Assessment of Anti Herpes Simplex Virus Type 1 Activity in *Bidens biternata* and *Mangifera persiciformis*

by

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ABSTRACT

The disease known as herpes, caused by herpes simplex virus type 1 (HSV), is a common infection resulting in lesions on the mouth or genitals. At least half of the population of the United States has experienced infection by HSV. There is presently no preventative vaccine for HSV and resistance to acyclovir, the only currently available therapy, is increasing. This signals a need to find other chemotherapeutic agents to use in treatment. This research evaluated extracts from two plants, *Bidens biternata* and *Mangifera persiciformis*, both used in traditional Chinese medicine, for potential anti herpes properties in a cell culture system. Both of these plants have shown high anti herpes activity. *Bidens biternata* showed 6% cytotoxicity from its most active fraction; however, this fraction failed to reliably inhibit HSV. We report an unknown isolated compound from *M. persiciformis* that has shown nearly 90% virus inhibition with 6% cytotoxicity at 50 μg/mL. This promising compound will be evaluated for structural identification in a future project.

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INTRODUCTION

A. Herpes Simplex Viruses

The disease commonly known as herpes, caused by herpes simplex virus (HSV), is a common, contact transmissible infection most often responsible for sores or lesions on the mouth or genitals (1). There are two types of herpes simplex viruses: HSV-1, which usually causes oral sores, often referred to as fever blisters or cold sores, and HSV-2, which typically causes sores in the genital region or rectum (2). Both types are transmitted through oral or genital secretion, respectively, and spread by direct or indirect contact. It often goes unnoticed due to the infection lying dormant in neurons and unseen for periods of time, otherwise known as latency, before being reactivated by another illness or condition that suppresses the host immune response (1). This dormant virus then causes recurring lesions in the same or nearby area when reactivated by the appropriate signals (1). At least half of the population of the United States has experienced infection by HSV-1 (3). Herpes simplex virus 1 is most common in childhood, whereas HSV-2 is sexually transmitted with initial infection occurring most often in young adults (4). Herpes Simplex Virus 1 may also be responsible for more serious, life-threatening diseases, such as meningoencephalitis and neonatal infection and cause severe infections in immunocompromised patients (5).

B. Infection

1. Viral Structure

Herpes simplex viruses, like all herpes viruses, are enclosed in an icosahedral capsid with a lipid envelope containing membrane proteins and a tegument to link capsid and envelope (6). The lipid bilayer envelope contains numerous glycoproteins, and the tegument is composed of multiple proteins with no defined shape (7). The capsid, containing 150 capsomeres made from five main proteins, houses a linear, double-stranded DNA with unpaired nucleotides at each terminus (7). These structures are all diagrammed in Figure 1.

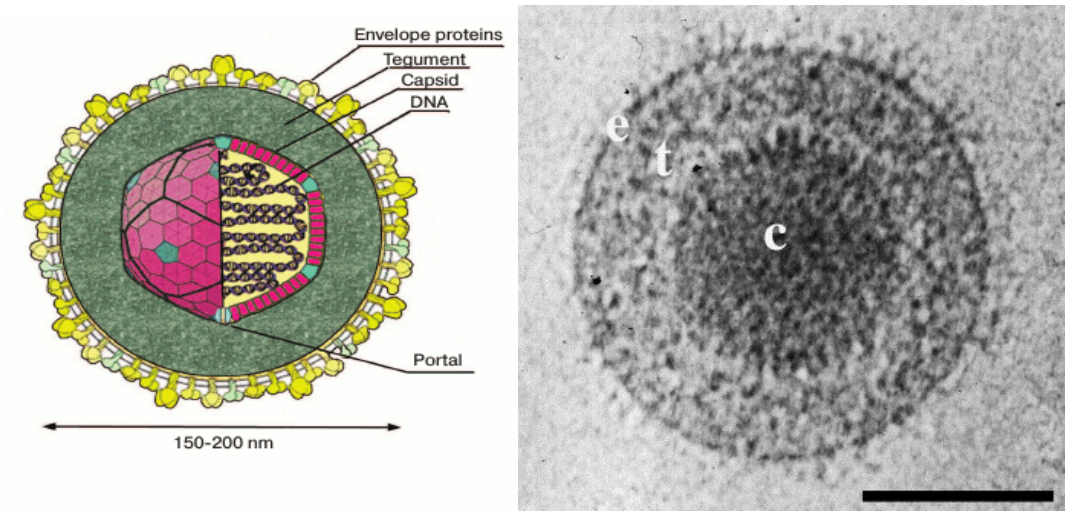

Figure 1. Two diagrams of an HSV-1 virion. On the left is a drawn diagram labeling the tegument, capsid, proteins, and DNA (37). On the right is an electron microscopic image taken of a virion with the (c) nucelocapsid, (t) tegument, and (e) envelope (10).

2. Cellular Entry and Replication

The HSV-1 virus enters the host cell through receptor mediated endocytosis, a cell mediated entry of foreign substance into a cell (8). Through interaction of viral

proteins with the cellular receptor present in all animal cells, heparan sulfate proteoglycan, the virus binds to the cell and initiates viral entry (9). From here, the virus fuses with the membrane and releases the nucelocapsid into the cellular cytoplasm (9). Some tegument proteins are then used to transport the nucleocapsid toward the nuclear membrane to uncoat and release DNA into the nucleus where transcription and replication occur (9). Viral DNA then uses RNA Polymerase II to express viral genes and begin viral genome replication (11). Furthermore, viral DNA is transcribed to form capsids and proteins to encapsulate the newly replicated viral genome (12). These newly formed viruses can then escape to infect other cells, specifically neurons, through exocytosis. This whole process is seen in Figure 2. The most common neural ganglion the virus attacks belongs to the trigeminal nerve.

