Researchers develop glowing probes to detect germs via RNA

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(PhysOrg.com) -- A team of researchers from the Boston area have developed a “glowing probe” molecule that is able to detect the presence of many common types of bacteria, viruses and even fungi. The results of their work, which they describe in their paper published in the *Proceedings of the National Academy of Sciences*, show that the molecular probes can be used to help diagnose diseases.

In recent years, people in the medical profession have had to rely on DNA analysis to identify certain pathogens, which can take days, or even sometime weeks to carry out. Time that could be better spent treating the diseases they cause. The research team, led by Deborah T. Hunga, following up on findings by Amy Barczak has found that focusing on RNA molecules instead offers much more timely results.

The probes are based on the fact that when DNA molecules are switched on, they pass on information to RNA molecules, which are far more prevalent in the body and thus easier to find and look at. Thus, when DNA molecules are switched on due to coming under attack by a pathogen, RNA molecules are notified, which opens up the possibility of simply watching RNA molecules for reactions instead of testing DNA directly. That’s just what the team has done. They’ve created so-called glowing probe molecules that physically light up when they come into contact with the material that is transmitted to RNA molecules from DNA when it comes under attack. And because different DNA molecules switch on for different germs, the message sent is different causing specific probes to light up, which allows for identifying which

pathogen has struck.

In lab tests, the glowing probes have been able to identify HIV, herpes, influenza, several kinds of bacteria and even the fungus that causes thrush. The team believes that their probes could be used together to test for a variety of ailments in one fell swoop, saving countless hours.

As impressive as their results are thus far, there's more to the story. The team also found that their glowing probes were also able to discern whether a discovered bacteria was drug-susceptible or resistant, a result that could save precious time when trying to figure out the most appropriate drug to use to treat patients infected with dangerous pathogens.

Because their research is still so new, more work will need to be done to ensure that the probes are as accurate as they seem and to figure out exactly which pathogens can be identified by them and which cannot.

More information: RNA signatures allow rapid identification of pathogens and antibiotic susceptibilities, *PNAS*, Published online before print April 2, 2012, doi:10.1073/pnas.1119540109

Abstract
With rising rates of drug-resistant infections, there is a need for diagnostic methods that rapidly can detect the presence of pathogens and reveal their susceptibility to antibiotics. Here we propose an approach to diagnosing the presence and drug-susceptibility of infectious diseases based on direct detection of RNA from clinical samples. We demonstrate that species-specific RNA signatures can be used to identify a broad spectrum of infectious agents, including bacteria, viruses, yeast, and parasites. Moreover, we show that the behavior of a small set of bacterial transcripts after a brief antibiotic pulse can rapidly differentiate drug-susceptible and -resistant organisms and that these measurements

can be made directly from clinical materials. Thus, transcriptional signatures could form the basis of a uniform diagnostic platform applicable across a broad range of infectious agents.

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