SADC announced their intention to produce DDT locally (SADC 2011). Furthermore, the 35 heads of state and government who are members of the African Leaders Malaria Alliance (ALMA) recently endorsed use of DDT in indoor residual spraying (IRS) (ALMA 2010). Such organized actions by affected countries bespeak broad recognition of scientific issues and continuing need for DDT in malaria control programs. Those actions expose the misrepresentations of those who contend support for DDT is limited to a small number of extremists.

Bouwman et al. (2011) argued that "evidence of adverse health effects due to DDT … is mounting" and therefore DDT should be accompanied by information on the potential side effects, just as with prescription medicine. We believe that the interpretation of the mounting evidence is itself a minority view and that their argument is false.

The World Health Organization's (WHO) review of human health aspects of DDT use in IRS concluded that "for households where IRS is undertaken, there was a wide range of DDT and DDE serum levels between studies. Generally, these levels are below potential levels of concern for populations" (WHO 2011). None of the thousands of studies that have been conducted regarding possible human health effects of DDT satisfy even the most basic epidemiological criteria to prove a cause-and-effect relationship. In their commentary, Bouwman et al. (2011) confused a large number of studies that uniformly fail the criterion of consistency in demonstrating that DDT causes actual harm, with isolated studies revealing some statistical association or correlation as a suggestion of harm. It is on this basis that the authors argued for precaution in the use of DDT. In contrast, we argue that precaution should govern Bouwman et al.'s aggressive anti-DDT campaigning and not precaution in the use of DDT to prevent disease and save lives. The growing number of studies is not proof or evidence that DDT causes harm, but it is evidence of growing funding for research on this topic.

Bouwman et al. (2011) argued that households should be informed about unproven and speculative risks from DDT. Their argument must be rejected as the worst form of scaremongering because it will result in growing risk of disease and death from malaria while providing no proven health benefit. Ignoring proven and catastrophic health decrements from malaria infections while warning of theoretical concerns about DDT exposures is a function of ideology. Such precautionary messaging is not good public health policy or sound science.

R.T. is the director of Africa Fighting Malaria (AFM), a policy and advocacy group, and both R.T. and D.R. serve on the AFM board. The organization has offices in South Africa and the United States and conducts critical analysis of malaria control programs and funding agencies and strives to build more transparent, accountable, and effective malaria control programs. AFM has worked to defend the decisions of malaria control programs to use DDT and to argue for a sound, scientific assessment of the chemical. AFM does not now, or in the past, accept funds from the insecticides industry.

Richard Tren
Africa Fighting Malaria
Washington, DC
E-mail: rtren@fightingmalaria.org

Donald Roberts
Uniformed Services University of the Health Sciences
Bethesda, Maryland

References

ALMA (African Leaders Malaria Alliance). 2010. Report to ALMA Heads of State and Government. ALMA.

Biovision. 2011. Projects: International. Stop DDT: Promoting Effective and Environmentally Sound Alternatives to DDT. Available: http://www.biovision.ch/fileadmin/pdf/e/projects/2011/International/BV_Factsheet_Stop_DDT_2011_E.pdf [accessed 6 September 2011].

Bouwman H, van den Berg H, Kylin H. 2011. DDT and malaria prevention: addressing the paradox. Environ Health Perspect 119:744–747; doi:10.1289/ehp.1002127 [Online 18 January 2011].

SADC (Southern African Development Community). 2011. Letter from SADC to A Steiner, Executive Director, United Nations Environment Programme, Notification of SADC Countries Respecting DDT Use and Production, 5 April 2011. Available: http://www.fightingmalaria.org/pdfs/sadclettertounep.pdf [accessed 8 September 2011].

United Nations Environment Programme. 2007. Future Plans for Work on DDT Elimination. A Stockholm Convention Secretariat Position Paper, November 2007. Geneva: Secretariat of the Stockholm Convention. Available: http://chm.pops.int/Portals/0/Repository/DDT-general/UNEP-POPS-DDT-PROP-SSCPP.English.PDF [accessed 8 September 2011].

WHO (World Health Organization). 2011. DDT in Indoor Residual Spraying: Human Health Aspects. Environmental Health Criteria 241. Geneva:WHO. Available: http://www.who.int/ipcs/publications/ehc/ehc241.pdf [accessed 5 May 2011].

DDT Paradox: Bouwman et al. Respond

doi:10.1289/ehp.1103957R

In our commentary (Bouwman et al. 2011), we presented our centrist point of view on DDT, briefly, that despite DDT's known protective effects against malaria, there is a need to eventually eliminate its use due, in part, to growing concerns about DDT's human health impacts. How this can be misrepresented as anti-DDT by Tren and Roberts is simply astounding.

The reference to "isolated studies" on health aspects of DDT by Tren and Roberts has no basis. Of the 22 epidemiological studies from 2009 that we cited, 12 showed that DDT was significantly associated with some condition. We also notice that their "thousands of studies" is not substantiated by references. The evidence we presented is consistent with that of Eskenazi et al. (2009) and justifies our recommendation to invoke precaution.