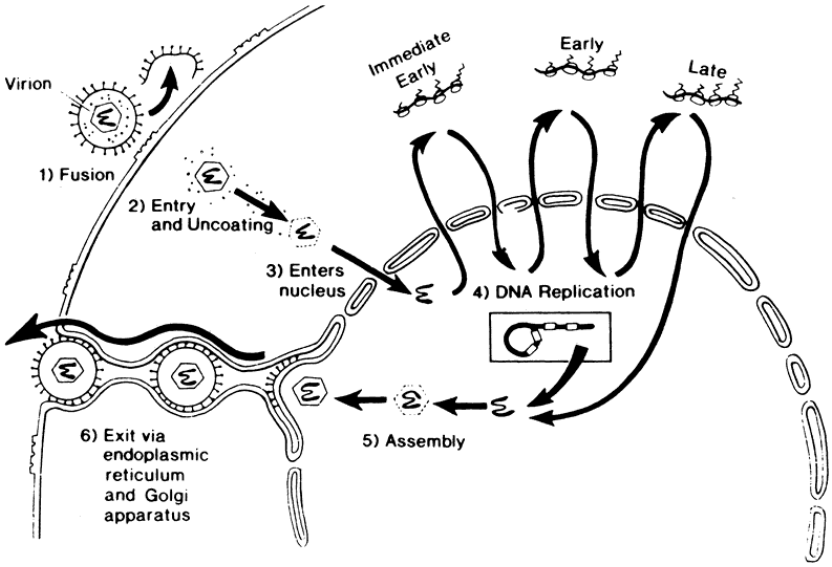

Figure 2. HSV-1 mechanism of infection (13).

3. Virus Latency

After the initial appearance of sores, infection does not cease. Rather, HSV-1 can return throughout a lifetime due to its residence in host nerve cells, as a latent infection (13). After the initial infection, the virus spreads to neural ganglia where it can travel to the skin through mucosal membranes using axonal transport mechanisms (14). In order to begin latency, the virus is packed into circular DNA elements within histones (13). The DNA then undergoes regular cell cycle processes until reactivated by an outside occurrence (13). It has also been suggested that virus may lay dormant in tissues peripheral to the ganglia, available for recurrent infections (14). There are many stimuli that cause reactivation of HSV-1, beginning with basic stresses to the body, such as raised body temperatures and most significantly, disruption to the immune system (15). Psychological stressors, such as social stress, mental tension, or fatigue can also disrupt nervous, endocrine, and immune systems, leading to recurrence of the infection (16). Following reactivation, the virus then returns to the ganglion of the neuron through the mucosal membranes until acted upon by another stressor.

C. Disease

1. Symptoms and Transmission

At the initial onset of infection, fever, and fluid filled vesicles are most commonly seen (17). The most recognizable and well-known symptom of HSV-1 infection are sores and blisters that contain an abundance of virus particles ready for transmission to another hosts or areas (18). Although sores are the primary sign of infection, cutaneous lesions filled with herpes viruses on the fingers and toes, called herpetic whitlow, are also seen (13). Photographic examples of these sores and whitlow are shown in Figure 3. The virus

is spread through direct skin-to-skin contact, from an individual secreting HSV to a mucosal layer or abraded skin of another individual, where it can infect the host's cells and travel through neurons to neural ganglia, setting up latency (14). Herpes simplex virus 1 can also cause genital sores, which are similar to those found on the face, and similarly transmissible (19). There is additionally a risk of maternal transmission to a newborn during birth (20).

Figure 3. Oral Herpes and Herpetic Whitlow. Oral herpes is shown on the left (39) and herpetic whitlow on the finger on the right (40).

2. Associated Illnesses

A herpes infection may lead to other illnesses, such as aseptic meningitis (6). This includes infection of cerebrospinal fluid, infection of the brain, and inflammation of the spinal cord. Occasionally, infection can reach the eyes, causing conjunctivitis or blepharitis (21). Because of its effects on neurons, HSV infections may also play a role in lowering IQ and language skills as well as early Alzheimer's Disease development (7, 8). Rarely, neonatal HSV infection occurs during birth, and in these infections, it is often lethal (6).

D. Prevalence

Worldwide, HSV-1 seroprevalance ranges from 15%-65% and HSV-2 from 12-45% (10). In the United States, the infection rates are around 50% and 15%, respectively (8). Both types of herpes simplex are most common in adults aged 40-49 (3). Most notably, immunocompromised patients or those going through chemotherapy have a higher chance of acquiring HSV infection and high chance of fatality, making them a very important demographic (9). In the United States, out of the 20 million new sexually transmitted infections in 2013, 750,000 were caused by HSV-2, and of the current 110 million sexually transmitted infections, HSV-2 accounts for 24 million (22).

E. Treatment

1. Current Treatment

There are unfortunately no cures for herpes, nor are there any immunizations (2). There is, however, a drug to relieve the symptoms of an infection called acyclovir, which is used orally or topically (6). Acyclovir acts by using the viral enzymes to resemble a nucleotide, the basic building block of DNA, then inserting into the viral sequence causing a termination in replication of the viral genome (23). Similar versions of acyclovir include famciclovir, penciclovir, ganciclovir, and valaciclovir, which all have a similar mechanism of action as acyclovir but with variable efficacy (23).

2. Resistance

Because acyclovir is the only current treatment for herpes, it is used all over the world. Consequently, there has been growing resistance of immunocompromised patients

to this medication, increasing from 3.8% to 15.7% from 2002 to 2011 (11). This resistance mechanism has been observed to be a viral mutation in the machinery used to insert acyclovir, or any other related drug, into the viral DNA preventing it from being inserted (5). It is necessary to find an alternative therapy drug as resistance continues to increase.

F. Traditional Chinese Medicine

There have been noteworthy advances in antiviral drug research using Traditional Chinese Medicine (TCM) (12). In recent years, the possibility of verifiable therapeutic properties of TCM plants have been investigated as a way to discover potential new drugs and treatments for a variety of diseases. Studies have shown that some TCM plants are potential treatments for issues such as bronchial asthma, atopic dermatitis, and irritable bowel syndrome (43). Furthermore, in a study using 22 TCM plant isolated compounds, anti-leukemic activity was found and further investigated to be used as a novel treatment (44).

