

Your house design could affect your health

BY CHELSEA HARVEY
THE WASHINGTON POST

The way we design and build our houses could have a surprising impact on a tiny, but important, aspect of our personal lives: the microscopic organisms that share those homes with us.

A groundbreaking study published Friday in the journal *Science Advances* finds that certain aspects of a house's design could have an influence on the types of microbes found inside, with more urban homes separating humans from the outdoors and keeping out the environmental microbes we once evolved to coexist with. And, the researchers speculate, these changes could be having an impact on public health.

"We humans build the environments we live in and spend most of our time [in], and these may be very different to the natural environments," said Maria Gloria Dominguez-Bello, a professor at New York University's School of Medicine and the new paper's senior author, during a Thursday press briefing. "Very little is known about microbes of the built environment."

Figuring out how building design may affect microbial communities is important because of the ways exposure to these organisms may affect human health and development, the researchers suggested.

"There is increasing evidence that exposure to microbial biodiversity from the natural environment is important for health," said Graham Rook, a professor of medical microbiology at the University College London (who was not involved in this study) in an email to *The Washington Post*. Exposure to the microorganisms

in our mothers' bodies (which eventually populate our own) and exposure to microbes in the natural environment are thought to be important for healthy development, he said.

For their investigation, the new study's authors focused on four communities in the Amazon Basin, all of which are located in areas with similar climates and outside environments. The differences between them had to do with their degree of urbanization.

At one end of the spectrum was the remote jungle village of Checherta, Peru, featuring open-air one-room huts made of natural materials. Next, there was the small rural community of Puerto Almendras, Peru, which contains homes with exterior walls but no interior divisions. Third was the Peruvian town of Iquitos, whose homes generally have external walls and interior room divisions, although the interior walls don't always stretch all the way to the ceiling. And at the far end of the spectrum was the city of Manaus in Brazil, the largest city in the Amazon Basin, featuring contemporary home design with exterior walls made of synthetic materials and clear room divisions.

"As we move from rural to urban... houses become more isolated from the outside environment and also become more internally compartmentalized according to the function of the spaces," said coauthor Humberto Cavallin, a professor at the University of Puerto Rico's School of Architecture, at the press briefing.

In each community, the researchers swabbed both the floors and the walls in each room of the houses and



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then examined the swabs to see what kinds of microbes were present. They found that urbanization had a clear impact on the microbial communities inside the houses.

"The results of the study reveal that microbes from house walls and floors differ across habitations," said lead author Jean Ruiz-Calderon, a biologist at the University of Puerto Rico. "With increasing urbanization, houses contain a higher proportion of human-associated bacteria... and decreasing proportions of environmental bacteria."

In Checherta and Puerto Almendras there was a greater proportion of environmental bacteria, including soil bacteria such as *Mesorhizobium*, inside the homes than in Iquitos and Manaus. On the other hand, the urban homes had richer communities of human-associated microbes, such as *Streptococcus* and other

bacteria usually found inside human mouths.

"The findings confirm, and extend, the findings of other studies," said Rook, the University College London professor, in his email. "Increasing urbanization and modern high-income lifestyles result in loss from our homes of microbes from the natural environment."

The walls of urban homes were particularly telling, the researchers noted. While microbial communities found on the floors tended to be fairly similar from one room to the next, wall microbes tended to be specific to the rooms in which they were found. For instance, bathrooms tended to contain a higher proportion of bacteria associated with the human mouth. The researchers noted that in highly urbanized homes, it was even possible to predict what room a sample came from just by examining its microbes.

"This indicates that walls become reservoirs of bacteria that come from different sources depending on the use of the spaces," Ruiz-Calderon said.

The study focused only on a few communities in one part of the world, so the authors are careful to note that the results can't necessarily be generalized. Other similar studies would have to be conducted in other places to definitively say this is a pattern that exists around the world. However, they do point out the importance of continued research into the potential health implications of urban design.

Research has suggested that exposure to microbes found in the natural environment is important for health, including for the healthy immune development of infants. Several scientific hypotheses suggest that changes in human lifestyles, many of them associ-

ated with increasing urbanization, have limited our exposure to many of the microorganisms we originally co-evolved with, and that the "disappearing microbiota" may have negative implications for human health.

The researchers also suggest that higher degrees of human-associated microbes in urban homes might be a sign that urban design could be making it easier for humans to pass pathogens between one another.

"We are in environments that are highly humanized, and therefore a lack of ventilation and high concentrations of human bacteria may... facilitate human-to-human transmission of microbes," Dominguez-Bello said. In other words, if a person is sick in the type of home where human-associated bacteria tend to congregate in higher numbers, it may be easier for that person to pass on the offending bacteria to other members of the household.

For now, though, these ideas are just speculation. In this study, the researchers did not actually evaluate the transmission of pathogens or any other aspect of human health in the communities they examined. It's an area of future research they hope to look into, Dominguez-Bello said.

But the results do underscore the ways that modern living is changing human interactions with the natural environment and caution that these changes may be affecting us in ways we don't yet understand.

"As we alter our built environments in ways that diverge from the natural exposures we evolve with, we need to be aware of the possible consequences," Ruiz-Calderon said.

