWs focused on their potential acceptability in rural Pakistan. This study used focus group discussions in culturally distinct rural communities. There was consensus among those interviewed that their communities need a trained health care professional, such as a CMW, around the clock. There was some trepidation among Lady Health Visitors (LHVs) and dais, caregivers who might be in competition with CMWs. Dais and LHVs, however, expressed conditional willingness to work with CMWs.

In the Council's second study on CMWs, researchers interviewed 106 midwives who had completed their training under PAIMAN and had successfully passed their final examina-

Figure 2 Comparison of skills between untrained dais, trained dais, and CMWs



tion. The study showed that CMWs' knowledge about danger signs of pregnancy, delivery, and management of eclampsia and prolonged labor is poor. Their knowledge about neonatal care is also unsatisfactory. However, they are clearly more capable of resuscitating and stabilizing mothers and newborns than the dais, and their knowledge regarding infection prevention during delivery is better. One of the reasons for performing poorly on knowledge and skills assessment could be that the interviews were conducted before many of the CMWs had been placed in their communities, so they had not been using any of their skills when interviewed.

Strengths and weaknesses of CMWs and trained dais

The PAIMAN studies show that dais trained in the Population Council's SMART methodology are on par with CMWs in terms of delivery care and would perform normal deliveries adequately. (See Fig. 2.) In an emergency, however, CMWs might be better prepared. Unfortunately, it will take a projected time of ten or more years, under current conditions, for the anticipated full contingent of CMWs to be fully deployed. It is highly unlikely that Pakistan will achieve Millennium Development Goals 4 (reduce child mortality) and 5 (improve maternal health) by 2015 solely by training CMWs and relying on them to improve maternal mortality for the rural population.

"We recommend a constructive partnership between *all* midwives—trained and untrained dais and CMWs," said Zeba Sathar, the Council's country director in Pakistan.

"That will go a long way toward reaching acceptable levels of health care coverage in rural areas, primarily focused on in-home care." Both dais and CMWs need to be integrated into the national healthcare system, so that they receive supervision and regular retraining and so that best practices are continually reinforced. Further, a creative solution adopted by HANDS shows promise in alleviating tensions between CMWs and dais: recruit CMWs from among relatives of dais. HANDS has reported success in finding such women in interior Sindh.

"This solves both the competition problem and the problem of finding a successor to the dai, while providing an excellent entrée to the new, young CMW," said Population Council consultant Peter C. Miller. ■

SOURCES

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OUTSIDE FUNDING

US Agency for International Development

Education Helps Girls Overcome a History of Disadvantage

A recent report—*New Lessons: The Power of Educating Adolescent Girls*, by Cynthia B. Lloyd, with Juliet Young—builds a case for the education of adolescent girls. It provides a framework for positioning them within the educational system. And it assesses past and current educational programs for girls in relation to the evidence on successful and promising approaches.

“Continuing education during adolescence is a necessary first step for girls if they are to overcome a history of disadvantage in paid employment and civic life,” says Lloyd, who was at the Population Council when she wrote the book and is now a Council consulting senior associate.

Lloyd previously chaired the panel of experts who produced the enormously influential volume on the lives of adolescents, *Growing Up Global: The Changing Transitions to Adulthood in Developing Countries*. Lloyd and several other Population Council staff members contributed to that publication and its follow-up, *The Changing Transitions to Adulthood in Developing Countries: Selected Studies*, both of which shaped the World Bank’s *World Development Report 2007* and influenced many policies on adolescent girls around the world.

State of girls’ education around the world

Over the past 15 years, girls’ education in the developing world has been a story of progress. Interest and financial backing from the development community have grown steadily in response to accumulating evidence documenting the many benefits of girls’ schooling. Female education is now a major part of global development commitments, including the Millennium Development Goals.

Alongside this global interest, school enrollments have climbed. The large majority of girls now attend primary schools, and most girls attend school into early adolescence. The gender gap is closing, and higher enrollments are boosting economic returns.

But there is still a long way to go, says Lloyd. Girls’ primary school completion rates

are below 50 percent in most poor countries. The situation is worse by the time girls reach secondary school. In Africa, girls’ secondary school enrollments have fallen relative to boys’ since 2000. And throughout the developing world, young women are underrepresented in the workforce.

One of the most significant problems in most developing and conflict-affected countries is the failure of education systems to realize their potential to empower adolescent girls. Fewer girls attend formal education in later adolescence and, of those who do, many are in primary rather than secondary school, where one might expect to find them. The fact that the majority of donor funding is directed toward girls’ primary school attendance may contribute to this pattern.