Many plant extracts used in China over hundreds of years have been shown to have anti viral properties (12). When TCM plants began to be investigated, compounds from the plant *Artemisia annua* that previously demonstrated anti malaria and anti cancer activity, also displayed inhibition of viruses, including human cytomegalovirus and other members of the *Herpesviridae* family. *Prunella vulgaris*, the “self heal” plant, has been reported to have strong activity against HIV-1, HIV-2, and acyclovir-resistant HSV-1 and holds promise as a future drug (29, 30). *Bidens biternata* is a common herb found in India and Asia that is used as a leafy vegetable with nutritional value (31). It has been used in

traditional medicine to treat inflammation, infections, diabetes, malaria, leprosy, ulcers, and diarrhea, and studies on its constituent chemicals have shown potential to have medicinal uses (32). Moreover, anti herpes simplex activity has been found in a similar species, *Bidens pilosa* (33).

Mangifera persiciformis, also known as peach mango, is a tree native to China (34). It has in the past been evaluated for its constituent chemicals in order to use them for biological analysis, but no activity in any organism has been found yet (35). The lack of studies done on the plant may also be linked to its classification as a threatened species (34). With the prevalence of TCM showing anti viral and even some anti herpes activity, it is important to investigate any leads.

G. Current Study

The purpose of this research is to further test *Bidens biternata* and *Mangifera persiciformis* for their potential anti herpes properties. In two previous studies, various TCM plants were tested for potential anti herpes activity (46, 47). These two plants had the highest virus inhibition in the studies, prompting further research to find what compounds were active in them (46, 47). Two kilograms of dry *Bidens biternata* plant material was provided through a partnership between Guangxi Botanical Garden of Medicinal Plants in China and the Tennessee Center for Botanical Medicine Research (TCBMR). A crude plant extract had shown 96% inhibition on amount of cells killed by herpes in preliminary testing. Similarly, *Mangifera persiciformis* was provided as a crude extract, and previous crude extracts had shown 99% virus inhibition. Testing began with separating the crude plant extract into multiple fractions and testing their activity against

herpes simplex virus 1. Active fractions were further separated and tested until a putative pure compound was isolated. Purification and fractionation of extracts has been done in concurrence with evaluation of these extracts and fractions in the Chemistry and Biology departments at MTSU. This study has been done with the long-term goal of isolating and identifying the anti viral compound or combination of compounds in *Bidens biternata* and/or *Mangifera persiciformis*.

MATERIALS AND METHODS

A. Extract Preparation

To get a crude extract from the dry plant material a machination or decoction is done. This is the process of soaking a material in a solvent to extract the chemicals out of it. In this example, approximately 50 g of dry plant material was put into three 250 mL beakers filled with methanol and placed on a warm hot plate overnight at 35° C. After isolating the crude extract, the remaining sample was put through liquid-liquid extraction using hexane, chloroform, and ethyl acetate in that increasing order of polarity (Sigma, Chemical Company, St. Louis, MO). This was done by mixing the sample with water and a low polarity solvent, thus separating different parts of the plant extract. The aqueous layer was then removed from the separated mixture and mixed with a higher polarity solvent to get further separation. This process was repeated until the highest polarity solvent was used. These four separate extracts were evaluated for virus inhibition. This method is diagrammed in Figure 4.

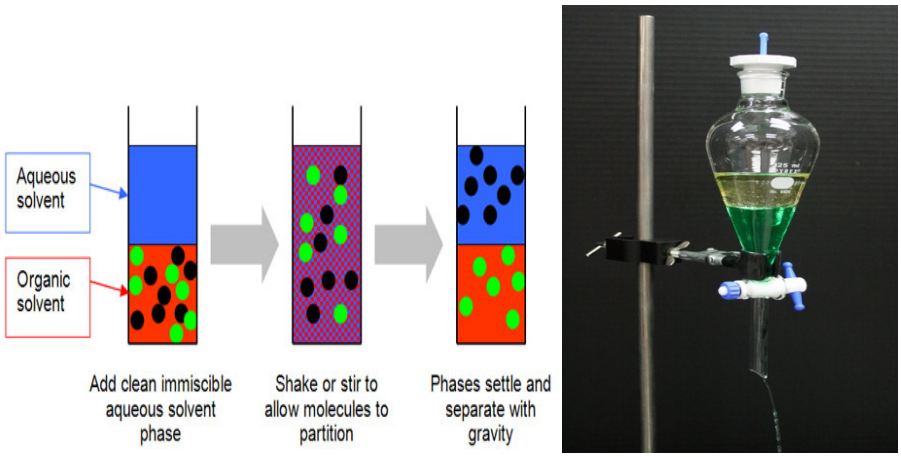

Figure 4. Liquid liquid extraction. The process is shown on the left (41), and a photo of actual procedure, right (41).

The extract fractions with the greatest antiviral activity were separated into further fractions using a gravity column. This method is carried out by taking advantage of the degree of attraction chemical constituents have to an adsorbent. A solid phase of silica gel is placed in a column, with the organic material placed at the top. Solvents, or eluents, are passed through the silica gel, carrying parts of the organic material along with it to the bottom of the column where is drained into separate containers. These eluents are each at varying degrees of polarity, meaning they attract different organic materials, allowing for separation after each successive solvent used. A basic representation of this method is shown in Figure 5.

