Children raised in a rural environment, surrounded by animals and bacteria-laden dust, grow up to have more stress-resilient immune systems and might be at lower risk of mental illness than pet-free city dwellers, according to new research published in the Proceedings of the National Academy of Sciences (PNAS).

"It has already been very well documented that exposure to pets and rural environments during development is beneficial in terms of reducing risk of asthma and allergies later in life," said co-author Christopher Lowry, a professor of integrative physiology at CU Boulder. "This study moves the conversation forward by showing for the first time in humans that these same exposures are likely to be important for mental health."

For the study, led by University of Ulm Professor Stefan Reber, the scientists recruited 40 healthy German men between 20 and 40 years old. Half had grown up on a farm with farm animals. Half had grown up in a large city without pets.

On test day, all were asked to give a speech in front of a group of stone-faced observers and then asked to solve a difficult math problem while being timed.

Blood and saliva were taken five minutes before and five, 15, 60, 90 and 120 minutes after the test.

Those who grew up in cities had significantly higher levels of immune system components called peripheral blood mononuclear cells (PBMCs) after the stressful experience.

They also showed prolonged elevation of the inflammatory compound interleukin 6 and muted activation of the anti-inflammatory compound interleukin 10.

People who grew up in an urban environment had a much-exaggerated induction of the inflammatory immune response to the stressor, and it persisted throughout the two-hour period," Lowry said.

Surprisingly, while their bodies launched a hair-trigger response to the stress, the former city kids reported feeling less stressed than their rural counterparts did.

"If you are not exposed to these types of organisms, then your immune system doesn't develop a balance between inflammatory and anti-inflammatory forces, and you can develop a chronic, low-grade inflammation and exaggerated immune reactivity that makes you vulnerable to allergy, autoimmune disease and, we propose, psychiatric disorders,"

A lot of research still needs to be done. But it looks as if spending as much time as possible, preferably during upbringing, in environments offering a wide range of microbial exposures has many beneficial effects,"