While primary schooling is a basic need for all children, education for adolescents can be transformative. Many benefits are immediate. The prospect of secondary education motivates girls to complete primary school. Being in school along with boys during adolescence fosters greater gender equality in the daily lives of adolescents. Education for adolescent girls helps them avoid long working hours and early pregnancies, and lowers their risk of HIV infection. In the long term, secondary education offers greater prospects of remunerative employment, with girls receiving substantially higher returns in the workplace than boys when both complete secondary school.

New Lessons seeks to increase understanding about the education of adolescent girls. Given the lack of information on education programs for girls, Lloyd and Young provide new data and analysis from research on more than 300 past and current programs and projects. Drawing on available data, they identify demand-side and supply-side approaches that are most commonly practiced with the goal of improving education for girls. “One of our most important findings is that there have been very few evaluations of these common programs,” says Lloyd. “Also, we were surprised to find that only 18 percent of the programs

include livelihoods or vocational training, which are key in girls’ transitions from school to work.”

Demand-side strategies to support adolescent girls in school, and the evidence of their effectiveness in keeping them in school:

- Scholarships and stipends: proven successful
- Transportation and boarding: promising but unproven
- Advocacy or community engagement in girls’ education: promising but unproven
- Safety policies and training; codes of conduct: promising but unproven
- Girl-only toilets and provision of sanitary supplies: unlikely to succeed

Supply-side strategies to enhance educational access, the learning environment, and curricular relevance for adolescent girls, and evidence of their effectiveness:

- Creation of non-formal educational programs, either complementary or alternative: promising but unproven
- Recruitment and training of female teachers, para-teachers, and other educators: proven successful
- Gender training for teachers: promising but unproven
- Mentoring, tutoring, and peer support: promising but unproven
- Life skills and literacy training: promising but unproven
- Livelihoods and vocational training: promising but unproven

The report is one of the first to stress the need for more data on the growing non-formal education sector. While there has been a rapid rise in NGO-funded non-formal schools, data are lacking on enrollments or learning outcomes for those participating in the non-formal sector, and on the social and economic returns for girls who enroll in these programs. But evidence suggests that enrollment in non-formal institutions is significant among adolescents and that many girls move between formal and non-formal education in response to the particular pressures they experience.

Taking action for adolescent girls' education

Flowing from the evidence that Lloyd and Young present is an educational manifesto for girls. (See box.) In that manifesto, they outline three developmental and learning phases during adolescence and, within each, identify learning goals and preferred educational pathways for girls. Lloyd and Young also propose ten key actions that governments and nongovernmental organizations can take to support and promote girls' education.

1) Collect and compile data on non-formal education. A questionnaire module should be introduced into national household surveys and censuses to collect data on the extent and coverage of non-formal schooling, and the implementation of non-formal education should be tested on a pilot basis in several countries.

2) Build and maintain a global database for education programs for adolescent girls. Lloyd suggests that a program and project compendium included in her report become the platform for a dynamic global database of education programs that serve adolescent girls. Its scope should be expanded in order to identify promising models appropriate to girls' educational needs in different settings. This database should be made available to donors, practitioners, and international agencies.

3) Expand opportunities for girls to attend secondary school. Governments should define basic education as education through lower secondary school, or to age 16. To accommodate the resulting influx of students, governments and the private sector should increase the number of formal and non-formal secondary school places by extending existing primary school facilities and offering well-targeted subsidies to disadvantaged girls to attend either public or private secondary schools.

4) Support the non-formal education system. The non-formal education system must be well integrated with the formal system and be designed to help adolescent girls achieve their educational and developmental needs. Non-formal schools must be upgraded, certified, and licensed, and pathways should be established from the non-formal to the formal sector, as well as the reverse. Baseline surveys should assess educational backgrounds, skills, and knowledge gaps of population subgroups who are potential beneficiaries, in order that

An Educational Manifesto for Adolescent Girls

Early adolescence: Ages 10–12

Where every girl should be: Formal primary school or accelerated complementary school

What every girl should be acquiring: Literacy, numeracy, critical thinking skills, basic health knowledge, knowledge about their communities and the world

Middle adolescence: Ages 13–15

Where every girl should be: Post-primary formal school or accelerated complementary school

What every girl should be acquiring: Reading and writing fluency for lifelong learning, critical thinking skills, fluency in an internationally spoken language, computer skills, proficiency in math/science, health and reproductive health knowledge, financial literacy, skills for social and civic participation, knowledge about social systems and local and global issues

Late adolescence: Ages 16–19

Where every girl should be: Formal secondary school or alternative education with a vocational or livelihoods focus

What every girl should be acquiring: Marketable skills, information-gathering skills and habits for lifelong learning, financial knowledge and skills

educational systems can be designed to address existing needs.