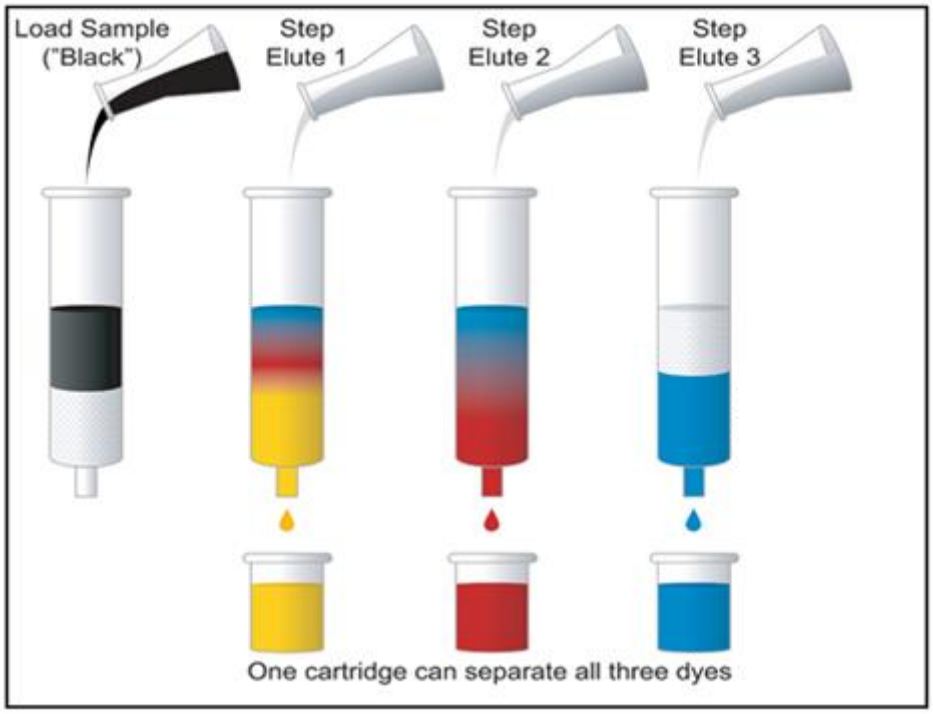

Figure 5. Basic example of how chromatography works (42).

These different fractions are then dried and stored, while aliquots are created in dimethyl sulfoxide (Sigma) for assay testing. Dimethyl sulfoxide was tested alone on cells without extract to verify that DMSO had no toxic effect on cells.

B. Media Preparation

Phosphate Buffered Saline (PBS) was prepared by mixing 991 mL deionized water (dH_2O), 8 g of NaCl (Fisher Scientific, Suwanee, GA), 1.15 g of Na_2HPO_4 (Fisher Scientific), 0.2 g of KCl (Fisher Scientific), and 0.2 g of KH_2PO_4 (Fisher Scientific). The solution was then sterilized by autoclaving.

To prepare fresh supplemented M199 Hanks' or M199 Earle's medium, approximately 90 mL of M199 Hanks' or M199 Earle's media (Sigma) was poured into an autoclaved glass bottle. In addition, 8 mL of fetal bovine serum (Gibco Life Technologies, Grand Island, NY), 1 mL of glutamine (Sigma), 1 mL of penicillin-streptomycin (Sigma), and 0.5 mL of fungizone (Invitrogen, Carlsbad, CA) were added to the solution. Prepared supplemented media in glass bottles were labeled, dated, and stored at 4°C along with unsupplemented media.

C. Cell Maintenance

All work done involving cells, virus, and extracts was done under a biological Class II safety cabinet. HSV-1 (MacIntyre Strain) was grown in host Vero cells, derived from African Green Monkey kidney cells [certified cell line 81, American Type Culture Collection, Manassas, VA]. These cells were kept in 25 cm^2 tissue culture flasks (Corning Costar Corp., Cambridge, MA) with M199 Hanks' and M199 Earle's medium. They were maintained through weekly flask changes. First the remaining Earle's medium in the flask was decanted, then subsequently washed twice with 5 mL PBS for one minute each time. This was an important step because the serum in Earle's medium deactivates the trypsin, which was used in the following step. Next, the cells were removed from the bottom of the flask by incubating with 5 mL of 0.1% trypsin and placing the flask in the 37 °C incubator for 5-10 minutes. The trypsin was decanted, and the flask placed back in the 37 °C incubator for 15-20 minutes. Once the cells could easily slide off the flask, 5mL of M199 Hank's media was added and triturated using a pipette to break up clumps of cells. These single cells were used at the appropriate dilution to make a fresh flask or

place in a plate for testing. Fresh cells in a new flask were incubated at 37° C containing 5 mL M199 Hanks' for two days and then changed to 5 mL M199 Earle's medium for another five days. A week after cells were passed, a confluent monolayer on the bottom of the flask was formed. At this point, cells could be again passed or used in a plate to test *Bidens biternata* or *Mangifera persiciformis* fraction samples.

D. Plate Set-Up

To prepare a plate, cells were detached from the bottom of the flask, as described, and seeded in a 96-well tissue culture plate (Corning Costar Corporation) at a concentration of approximately 5000 cells per 100 μL well. The plate was incubated for 24 hours in 5% CO_2 at 37° C to allow cells to re-attach and form a monolayer. Various preparations were added to wells for testing. These preparations included media alone, virus alone, extract alone, DMSO and cells, acyclovir and cells, acyclovir and virus, or extract plus virus. The set up for a typical plate included six wells with only media, six wells with only media and cells as a control of cell growth, six wells with media, cells, and virus as a virus cell death control. Each preparation was tested in triplicate (see Figure 6). To evaluate cell viability or virus inhibition, 11.1 μL PrestoBlue was added to each cell 48 hours after the extract or virus was added. PrestoBlue is a fluorescent, cell permeable dye that changes color from blue to red when resazurin in the dye is reduced to resorufin by viable cells, allowing cell viability to determined. After dye had incubated with cells for thirty minutes, the plate was inserted into a spectrophotometer (Molecular Devices, Sunnyvale, CA) that recorded of fluorescence of each well. From this information, the cell viability and inhibition of virus could be calculated.

	1	2	3	4	5	6	7	8	9	10	11	12
A		Blank			Cells + Extract 1							
B		Blank			Cells + Extract 2							
C		Cells only			Cells + Extract 3							
D		Cells only			Cells + Extract 4							
E		Virus + Cells			Cells + Extract 5							
F		Virus + Cells			Cells + Extract 6							
G												
H												

Figure 6. Example of a Plate Setup for Cytoxicity Testing. Extracts and controls were screened in triplicate as indicated by the colors on the plate.