Tren and Roberts refer to the recent Convention of the Parties of the Stockholm Convention (COP-SC) and the DDT Expert Group's report to the COP-SC (UNEP 2011b). The report stated that

> In certain settings, there is a continued need for DDT for malaria vector control, until locally appropriate and cost-effective alternatives are deployed for a sustainable transition away from DDT. (UNEP 2011b)

Moreover, the COP-SC report (UNEP 2011a) stated that "there was broad support for the recommendation by the DDT expert group that DDT was needed in some countries for disease vector control." It is simply impossible to construe this statement as "anti-DDT."

Most, if not all, of the actions considered by Tren and Roberts as "anti-DDT" can be aligned with a centrist point of view, because most countries involved are Parties to the SC. The COP-SC final report (UNEP 2011a) stated that "there was broad agreement regarding the need to combat malaria and to reduce and eventually eliminate the production and use of DDT."

Regarding the World Health Organization (WHO) assessment of DDT (WHO 2011) quoted in their letter, Tren and Roberts fail to add the qualification included in the same paragraph, namely,

> In some areas, the exposures in treated residences have been higher than potential levels of concern. Efforts are needed to implement best practices to protect residents in treated households from exposures arising from IRS [indoor residual spray]. Of particular concern would be women of childbearing age who live in DDT IRS-treated dwellings and transfer of DDT and DDE to the fetus in pregnancy and to the infant via lactation.

This is what we concluded in our commentary (Bouwman et al. 2011).

WHO procedures recommend the removal of furniture and food from houses to be sprayed, as well as a no-entry period (Najera and Zaim 2002). This implies an explanatory obligation toward the households why this has to be done. Nowhere in our commentary did we actually argue "that households should be informed about" the possible effects of DDT, as purported by Tren and Roberts. We maintain however, that the use of any insecticide in IRS raises ethical issues. This requires further investigation; the implications for IRS are yet unknown.

We defined our position as centrist because we acknowledge the role of DDT in malaria vector control as well as the urgency to move away from DDT once suitable, safe, and sustainable alternatives are in place.

Our position is based on available evidence; invoking precaution, we suggest, is the best approach to address the paradox.

H.B. has acted as an expert committee member regarding DDT for the Stockholm Convention and the WHO, and has received travel and living expenses from the United Nations (UN). H.v.d.B. has acted as adviser or expert committee member in relation to DDT and disease–vector control for the Stockholm Convention and the WHO, and has received compensation for travel, living, and consultations from the UN. H.B. and H.K. have received research funding for their work on DDT from the South African and Swedish Research Partnership Programme Bilateral Agreement. H.B., who participates in research on DDT, has received funding from the National Research Foundation and the Water Research Commission (South Africa). H.K. has received funding for research on pesticides in malaria control from the Swedish International Development Agency and the Norwegian Research Council. None of the funding sources restricted the authors' freedom to design, conduct, interpret, or publish research. The authors declare they have no actual or potential competing financial interests.

Henk Bouwman
North-West University
Potchefstroom, South Africa
E-mail: henk.bouwman@nwu.ac.za

Henk van den Berg
Wageningen University
Wageningen, the Netherlands

Henrik Kylin
Linköping University
Linköping, Sweden

References

Bouwman H, van den Berg H, Kylin H. 2011. DDT and malaria prevention: addressing the paradox. Environ Health Perspect 119:744–747; doi:10.1289/ehp.1002127 [Online 18 January 2011].

Eskenazi B, Chevrier J, Rosas LG, Anderson HA, Bornman MS, Bouwman H, et al. 2009. The Pine River Statement: human health consequences of DDT use. Environ Health Pespect 117:1359–1367.

Najera JA, Zaim M. 2002. Malaria Vector Control: Decision Making Criteria and Procedures for Judicious Use of Insecticides. WHO/CDS/WHOPES/202.5 Rev.1. WHO Pesticide Evaluation Scheme. Geneva: World Health Organization. Available: http://whqlibdoc.who.int/hq/2003/WHO_CDS_WHOPES_2002.5_Rev.1.pdf [accessed 6 September 2011].

UNEP. 2011a. Report of the Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants on the Work of Its Fifth Meeting [Advance copy]. UNEP/POPS/COP.5/36. Available: http://chm.pops.int/Convention/COP/Meetings/COP5/tabid/1267/mctl/ViewDetails/EventModID/870/EventID/109/xmid/4351/language/en-US/Default.aspx [accessed 4 June 2011].

UNEP. 2011b. Report of the Expert Group on the Assessment of the Production and Use of DDT and Its Alternatives for Disease Vector Control. UNEP/POPS/COP.5/5. Available: http://chm.pops.int/Convention/COP/Meetings/COP5/COP5Documents/tabid/1268/language/en-US/Default.aspx [accessed 4 June 2011].

WHO (World Health Organization). 2011. DDT in Indoor Residual Spraying: Human Health Aspects. Environmental Health Criteria 241. Geneva:WHO. Available: http://www.who.int/ipcs/publications/ehc/ehc241.pdf [accessed 30 April 2011].