APPS Fellow
Professor Allen Kerr

Many younger plant pathologists will know of Allen Kerr as an APPS Fellow and via the Allen Kerr prize, which is awarded each year by APPS for the most outstanding PhD research in plant pathology.

Allen Kerr's own research career had many significant highlights, including fundamental observations which led to the discovery of the tumour-inducing plasmids (Ti plasmids) in *Agrobacterium*, paving the way for plant genetic engineering, and the discovery and understanding of the most successful example of biological control in plant pathology, the use of strain K84 for control of crown gall disease of stonefruit.

Allen's career began in Edinburgh University where he enrolled in Science, with an interest in bacteriology. His interest in botany and an inspiring mycologist as a teacher led Allen to discover the joy of plant pathology, and his career as a plant pathologist began. In 1950, he was offered a job at the Waite Agricultural Research Institute. He enrolled in a PhD on *Rhizoctonia solani*, then (as now) an important pathogen of cereals in southern Australia. A sabbatical with Dr SD Garrett at Cambridge in 1959 stimulated a lifelong interest in biological control.

After a period in Ceylon in the 1960's studying blister blight of tea (*Exobasidium vexans*), Allen returned to Adelaide at a time when crown gall disease was causing very significant economic losses in the South Australian stonefruit industry. At this time, it was known that, after infection, crown gall tumours could grow without the causal bacterium, and a hypothetical "tumour- inducing principle" had been proposed by Braun, but the discovery of the Ti plasmid was still a decade away.

Allen's research at the Waite focused on the ecology of *Agrobacterium*, and through his use of different selective media, realised that pathogenicity was being transferred from pathogens to non-pathogens. He soon understood that this must be the result of plasmid transfer between strains. The demonstration of pathogenicity transfer led to an international race to locate the "tumour-inducing principle" and in 1975 Eugene Nestor's lab in Seattle published evidence for the Ti plasmid. This created the basis of the revolution in plant genetic engineering.

Allen Kerr's own research re-focused on the biology of *Agrobacterium* studies on non-pathogenic and pathogenic strains led to the important observation that a non-pathogenic strain of Agrobacterium completely inhibited crown gall formation when mixed with a pathogen. Work in the lab then demonstrated that control was dependent on the production of an antibiotic, agrocin 84 by the non-pathogen, strain K84.

As with many effective controls, the seriousness of crown gall disease to stonefruit production is now largely forgotten. Stonefruit growers were supplied with strain K84 on agar slopes from a small incubator in Allen Kerr's lab for many years.

A report from Greece that pathogens could arise which produced agrocin 84 led to a detailed genetic study of the agrocin 84 plasmid. Using transposon mutants supplied by Stephen Farrand (University of Illinois), the genes controlling agrocin synthesis and plasmid transfer were mapped. Dr. David Jones, working with Allen Kerr, constructed a deletion mutant of K84, which was unable to transfer the plasmid.

The deletion mutant, K1026, was shown to be as effective as K84 at controlling crown gall disease and approval was gained to use this genetically modified strain as a commercial control. It was the first genetically engineered organism in the world to be released for commercial use.

The highlights of Allen's research were undoubtedly the discovery of pathogenicity transfer, the successful biological control of crown gall and the commercial use of the genetically engineered biological control agent. However, Allen and his collaborators also made a wide range of contributions to plant bacteriology with significant impact on the control of crown gall disease of grapevines, on the understanding of conjugation in *Agrobacterium*, and on the role of bacteria and bacteriophage in Annual Ryegrass Toxicity (ARGT).

Allen Kerr's career and achievements were recognised by the award of the inaugural Australia Prize (1990), election as a Fellow of the Australian Academy of Science, Fellow of the Royal Society, Foreign Associate of the National Academy of Sciences, US and Fellow of the American Academy of Microbiology, not to forget the APPS Allen Kerr Prize. The recipients of this award can hope that some of Allen Kerr's intellect and insight will be transferred along with this prize!

Kathy Ophel-Keller
SARDI
December 2006

Profile from Bright Sparcs
APS Fellowship
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Inaugural Australia Prize

The Australasian Plant Pathology Society congratulates Professor Allen Kerr, Head of the Department of Plant Pathology at the Waite Agricultural Research Institute, Adelaide. Professor Kerr is one of three co-winners of the inaugural Australia Prize, established last year by the Federal Government as part of its science and technology awareness programme.

In announcing the winners, the Prime Minister, Mr Hawke, said the prize had been awarded for outstanding achievement in promoting human welfare in the field of biological sciences related to agriculture and the environment. In particular, the three scientists had been honoured for their achievements in the genetic engineering of plants and microbes. They and their research teams have made breakthroughs which will radically alter our approach to agriculture in the twenty-first century.

Allen Kerr, perhaps the most distinguished member of the Australasian Plant Pathology Society, was born in Edinburgh, Scotland and gained a Bachelor of Science with Honours in 1947 from the University of Edinburgh. After four years at the North of Scotland College of Agriculture, he took up a position as Lecturer in Plant Pathology at the Waite Agricultural Research Institute.

For the past 20 years, since returning from the Tea Research Institute in Ceylon (Sri Lanka) in 1967, Professor Kerr has devoted his talents to investigations of crown gall and its cause, *Agrobacterium tumefaciens*. The work started as an ecological study of agrobacteria in soil and on the roots of stone fruit trees. A taxonomic study showed that there were two distinct biovars of *A. tumefaciens*, with biovar 2 being predominant. A selective medium was developed that enabled the emuneration of the organism in soil and around roots.

A non-pathogenic biovar 2 strain (K84) prevented crown gall induction when seeds or roots of young plants were dipped in a cell suspension. This method of control is now widely practised around the world. Disease control by strain K84 is achieved by the *in situ* production of an antibiotic called agrocin 84. Strain K84 also competes with pathogenic strains for two distinct kinds of opines which are produced in galls.

With genetic engineering techniques, Professor Kerr has developed a new strain of *A. radiobacter*, designated K1026, which produces agrocin 84 but is incapable of transfer of immunity to agrocin 84 to pathogenic strains of *A. tumefaciens*. Strain K1026 effectively controls crown gall and has been registered as a pesticide in New South Wales. It is the first genetically engineered organism to be released for general use.

Professor Kerr's work has led to a breakthrough in the introduction of new genes into plants. Virulent strains of *A. tumefaciens* possess a loop of

specialised DNA called the tumour inducing (Ti) plasmid. During infection, the bacterium transfers and integrates part of this plasmid into host cells. The genes transferred cause host cells to proliferate and synthesise hormones involved in cell growth and division. However, it has been possible to excise these genes from the plasmid, without losing the ability to transfer genes into plant cells. It has also been shown that new genes from various sources can be inserted into the plasmid and transferred into plant cells. This work provides a means for introducing valuable alien genes, such as genes for disease resistance, into plants thereby transforming susceptible plants into resistant plants. It is also helping to provide a biological alternative to chemical control, leading to a safer and cleaner environment.

Allen Kerr has received many honours during his distinguished career, including Fellow of the Royal Society, Fellow of the Australian Academy of Science and the Ruth Allen Award from the American Phytopathological Society. He was President of the Australasian Plant Pathology Society from 1980–83. The Society again congratulates Allen on this outstanding achievement, which culminates a long and illustrious career.

(R.L. Dodman)
Editor-In-Chief