

**Horizontal gene transfer to bacteria of an *Arabidopsis thaliana*  
ABC transporter that confers kanamycin resistance in  
transgenic plants**

**A Thesis presented for the  
Masters of Science degree  
The University of Tennessee, Knoxville**

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December, 2006**

## Abstract

The use of antibiotic resistance markers is an important tool in the production and selection of transgenic plants. There have been increased concerns about the potential horizontal gene transfer (HGT) from transgenic plants to bacteria of medical and environmental importance. Until recently all antibiotic resistance genes used in transgenic studies have been bacterial in origin. An *Arabidopsis thaliana* ABC transporter, *Atwbc19*, was the first plant gene shown to confer kanamycin resistance when overexpressed in transgenic plants. The *Atwbc19* gene was evaluated for its ability to transfer antibiotic resistance to *Escherichia coli*, which are found in the human gut and environment. Simulated HGT was staged by subcloning *Atwbc19* under the control of a bacterial promoter, genetically transforming the bacteria and assessing if resistance was conferred as compared to the same treatment of the *E. coli nptII* gene. The *nptII* gene provided greater resistance to kanamycin in *E. coli* than that of the *Atwbc19* gene and was significantly different from the no-plasmid control at higher concentrations of kanamycin (e.g., over 10 mg L<sup>-1</sup>) ( $p < 0.05$ ). The *Atwbc19* gene was not significantly different from the no-plasmid control at higher concentrations of kanamycin (e.g., over 25 mg L<sup>-1</sup>) ( $p < 0.05$ ). *E. coli* transformed with *Atwbc19* conferred little resistance to kanamycin at 100 mg L<sup>-1</sup>.

Results from Northern gel blot analysis indicated that expression levels for *nptII* were similar to that of *Atwbc19* for the two concentrations of the antibiotic kanamycin tested. However, there was a slightly apparent decrease in the level of expression for *Atwbc19* compared to the *nptII* gene that was most likely the result to the plant codon usage of the *ABC* gene or its large size (over two-fold greater than *nptII*). This research

supports the use of the *Atwbc19* gene in transgenic plants as a selectable marker and potential replacement of the *nptII* gene for kanamycin selection systems.

To the Graduate Council:

I am submitting herewith a thesis written by Kellie Parks Burris entitled "Horizontal gene transfer to bacteria of an *Arabidopsis thaliana* ABC transporter that confers kanamycin resistance in transgenic plants." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Plant Sciences.

C. N. Stewart, Jr.  
Major Professor

We have read this thesis  
and recommend its acceptance:

Steve Ripp

Janice Zale

Accepted for the council:

Linda Painter  
Interim Dean of Graduate Studies

(Original signatures are on file with official student records).