E. Extract Cytotoxicity Testing

To ensure extracts were not toxic to the cells, each extract fraction was diluted two-fold, starting at a concentration of 100 µg/mL by adding 396 µL of M199 Earle's and 4 µL of extract into a 1.5 mL Eppendorf microfuge tube (Fisher). These extracts were

then added at 100 μL per well. A total of six wells were reserved as the virus only control. Virus control wells were prepared by adding 8 μL of virus and 792 μL of M199 Earle's media into a microfuge tube. The stock virus tube was then marked as used and put back into a -20° C freezer. When stock virus tubes were used for the second time to prepare the virus only control wells, 10 μL of virus and 790 μL of M199 Earle's media were added to the microfuge tube. Additional virus was added due to repeated freeze-thaw cycles that decrease virus titer. Stock virus tubes were discarded after the second use. Following a 48-hour incubation of each fraction with cells alone in 5% CO_2 at 37° C, PrestoBlue was added to each well and cell survival was determined using a spectrometer. Based on our laboratory standard protocol, the highest concentration of extract that showed less than a 20% reduction in cell viability was considered non-toxic and acceptable for further antiviral testing. Dilutions were cut in half until each extract demonstrated a cytotoxicity of less than 20%.

F. Virus Dilution Testing

Virus was added to cells at a multiplicity of infection (MOI) of 0.1, meaning one virus particle for every ten cells. Each well was estimated to contain 5000 cells, so a dilution of 500 HSV-1 was added to each cell. After 48 hours' incubation, PrestoBlue was added to evaluate virus concentration. A virus dilution that killed between 50% and 75% of cells was considered acceptable. If cell death was outside of this range, the dilution was readjusted to result in the necessary cell death.

G. Extract Testing

To test an extract's ability to inhibit HSV-1, a 96 well plate was prepared as outlined and incubated for 24 hours. Then 4 μL of virus and 4 μL of the non-toxic

concentration of the extract were mixed with 392 µL of M199 Earle's in an Eppendorf microcentrifuge tube. A volume of 100 µL of this solution was added to each designated well. After 48 hours of incubation in 5% CO_2 at 37° C, 11.1 µL of PrestoBlue was added to each well. The plate was then read in the spectrophotometer to determine cell viability. By comparing the data from the cell control, the virus control, and each individual extract with virus, the virus inhibition could be determined. Based on our laboratory standard protocol, an extract must inhibit at least 50% of virus to be considered effective. Each triplicate sample was tested three times.

RESULTS

A. *Bidens biternata*

After liquid-liquid extraction, four extracts were obtained, Bba, Bbb, Bbc, and Bbd. This was named after the initials of *Bidens biternata* with each subsequent extract labeled with a, b, c, or d. First, each extract had to be tested for cytotoxicity to obtain a working dilution of the sample to test against the virus. The results of this cytotoxicity testing is shown in Table 1.

Table 1. *Bidens biternata* Cytotoxicity Results. This table shows the highest concentration of extract that killed less than 20% of the cells. Cytotoxicity is measured in percentage of cells killed compared to the control cells with a standard of error.

Extract	Non-Toxic Concentration (µg/mL)	Cytotoxicity
Bb crude	**100**	**12 ± 6**
Bba	**50**	**12 ± 3**
Bbb	**50**	**12 ± 4**
Bbc	**50**	**-9 ± 8[1]**
Bbd	**100**	**-1 ± 5[1]**

[1] A negative value indicates that extract-exposed cells had lower cell death than control cells that were not exposed to the extract.

The concentration chosen was the highest concentration in which the extract caused less than twenty percent cell death. For the crude sample this was 100 µg/mL, Bba

50 µg/mL, Bbb 50 µg/mL, Bbc 100 µg/mL, and Bbd 100 µg/mL. After establishing the working concentrations, each extract was assayed for its potential virus inhibition. The results are shown in Table 2.

Table 2. *Bidens biternata* Virus Inhibition Results. This table shows the virus inhibition of each extract at their working dilution. Virus inhibition is measured by comparing the amount of cell death between cells with virus only and cells with virus and extract.

Extract	Non-Toxic Concentration (µg/mL)	% Virus Inhibition
Bb Crude	**100**	**20.54 ± 12**
Bba	**50**	**22.14 ± 8**
Bbb	**50**	**4.85 ± 6**
Bbc	**100**	**55.41 ± 10**
Bbd	**100**	**-1.50 ± 5**

Although the highest virus inhibition was Bbc, it was nowhere near the previous study's inhibition of 97%. To investigate further this loss in inhibitory activity, a control assay was done using the original sample, 16C, from the previous study as well as the known anti herpes drug acyclovir. The results of this are shown in Table 3

Table 3. *Bidens biternata* Control Testing. This table shows the virus inhibition of a known HSV-1 inhibitor, acyclovir, the original plant samples used in previous studies, 16C, (46), and the current extract being used for testing, Bbc.

Extract	Non-Toxic Concentration (µg/mL)	% Virus Inhibition
Acyclovir (control)	**5**	**99.31**
16C	**100**	**-22.44[1]**
16C	**50**	**4.96**
Bbc	**100**	**22.48**

The results of this assay showed a decrease in activity of the original active fraction and the active fraction of this experiment.

B. *Mangifera persiciformis*

The next plant investigated was *Mangifera persiciformis*. An initial cytotoxicity test was done to obtain a working solution of each extract. The extracts were provided by the Guangxi Botanical Garden. They are named according to the original crude material of *Mangifera persiciformis*, given as 23B. Each successive fraction was given a number along with the original name. The cytotoxicity results of the 12 fractions are shown in Table 4. From this table, the highest concentrations that have less than twenty percent cytotoxicity were taken and tested for their virus inhibition. The results for this virus inhibition test are shown in Table 5.

Table 4. *Mangifera persiciformis* Cytotoxicity Testing. This table shows the highest concentration of extract that killed less than 20% of the cells. Cytotoxicity is measured in percentage of cells killed compared to the control cells with a standard of error.

Extract	Concentration (µg/mL)	Cytotoxicity
23B03	**50**	**-19 ± 0**
23B04	**50**	**-4 ± 3**
23B05	**50**	**-17 ± 7**
23B06	**100**	**7.7 ± 0.4**
23B07	**100**	**-2 ± 4**
23B08	**100**	**-7 ± 7**
23B09	**50**	**-22 ± 0**
23B10	**50**	**-40 ± 0**
23B11	**100**	**-3 ± 9**
23B12	**100**	**-16 ± 12**
23B13	**100**	**-15 ± 12**
23B14	**50**	**-0.4 ± 0**

Table 5. *Mangifera persiciformis* Virus Inhibition Results. This table shows the virus inhibition of each extract at their working dilution. Virus inhibition is measured by comparing the amount of cell death between cells with virus only and cells with virus and extract.