5) Develop after-school tutoring and mentoring programs in both primary and secondary schools. These programs should support girls' education and development and enhance their chances of progressing to or succeeding in secondary school. They can provide one-on-one mentoring and ensure that after-school hours are dedicated to study and not to part-time jobs or family obligations. The programs can also provide supplementary training beyond the formal curriculum to develop skills for social and civic participation—in the process teaching basic health, reproductive health, and financial literacy.

6) Produce curricula relevant to adolescent girls. Adolescent girls in the developing world need to acquire remunerative and marketable skills that are not taught at home, such as

facility with computers, fluency in an internationally spoken language, financial skills, and knowledge of social systems. New methods to promote interactive and collaborative learning can help develop critical thinking and decisionmaking skills and instill a habit of lifelong learning—capacities that will equip girls for a rapidly changing world.

7) Offer post-secondary vocational programs. The majority of girls who complete secondary school do not continue on to university. For girls going directly into the workforce, it is important to offer programs that support them in making a successful transition to remunerative work and household financial management. Such programs must be based on market assessments and provide relevant, flexible skills for employment and professional growth in a global economy.

8) Provide training and incentives for women to enter and remain in teaching. Female teachers can reinforce the importance of education to girls, and many girls respond better to female teachers. The number of women who enter teaching is increasing, and teaching appears to be a viable, desirable profession for women who have completed secondary school.

9) Promote smooth transitions between non-formal and formal schools. Complementary schools should be developed within the non-formal education system to help girls, many of them primary-school dropouts, continue on to formal secondary school. Complementary schools should also offer younger adolescents the opportunity to reenter formal primary school.

10) Encourage and evaluate innovation. The curricula in both formal and non-formal schools attended by adolescents should be revamped to develop new approaches to education. Although many of the current approaches are unproven, some appear particularly promising. To test their effectiveness, research/program partnerships should invest in designing and implementing pilot projects to measure and assess their impact on girls over the short and medium term. ■

SOURCE

Lloyd, Cynthia B. with Juliet Young. 2009. *New Lessons: The Power of Educating Adolescent Girls—A Girls Count Report on Adolescent Girls*. New York: Population Council.

OUTSIDE FUNDING

Nike Foundation and United Nations Foundation

Comparing Computer and Face-to-Face Interviewing

Women are two to four times more likely than men to become infected with HIV through unprotected heterosexual intercourse. There is a great need for women-initiated products, such as microbicides, to protect them against HIV transmission. The Population Council is actively developing microbicides; in addition to the Council's microbicides biomedical research, investigators are conducting a variety of behavioral studies. Recently, Council scientists completed a study to compare two methods of interviewing participants in microbicide clinical trials to determine which method gives more accurate reporting of behavior.

Most microbicides studied so far are not absorbed into the body, so it can be difficult to determine whether the product is actually being used. Researchers rely upon study participants to report honestly how and when they use the product. If participants in a microbicide trial misreport their use of the product or their sexual activity, it becomes difficult to determine whether the microbicide is effective. However, it is sometimes hard for people to be truthful about subjects that they might find embarrassing, such as not using a product the way they have been instructed or telling a stranger about their sexual behavior.

One method that has shown promise in studies that collect such sensitive information is known as audio computer-assisted self-interviewing (ACASI). With this technology, study participants listen to prerecorded questions from a computer through headphones and record their responses using a touch screen or key pad. Neither the investigator nor anyone else in the area where the interview is being conducted hears the question or response, which may make it easier for the respondent to be honest.

Study design

Between March 2007 and April 2008, researchers enrolled 849 women in a methodological experiment at the South African sites that participated in the Population Council's Phase

3 clinical trial for the microbicide candidate Carraguard®. Participants in this study were randomly assigned to face-to-face interviews or ACASI. They were given applicators filled with placebo gel and asked to insert the gel vaginally prior to each sex act, and to use a condom each time they had sex. The women were aware that the gel they were given was a placebo and that the purpose of this study was to compare two methods of interviewing. Condoms were provided at the study sites. At each of three monthly follow-up visits, women returned used applicators, received condoms, had a physical exam, and completed a behavioral interview.

