
Preface

Viruses are dangerous and are waiting for the chance to break out and infect society. Humankind lives in uncertain times, and this is our future without vigilant and effective safeguards. This is further exasperated by the ability to create new viruses, from scratch, within a few weeks. These contagions have the potential to escape confinement, infect people, and harm the plants, insects, and animals we depend upon to survive. Society is in danger, but we no longer need to wait for an innovative method to detect these malicious microbes.

Many viruses can be detected simultaneously using the Integrated Virus Detection System (IVDS). *Integrated Virus Detection* describes this technology and provides many examples, including a chapter on previously unknown viruses found in honeybees that includes charts on seasonal and yearly variations. This straightforward technology can be used to detect previously unknown viruses collected from environmental and other complex biological matrices.

This book presents in a single reading a summary of more than 10 US patents that were issued for the invention of the Integrated Virus Detection System. IVDS is powering a revolution in humankind's ability to rapidly detect, measure, and monitor viruses and virus-like particles. Three facts make this possible: (1) viruses are in the size range of 20–800 nm; (2) there is sufficient disparity in each virus species' particle size such that size data may be used for detection and preliminary identification; and (3) virus particle density is distinct from other nanoparticles. IVDS is an innovative, non-chemical approach to near real-time comprehensive screening of all viruses present in a sample.

The entire virus-screening process from sample collection to review of results can occur within a few minutes. The absence of virion-particles is compelling evidence of a true-negative. Large numbers of samples may be processed to provide an excellent means to pre-screen samples for judicious targeting of subsequent tests such as mass spectrometry proteomics and polymerase chain reaction (PCR). The IVDS system employs relatively simple, low cost equipment, with few reagents. New advances indicate that the entire virion-size range can be measured concurrently and the process automated thus making virus detection simple and quick.

The IVDS technique is not limited by historical concerns and has been used successfully for many years to monitor the more than 20 virus species common in honeybees. Without effective viral detection, our environment is in danger. IVDS offers the solutions we need to allow for the successful treatment of apiaries expressing high viral loading and return the honeybees to health.

This book follows the invention of the IVDS technology, the development of the first instruments, and the use of IVDS methods to common applications. The reader can expect to gain a working understanding of the IVDS instrument and how to use the technology and methods in several applications.