Extract	Concentration (µg/mL)	Virus Inhibition
23B03	**50**	**-20 ± 14**
23B04	**50**	**-0.3 ± 6**
23B05	**50**	**67 ± 27**
23B06	**100**	**68 ± 9**
23B07	**100**	**41 ± 16**
23B08	**100**	**37 ± 17**
23B09	**50**	**75 ± 10**
23B10	**50**	**89 ± 24**
23B11	**100**	**56 ± 7**
23B12	**100**	**55 ± 7**
23B13	**100**	**31 ± 3**
23B14	**50**	**22 ± 14**

The two fractions chosen were 23B09 and 23B10. 23B09 was sub-fractionated using a combiflash using a mixture of ethyl acetate and hexane, yielding four fractions to further be tested. These fractions were 23B09a, 23B09b, 23B09c, and 23B09d. 23B10 yielded only one pure fraction using the same methods. This was called 23B10a. This pure compound was then run through various tests in an attempt to identify the compound. However, there was not enough material to fully identify the compound.

After attaining a pure compound from fraction 23B10, a Hydrogen and Carbon Nuclear Magnetic Resonance was done to potentially identify the compound. This test shows the individual components of the compound which can be used to piece together the structure of the compound. This diagram shows that the compound was indeed pure with clear, precise, and unambiguous peaks. This data is shown in Tables 8 and 9.

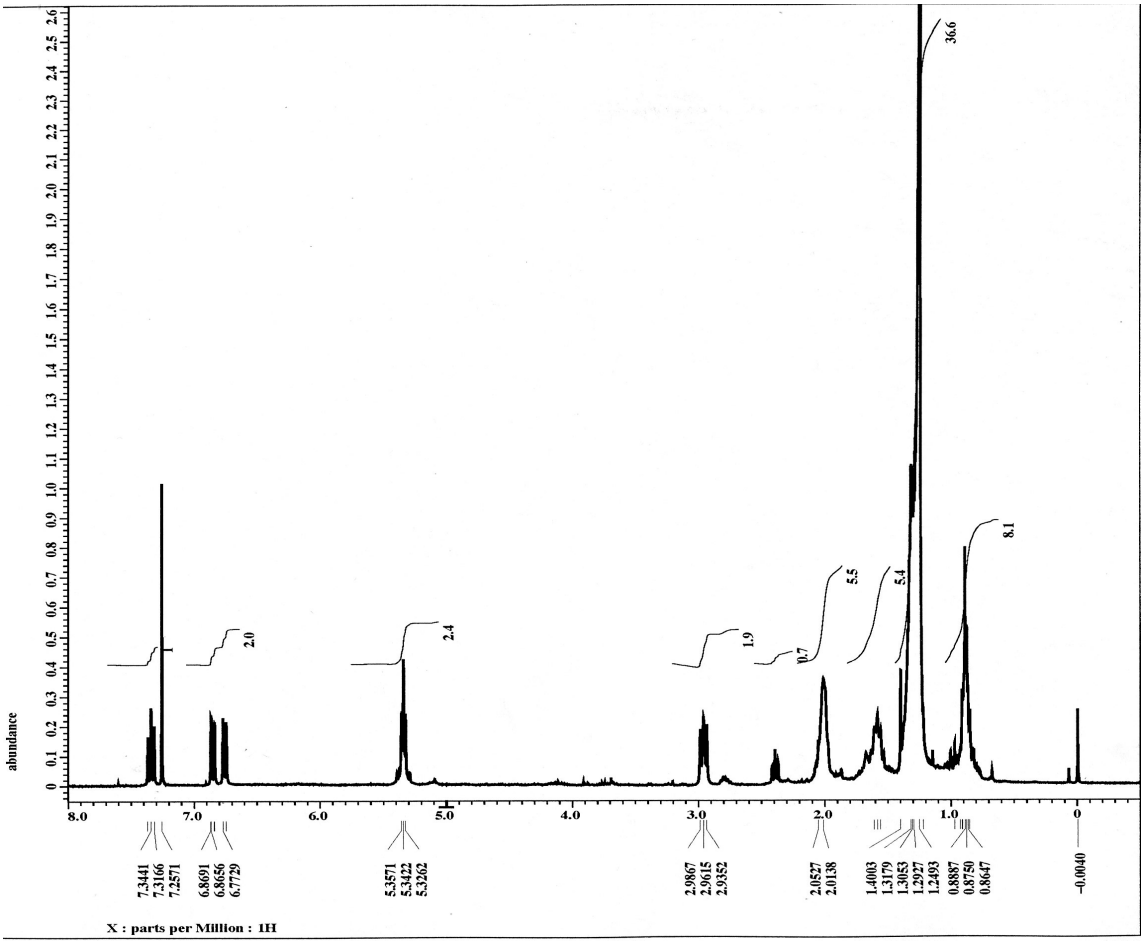

Figure 7. Proton NMR. These results show the amount of hydrogens and functional groups with hydrogens present within the compound.