The researchers assessed the accuracy of the women's interview responses using two biomarkers: the Population Council's applicator test, which indicates whether an applicator has been inserted in the vagina, and Rapid Stain Identification of Human Semen (RSID), which detects the presence of a semen protein in the vagina and is a biomarker of sex without a condom in the prior 48 hours.

Findings

ACASI respondents were significantly more likely to report sexual behaviors than those interviewed face-to-face. The RSID test indicated that the reports of sexual activity in the period immediately before the interview were more accurate for women in the ACASI group than for women in the face-to-face group. However, the biomarker analysis suggests that even ACASI does not lead to full disclosure.

Of particular note, women interviewed with ACASI were substantially more likely than women interviewed face-to-face to report having had anal sex, suggesting that this behavior might be under-reported by women in microbicide trials that use face-to-face interviews. If unprotected anal sex is common, then the ability to detect a protective effect in a vaginal product may be undermined.

ACASI respondents were also more likely to report vaginal hygiene practices, such as drying

the vagina after gel insertion. However, the differences between the two interviewing modes became smaller over time.

Notably, there were no significant differences between the two types of interviewing in the women's reporting of the use of condoms or gel at last sex—the behaviors of most interest to researchers in a microbicide trial.

“For many behaviors, ACASI appears to encourage equal or greater honesty than conventional face-to-face interviews,” says Population Council social demographer Barbara S. Mensch, lead researcher on the study. “But, as this study demonstrates, it is not a panacea and it is not without limitations. A computerized self-interview, although clearly of some benefit, may not fully overcome participants' reluctance to reveal that they did not use the product as they were instructed.” Electronic data capture also introduces further complexities, including the need for file backup and data storage to prevent data loss, training staff, and implementing a process for dealing with technological problems.

The researchers suggest exploring other innovative ways to collect behavioral data. For example, SMS (short-message-service) tools, which employ cell phones to monitor product use on a close to real-time basis, may reduce recall error and facilitate more honest reports. The Population Council's information technology team is building a prototype SMS application to allow Council investigators to use this technology. ■

SOURCE

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OUTSIDE FUNDING

Swedish Ministry of Foreign Affairs, United States Agency for International Development, and the William and Flora Hewlett Foundation

(an enzyme inhibitor that prevents infection of cells with HIV) combined with zinc acetate (a broad-spectrum antiviral agent). The researchers also tested candidate microbicide gels that contained either MIV-150 alone (also known as PC-815) or zinc acetate alone (PC-707).

Low-dose microbicide

PC-1005 contains only 0.002 percent MIV-150 and 0.3 percent zinc acetate. The small amount of active pharmaceutical ingredient enhances the safety profile of the gel and also helps contain costs. These antiviral agents are formulated in a base gel made up of carrageenan (a natural polymer isolated from seaweed). The Population Council previously tested a gel containing carrageenan alone to prevent HIV transmission, but did not find it to be effective. However, the gel was found to be stable, acceptable, and safe, all highly desirable characteristics for microbicide gel base.

MIV-150 was originally developed as a potential HIV therapy by Medivir AB, which licensed the drug to the Council for development as a microbicide. In nonclinical tests conducted by Medivir and Chiron Corporation, and confirmed by Council scientists, MIV-150 has shown significant activity against HIV-1 primary isolates, mutants, and strains of HIV-1 that are resistant to other anti-HIV drugs. Extensive pharmacology and toxicology testing has shown that MIV-150 is nontoxic to cells and tissues in a petri dish or in a live animal.

Testing the gel in monkeys

Prior to human trials, all drugs must first be tested in animals to ensure the highest level of safety and confirm potential efficacy in humans. Robbiani and her team tested the gels in adult female Chinese rhesus macaques, a type of monkey. These animals were housed and cared for at the Tulane National Primate Research Center in compliance with all animal welfare regulations. The gels were applied to the vagina daily for two weeks and then, 4–24 hours after the last application, a virus known

as SHIV-RT was introduced vaginally. SHIV-RT is a form of SIV, the monkey (simian) version of HIV, that has been genetically engineered to include the reverse transcriptase (RT) gene from HIV. The RT gene produces the enzyme reverse transcriptase, which is essential for HIV infection to take place, and is targeted by MIV-150.

Microbicide development is an essential, achievable objective.

