Posted by [**pt91**](http://www2.le.ac.uk/author/pt91) at Nov 18, 2016 02:55 PM | [**Permalink**](http://www2.le.ac.uk/offices/press/press-releases/2016/november/juices-from-damaged-salad-leaves-massively-stimulate-salmonella-growth-and-salad-leaf-colonisation-study-shows)

**Issued by University of Leicester Press Office on 18 November 2016**

* Lab study shows juices from damaged leaves in bagged salad increase *Salmonella* pathogen growth 2400-fold over a control group
* Leached juices also increased the pathogen’s capacity to form a strong and wash-resistant attachment to salad leaves
* Research highlights need for growers to maintain high food safety standards

**Watch and embed a video interview with Dr Primrose Freestone and Giannis Koukkidis:**[**https://www.youtube.com/watch?v=n9pFkC1-Z7U**](https://www.youtube.com/watch?v=n9pFkC1-Z7U)

**A Q&A feature by the researchers for the general public is available here:**

[**http://www2.le.ac.uk/offices/press/features/features-2016/q-a-for-the-general-public-on-salad-leaves-and-salmonella-study**](http://www2.le.ac.uk/offices/press/features/features-2016/q-a-for-the-general-public-on-salad-leaves-and-salmonella-study)

**Juices from damaged salad leaves massively stimulate Salmonella growth and salad leaf colonisation, study shows**

University of Leicester team show leached juices from leafy vegetables enhance growth and virulence of food poisoning bug

Investigations by University of Leicester microbiologists have revealed that just a small amount of damage to salad leaves can massively stimulate the presence of the food poisoning bug *Salmonella*in ready-prepared salad leaves*.*

The scientists have discovered that juices released from damaged leaves also had the effect of enhancing the virulence of the pathogen, potentially increasing its ability to cause infection in the consumer.

The research is led by Dr Primrose Freestone of the University’s Department of Infection, Immunity and Inflammation and PhD student Giannis Koukkidis, who has been funded by a Biotechnology and Biological Sciences Research Council (BBSRC) *i-case* Studentship.

Their research investigates novel methods of preventing food poisoning pathogens from attaching to the surface of salad leaves to help producers improve food safety for consumers. This latest study, published today (18 November) in *Applied and Environmental Microbiology,* found that juices from damaged leaves in bagged spinach and mixed salad increased *Salmonella* pathogen growth 2400-fold over a control group and also enhanced their adherence to surfaces and overall virulence, or capacity to cause disease.

Dr Freestone said: “Salad leaves are cut during harvesting and we found that even microliters of the juices (less than 1/200th of a teaspoon) which leach from the cut-ends of the leaves enabled *Salmonella* to grow in water, even when it was refrigerated. These juices also helped the *Salmonella* to attach itself to the salad leaves so strongly that vigorous washing could not remove the bacteria, and even enabled the pathogen to attach to the salad bag container.

"This strongly emphasises the need for salad leaf growers to maintain high food safety standards as even a few *Salmonella* cells in a salad bag at the time of purchase could be become many thousands by the time a bag of salad leaves reaches its use by date, even if kept refrigerated. Even small traces of juices released from damaged leaves can make the pathogen grow better and become more able to cause disease.

"It also serves as a reminder to consume a bagged salad as soon as possible after it is opened. We found that once opened, the bacteria naturally present on the leaves also grew much faster even when kept cold in the fridge.

“This research did not look for evidence of salmonella in bagged salads. Instead, it examined how Salmonella grows on salad leaves when they are damaged."

Leafy green and other salad vegetables are an important part of a healthy diet, providing vitamins, minerals, and dietary fibre. Ready to eat prepared salads are particularly popular, are widely consumed and so of significant economic importance. Over recent years there has however been a number of outbreaks associated with fresh salad produce contaminated with *Salmonella* and *E. coli*both in the USA and Europe.  This has triggered considerable interest in effective strategies for controls and interventions measures both in UK industry, the EU and key research funding bodies ([**http://www.food.gov.uk**](http://www.food.gov.uk/)).

Despite a number of published reports on improving the microbiological safety of salad leaf production, very few studies have investigated the behaviour of *Salmonella* once the leaves have been bagged.

Giannis said: "Anything which enhances adherence of foodborne pathogens to leaf surfaces also increases their persistence and ability to resist removal, such as during salad washing procedures.  Even more worrying for those who might eat a *Salmonella*contaminated salad was the finding that proteins required for the virulence (capacity to cause infection) of the bacteriawere increased when the *Salmonella*came into contact with the salad leaf juices.

"Preventing enteric pathogen contamination of fresh salad produce would not only reassure consumers but will also benefit the economy due to fewer days lost through food poisoning. We are now working hard to find ways of preventing salad-based infections."

Professor Melanie Welham, Chief Executive, BBSRC said: “Food-borne pathogens like Salmonella are serious bacterial threats that affect our health which is why BBSRC invests in research to understand and combat food poisoning.”

Research published recently by the Food Standards Agency reported that annually there are more than 500,000 cases of food poisoning in the UK. While poultry meat was the most common source of infection, some 48,000 of food poisoning cases were from fresh produce: vegetables, fruit, nuts and sprouting seeds [**http://www.food.gov.uk/news-updates/news/2014/6097/foodpoisoning**](http://www.food.gov.uk/news-updates/news/2014/6097/foodpoisoning). Importantly, *Salmonella* was the pathogen that caused the greatest number of hospital admissions – around 2,500 per year.

‘Salad Leaf Juices Enhance Salmonella Growth, Colonization of Fresh Produce, and Virulence’ will be published in *Applied and Environmental Microbiology*on 18 November at 6pm UK time, DOI: [**10.1128/AEM.02416-16**](https://doi.org/10.1128/AEM.02416-16).

**Ends**

**Notes to editors:**