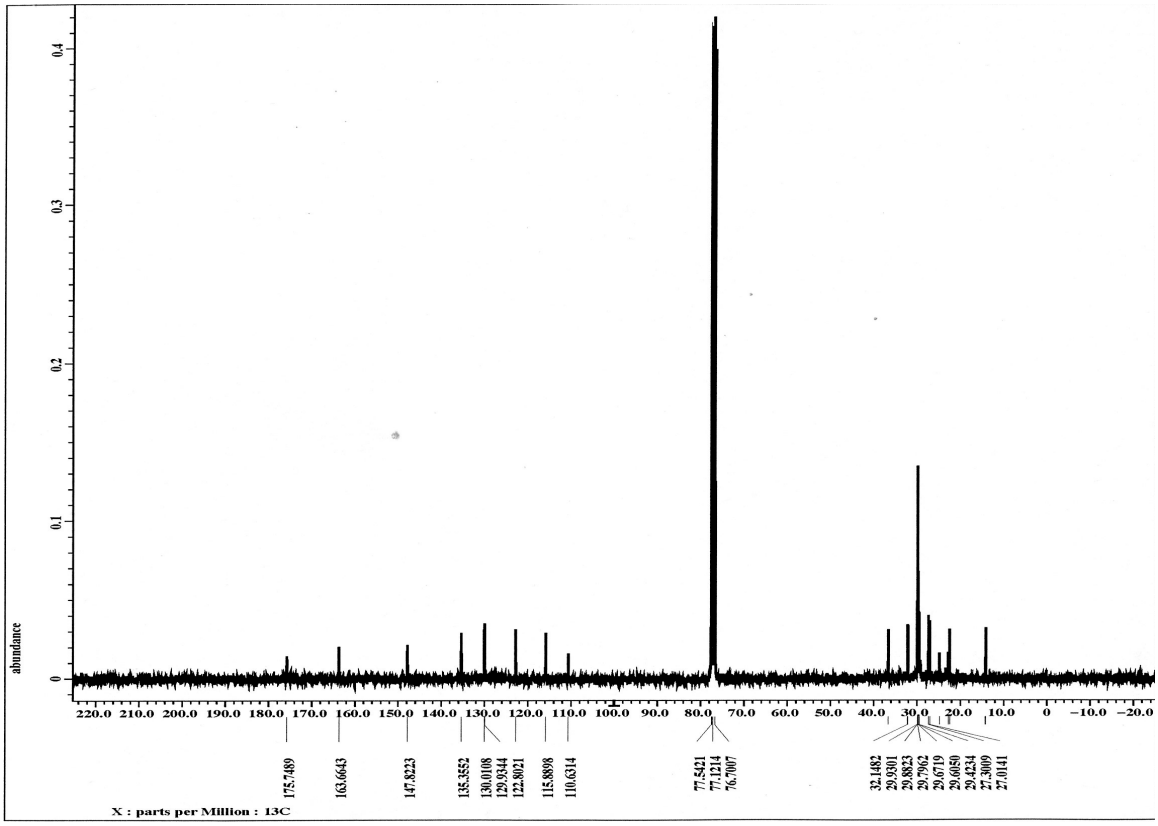

Figure 8. Carbon NMR. These results show the amount of carbons and functional groups with present within the compound.

Using this data, structural features can be identified, without a specific and solidified structure.

DISCUSSION

The first plant evaluated was *Bidens biternata*. This extract had shown up to 99% virus inhibition during previous studies (47). After getting the crude plant material, the plant components were extracted and separated into four different fractions using liquid-liquid extraction. Out of these four extracts, the most active was the fraction dissolved in ethyl acetate with the name Bbc. The next step involved separating the extract into further fractions to then assay further. However, during the three virus inhibition tests, this fraction showed steadily declining activity. In order to understand the nature of this decrease, a control assay was done. The current extract was tested again, along with the original extract sent from the Guangzhi Botanical Gardens used in the previous study and a known inhibitor of HSV 1, acyclovir. The results not only exhibited reduced virus inhibition in the current extract, but a complete lack of inhibition in the original extract. A proposed explanation is that the active compound responsible for the anti herpes activity was unstable and degraded over time. This occurrence is not unprecedented as it has been postulated in other experiments as well. Cuhadar et. al. reported that both long term storage or repeated freeze-thaw cycles could have a dramatic impact on sample integrity (48). Because of the instability of the compound, it was decided to move on to another plant, as no other fractions of *Bidens biternata* showed any activity.

Manigfera persiciformis was provided as a crude extract that had already been through the extraction and liquid-liquid extraction process. All lab preparations of this plant were done by a separate student using the same plant in a different study, and the extracts were shared. From this, a crude gravity column was done on the extract to yield

twelve fractions to test. Results from virus inhibition tests showed several active fractions 23B05, 23B06, 23B09, and 23B10. 23B05 and 23B06 both showed around 65% inhibition, which although acceptable, was not the highest in this study. 23B09 and 23B10, however, showed 75% and 89% inhibition respectively. Because these fractions both had high activity and were right next to each other, it is likely that they both contained the same active compound. These two extracts were then chosen to perform further sub-fractionations to test further. During fractionations, however, it was found the 23B10 was already a relatively pure compound. This compound was then evaluated to potentially elucidate the structure. Although initial tests were done, there was not enough material left to get a definitive structure.

There are, however, several clues to the structure from data gathered. This data, along with compounds isolated from this plant in previous studies can help eliminate previously isolated compounds and further examine potential compounds (48). In this report, multiple compounds were isolated and identified. From the NMR data gathered, it is clear that the compound that was isolated in this study contains an aromatic group. Of the seven compounds isolated from this plant in previous studies, all contained an aromatic group. The data from this study, however, suggests that there is only one of these groups, pointing toward either gallic acid or methyl gallate, both compounds found in this plant. Moreover, the NMR data suggests further functional groups not before seen, potentially leading to a novel compound. Previous gallic acid derivatives have shown anti herpes activity, leading further speculation that this is indeed part of this isolated compound (50). All of this data leads to the supposition that the active anti herpes compound in *Mangifera persiciformis* is likely a gallic acid derivative Because there is

strong data suggesting a novel anti herpes compound not previously reported in this plant, future investigations should be carried out to fully characterize this compound's structure.

