

Part 2: Dr. Kalpana Balakrishnan: Cookstove Challenges

Anne Johnson: This is Global Environmental Health Chat, the podcast that explores environmental health issues that transcend national boundaries. I'm your host Anne Johnson, and this podcast is produced by the National Institute of Environmental Health Sciences.

Welcome to the second episode in our 2-part series on cookstoves and indoor air pollution. In this podcast, we're drilling deeper into the research behind improved cookstoves. These cookstoves are intended to replace open fires and basic mud stoves, which produce high levels of harmful particulate matter and contribute to over 4 million preventable deaths each year. We'll also look into the challenges faced when bringing improved cookstoves into the field.

Our guest is Dr. Kalpana Balakrishnan. She's a professor of biophysics in the Department of Environmental Health Engineering at Sri Ramachandra University in Chennai, India. She also supports environmental health work at the World Health Organization and the government of India, where she's led fieldwork aimed at curbing the health burden of solid-fuel fires.

Kalpana Balakrishnan: In a country like India, where we have upwards of 700 million people actually using such solid fuels for their everyday household energy needs, the levels of exposure that populations experience as a result of these emissions is so much so that it is the highest-ranking environmental risk factor for disease burdens in India. So the cookstove discussion started by recognizing, 'How could we reduce the burden?'

Anne Johnson: So scientists and engineers began tinkering with technology to create cooking stoves that could be produced and used cheaply in India and other developing countries. The idea was to create stoves that people could use to cook more food with less fuel, thus reducing their fuel needs and lowering the amount of smoke going into the home.

For example, an enclosed fire burns hotter than a typical open fire, and the heat can be targeted more toward the cooking surface. Methods to increase air exchange or funnel smoke away from the kitchen also help. So can using fuels that are more processed, for example, wood burns more efficiently if it's chopped more finely or compressed into pellets.

Researchers started seeing significant improvements in efficiency and emissions when they tested various types of stoves in the lab. But the story was different when they brought the stoves into people's homes.

Kalpana Balakrishnan: What people breathe is not quite what's actually emitted by the fuel chamber in the stove itself. It's dictated by how long they're cooking and where they are spending their time, and what's the size of the room, and what types of food they can use these stoves for, and so forth. So there the efficiency the efficiency that was accomplished in the lab and the efficiency that was accomplished in the field setting started to break down. Just from an emissions point of view—not even exposures—when you take it to the field, households don't have time to use the stove, the pot configuration is not

convenient, sometimes the fuel is wet, sometimes the fuel is not chopped well enough, and so the efficiency in itself starts to drop between the lab and the field.

Anne Johnson: On top of that loss of efficiency, Kalpana said the biggest problem is that the household air is still just as polluted.

Kalpana Balakrishnan: Even with a stove that is performing as well as 70 percent efficiency in the field, the concentrations of particulate matter and carbon monoxide continue to exceed health-based guidelines. And the final icing on the cake came in realizing that it's not so much that the improved stove is being used or not used, it's how much of the traditional stove use has the improved stove been able to displace. So if you have a configuration in a household that is not fully met by these improved stoves, what happens is you have the households using two stoves, or sometimes three stoves together. And finally, the other part is even if one household were able to do this, it wouldn't be sufficient because there is a high density of households in these villages, so if you are very clean inside but all your neighbors are cooking with some amount of traditional stoves, then you have a huge contribution from the ambient emissions of these household devices to your own households. So it's not quite an indoor problem; it's an indoor-outdoor problem in these communities.

Anne Johnson: So if people in a community are still using open fires, the mere availability of improved cookstoves can't make much of a dent in the pollution people are breathing. With years of cookstove research largely yielding disappointing results, the question is where do we go from here?

Kalpana Balakrishnan: I hate to use the word impossible, but you know, it might be very, very difficult to actually burn solid fuels in these household devices in a manner that would actually be protective of health. So the thinking right now is to go in the direction of cleaner fuels, because that, we know, works. We have an energy-household energy solution that seems to work for 40 percent of the world's population, so it is only ethical, logical, and backed by science to say that what works for some part of the population of the world, we ought to find ways of making this available to the rest of the world that currently does not have access to it. We should be leap-frogging to a technology option, to a policy option that we have every bit of scientific evidence to think is the way forward. And, therefore, to move towards cleaner fuels, such as LPG or electricity, is already implied if we are to meet the guidelines.

Anne Johnson: So, Kalpana says the answers to achieving air quality guidelines may be in the technologies that people in more developed countries are already using. LPG, or liquified petroleum gas, for example, is used for cooking and heating in rural parts of many countries and burns much more cleanly than biomass.

Greater access to electricity in developing countries would eliminate the need for household fires altogether, moving combustion into power plants where emissions can be better controlled. Electrification also makes it more feasible to incorporate renewables like solar and wind.

The main goal, Kalpana says, is to reduce the need for burning biomass in the home. That, after all, is the key to keeping harmful smoke out of people's lungs.

You can find more information on this topic at our website, niehs.nih.gov/podcasts. Thanks to our guest, Dr. Kalpana Balakrishnan. This wraps up our two-part series. Thanks for listening to Global Environmental Health Chat, brought to you by the Global Environmental Health program of the National Institute of Environmental Health Sciences. [music]