Meeting between Pope, Russian Orthodox leader bridges 1,000-year division

BY NICK MIROFF
AND BRIAN MURPHY
THE WASHINGTON POST

HAVANA — Pope Francis landed here Friday for an unprecedented encounter with the head of the Russian Orthodox Church, a meeting that bridged a nearly 1,000-year rift in Christianity but whose focus was expected to be the current turmoil in the Middle East.

The brief talks between the pontiff and Patriarch Kirill — as they crossed paths at Havana's airport — marked the first meeting between the religious leaders of the Vatican and Moscow since an 11th century Christian schism over papal authority and other disputes.

Francis's Alitalia jet landed just before 2 p.m. at Havana's Jose Marti International Airport, and the pope was received on the tarmac by Cuban President Raul Castro, who walked with him into the terminal for the meeting. There were no public statements.

The cramped, decrepit airport terminal in communist-run Cuba was a highly improbable setting for the encounter between Francis and Kirill, two religious leaders in flowing vestments who preside over empires of architectural splendor.

"We are brothers. That is God's will," news agencies quoted Francis as telling Kirill as they greeted each other warmly, exchanging three kisses on the cheek. "I have the impression we are meeting at the right place, at the right time," Kirill told the pontiff, Russia's Interfax news agency reported.

Cuban state television showed images of the two men seated beside one another in a dark wood-paneled room, with a large crucifix on the wall behind them.

The Cuban venue for the meeting fit Francis's view of the island's importance. During a visit in September, he called Cuba a "key" between "north and south, east and west," and "a point of encounter for all peoples to join in friendship."

The meeting Friday between Francis and Kirill has several political dimensions.

For the Vatican, the moment culminates decades of overtures to the Russian church. It also could open greater channels with Moscow over the humanitarian fallout from Middle East conflicts, including the flood of refugees into Europe and ravages against ancient Christian communities and their sites by Islamist militants, such as the Islamic State.

On Sunday — with an eye toward the upcoming meeting with Kirill — the pope decried the bloodshed in "beloved Syria," where Russia has carried out airstrikes to aid the government of President Bashar Assad.

The United States, Russia and other powers agreed Friday to a "cessation of hostilities" in Syria's civil war within the next week, as well as humanitarian access to besieged areas. But the pact also leaves room for continued Russian air attacks.

Moscow could view the patriarch's meeting with Francis as a chance to display Russia's role in the Middle East and seek stronger bonds with the Vatican at a sensitive time.

Russia faces increasing pressures from the West over flash points, such as Ukraine, where Moscow annexed the strategic Crimean Peninsula in 2014 and backs pro-Russian separatists battling the government in Kiev. Meanwhile, Russia has denounced NATO plans to expand forces in Europe.

"To have [the pope], with his internationally recognized authority, not as a critic but as an ally or at least simply as a neutrally silent figure, is highly attractive to Putin and his associates," wrote Yury Avvakumov, an assistant professor of theology at the University of Notre Dame, who specializes in Eastern church affairs.

Vatican contacts with the Orthodox world are not new.

Pope John Paul II — who once praised the East by saying "the church must breathe with two lungs" — made landmark trips to Greece and other mostly Orthodox nations. He also held groundbreaking talks with Ecumenical Patriarch Bar-

tholomew I, who is based in Istanbul and is considered the spiritual head of the patchwork of highly autonomous Orthodox churches and patriarchs.

But the Russian church is by far the most powerful in terms of size, influence and wealth. Its backing for dialogue could begin reshaping the Christian landscape in profound ways.

Chances for a "full and organic reconciliation" between the churches are extremely remote at the moment, said the Rev. Paul McPartlan, a Catholic University professor who has taken part in Catholic-Orthodox dialogue since 2005.

"But this is a step, what I would call a moment of grace," said McPartlan. "When that happens, other things can flow."

The fundamental issues of the millennia-old break still loom large: the power of the papacy and other theological splits. In recent decades, another point of friction was added over Orthodox accusations of Roman Catholic reach into traditionally Orthodox regions, such as Ukraine and Belarus, through Vatican-affiliated churches.

Such differences with the Vatican could still block a quest that has eluded the Holy See: an invitation for a papal visit to Russia. Even just arranging the airport encounter took two years of "secret negotiations" by bishops, Francis was quoted as saying in an interview with Italy's *Corriere della Sera* newspaper.

Instead, a planned joint declaration Friday may stick to easier ground, such as appeals for Middle East peace and aid for threatened Christian communities, some of which date back to the early centuries of the faith.

The meeting has received heavy coverage on Russia's state-run television networks, a reliable mirror of what authorities want to show their citizens. Kremlin spokesman Dmitry Peskov called it a "mutual step to meet each other halfway."

The backdrop of Cuba — far from quarrels in Europe — also has resonance.

WHAT IS IT?

Send your answers for this week's What Is It (below) to: Robert Croul, 1095 North Road, Newburgh, Maine 04444. Readers may respond by email to restate@myfairpoint.net. Be sure to write "What is it?" in the subject line.



ROBERT
CROUL

The Jan. 30-31 Bangor Daily News "What Is It?" had no correct answers. It was a box used to store or carry butter. It was a bit unfair of me not to show the word "butter," which was stenciled on the back of it. The interior had zinc lining and a compartment for ice in the bottom.

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