The scientists found that all of the 21 monkeys treated with the MIV-150/zinc acetate combination gel (PC-1005) were fully protected from infection with SHIV-RT for up to 24 hours after two weeks of daily gel application. The gel with MIV-150 alone prevented infection in 5 of 7 monkeys treated when virus was introduced 8 hours after last application and 3 of 7 monkeys when virus was introduced at 24 hours. The gel with zinc acetate alone prevented infection in 11 of 14 monkeys when virus was introduced at 8–24 hours after last application. There were no detectable local adverse effects or undesirable changes in vaginal fluid proteins.

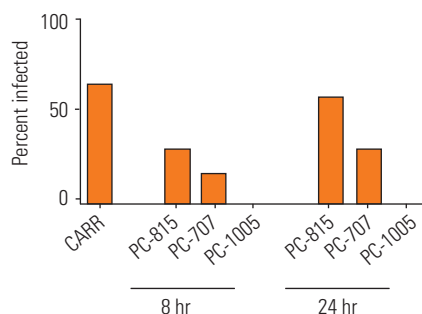
“This represents the first report of complete protection for 24 hours after gel application in macaques,” said Robbiani. “Based on these excellent efficacy and safety results, the MIV-150/zinc acetate gel is our lead microbicide candidate. Because of the significant protection seen with the gel containing only zinc acetate, such gels should also be considered for further development and human testing, since they are not expected to promote drug resistance.”

Additionally, “our unpublished research shows that carrageenan gels containing zinc acetate are extremely effective against vaginal and rectal herpes simplex virus-2 infection in mice,” says Council biomedical researcher Jose Fernández-Romero. In addition to being a significant public health problem in its own right, herpes can increase the risk of being infected with HIV, so a microbicide that prevented herpes infection might also reduce the risk of HIV infection.

Looking ahead

Scientists, under the guidance of Thomas Zydowsky, are now optimizing PC-1005 gels in terms of stability, safety, and efficacy. Once an optimized formulation is identified, Zydowsky’s team will prepare clinical-grade material to support a Phase 1 clinical trial; clinical trials are studies performed with human subjects. Based on current progress, Phase 1 trials testing the MIV-150/zinc acetate gel versus the zinc acetate alone are projected to begin in early 2012. ■

Daily application of PC-1005 fully protects for up to 24 hours



SOURCE

Kenney, Jessica, Meropi Aravantinou, Rachel Singer, Mayla Hsu, Aixa Rodriguez, Laris Kizima, Ciby J. Abraham, Radhika Menon, Samantha Seidor, Anne Chudolij, Agegnehu Gettie, James Blanchard, Jeffrey D. Lifson, Michael Piatak Jr., Jose A. Fernández-Romero, Thomas M. Zydowsky, and Melissa Robbiani. 2011. “An antiretroviral/zinc combination gel provides 24 hours of complete protection against vaginal SHIV infection in macaques,” *PLoS ONE* 6(1): E15835. «http://www.popcouncil.org/pdfs/JournalArticles/P1_6_1.pdf»

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HIV AND AIDS

Vaginal Microbicide Combination Shown Effective in Monkeys

The majority of new HIV infections around the world are in women. Women in the most severely affected areas remain at high risk, with the vast majority lacking access to an affordable means of protection under their control. But there is hope, if appropriate investments are made in the development and introduction of prevention technologies for women, in particular microbicides. Microbicides are compounds that can be applied inside the vagina or rectum to protect against sexually transmitted infections (STIs), including HIV. Population Council biomedical researchers have developed a candidate combination microbicide that completely protects monkeys from infection for at least 24 hours after repeated application.

Encouraging milestone

Although a number of products have been tested, research has identified only one microbicide candidate that may be effective in women. That announcement was an encouraging milestone, confirming that microbicide development is an essential, achievable objective. However, there is still room for improvement. In that trial the study gel was applied shortly before and after intercourse, and it contained a relatively high level (1 percent) of a drug that is currently being used to treat people living with HIV. Ideally, a microbicide could be used independently of sexual intercourse, would have a low dose of drug, and would use a drug that is not currently

being used to treat HIV-positive people, thereby limiting the emergence and transmission of drug-resistant viruses. While the researchers reported that no drug resistance was found in the women who acquired HIV infection during study follow-up, drug resistance is still a theoretical possibility.

PC-1005 gel

Melissa Robbiani, director of the Population Council's biomedical HIV research, and her team recently tested the effectiveness of the PC-1005 gel, which contains low doses of MIV-150

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