REFERENCES

1. Taylor TJ, Brockman MA, McNamee EE, Knipe DM. 2002. Herpes simplex virus. Front Biosci. 7: d752-764.
2. WebMD [Internet]. [GHHC] Genital Herpes Health Center. c2014. [cited 2016 January 16]. Available from: http://www.webmd.com/genital-herpes/pain-management-herpes?page=2
3. Bradley H, Markowitz LE, Gibson T, McQuillan GM. 2014. Seroprevalence of herpes simplex virus types 1 and 2—United States, 1999–2010. J Infect Dis. 209(3): 325-333.
4. Biskup UG, Ursic T, Petrovec M. 2015. Laboratory diagnosis and epidemiology of herpes simplex 1 and 2 genital infections. Acta Dermatovenerol Alp Pannonica Adriat. 24: 31-35.
5. Piret J, Boivin G. 2011. Resistance of herpes simplex viruses to nucleoside analogues: mechanisms, prevalence, and management. Antimicrob Agents Chemothe. 55(2): 459-472.
6. Mettenleiter TC, Klupp BG, and Granzow H. 2006. Herpesvirus assembly: a tale of two membranes. Curr Opin Microbi. 9: 423–429.
7. McGeoch DJ, Rixon FJ, Davison AJ. 2006. Topics in herpesvirus genomics and evolution. Virus Res. 117: 90-104.
8. Cai WH, Gu B, and Person S. 1988. Role of glycoprotein B of herpes simplex virus type 1 in viral entry and cell fusion J Virol. 62: 2596– 2604

9. Kennedy PGE, Rovnak J, Badani H, Cohrs RJ. 2015. A comparison of herpes simplex virus type 1 and varicella-zoster virus latency and reactivation. J Gen Virol. 96 (Pt 7):1581-1602.
10. Akhtar J, Shukla D. 2009. Viral entry mechanisms: cellular and viral mediators of herpes simplex virus entry. FEBS J. 276 (24):7228-7236.
11. Salameh S, Sheth U, Shukla D. 2012. Early events in herpes simplex virus lifecycle with implications for an infection of lifetime. Open Virol J. 6:1-6.
12. Boehmer, PE, Lehman, I. R. 1997. Herpes simplex virus DNA replication. Annu Rev Biochem. 66(1): 347-384.
13. Grinde B. 2013. Herpesviruses: latency and reactivation – viral strategies and host response. J Oral Microbiol. 5:10.
14. Whitley RJ, Kimberlin DW, Roizman B. 1998. Herpes simplex viruses. Clin Infect Dis. 26 (3): 541-555.
15. Halford WP, Gebhardt BM, Carr DJ. 1996. Mechanisms of herpes simplex virus type 1 reactivation. J Virol. 70 (8):5051-5060.
16. Padgett DA, Sheridan JF, Dorne J, Berntson GG, Candelora J, Glaser R. 1998. Social stress and the reactivation of latent herpes simplex virus type 1. Proc Natl Acad Sci USA. 95 (12):7231-7235.
17. Herpes simplex [Internet]. DermNet New Zealand; c1997-2015 [cited 2017 January 22]. Available from: http://www.dermnetnz.org/topics/herpes-simplex/
18. Simmons A. 2002. Clinical manifestations and treatment considerations of herpes simplex virus infection. J Infect Dis. 186: S71-S77.

19. Lafferty WE, Downey L, Celum C, Wald A. 2000. Herpes simplex virus type 1 as a cause of genital herpes: impact on surveillance and prevention. J Infect Dis. 181 (4): 1454-1457.
20. Anzivino A, Fioriti D, Mischitelli M, Bellizzi A, Barucca A, Chiarini F, Pietropaolo V. 2009. Herpes simplex virus infection in pregnancy and in neonate: status of art of epidemiology, diagnosis, therapy and prevention. Virol. 6: 40.
21. Wald A, Corey L. 2007. Persistence in the population: epidemiology, transmission. Cambridge: Cambridge University Press.
22. CDC Fact Sheet https://npin.cdc.gov/publication/incidence-prevalence-and-cost-sexually-transmitted-infections-united-states
23. Kimberlin DW, Whitley RJ. 2007. Antiviral therapy of HSV-1 and -2. In: Arvin A, Campadelli-Fiume G, Mocarski E, et al., editors. Human Herpesviruses: Biology, Therapy, and Immunoprophylaxis. Cambridge: Cambridge University Press.
24. Roizman B, Taddeo B. 2007. The strategy of herpes simplex virus replication and takeover of the host cell. Chapter 13, Human Herpesviruses: Biology, Therapy, and Immunoprophylaxis. Cambridge: Cambridge University Press.
25. Whitley RJ, Roizman B. 2001. Herpes simplex virus infections. Lancet 357(9267): 1513-1518.
26. Fruchter E, Goldberg S, Fenchel D, Grotto I, Ginat K, Weiser M. 2015. The impact of herpes simplex virus type 1 on cognitive impairments in young, healthy individuals — A historical prospective study. Schizophr Res. 168(1-2): 292-296.

27. Lövheim H, Gilthorpe J, Johansson A, Eriksson S, Hallmans G, Elgh F. 2015. Herpes simplex infection and the risk of Alzheimer's disease: A nested case-control study. Alzheimers Dement. 11(6): 587-592.
28. Herget GW, Riede UN, Schmitt-Graff A, Lubbert M, Neumann-Haefeli D, Kohler G. 2005. Generalized herpes simplex virus infection in an immunocompromised patient – Report of a case and review of the literature. Pathol Res Pract. 201(2): 123-129.
29. Smith JS, Robinson NJ. 2002. Age-specific prevalence of infection with herpes simplex virus types 2 and 1: A global review. J Infect Dis. 186(1): S3-S28.
30. Frobert E, Burrel S, Ducastelle-Lepretre S, Billaud G, Ader F, Casalegno JS, Nave V, Boutolleau D, Michallet M, Lina B, Morfin F. 2014. Resistance of herpes simplex viruses to acyclovir: An update from a ten-year survey in France. Antivir Res 111:36-41.
31. Chattopadhyay D, Chawla-Sarkar M, Chatterjee T, Dey RS, Bag P, Chakraborti S, Khan MTH. 2009. Recent advancements for the evaluation of anti-viral activities of natural products. New Biotech. 25(5): 347-368.
32. Zhang Y, But PPH, Ooi VEC, Xu HX, Delaney GD, Lee SHS, Lee SF. 2007. Chemical properties, mode of action, and *in vivo* anti-herpes activities of a lignin–carbohydrate complex from *Prunella vulgaris.* Antiviral Res. 75(3): 242-249.
33. Sukumaran P, Nair AG, Chinmayee DM, Mini I, Sukumaran ST. 2012. Phytochemical investigation of *Bidens biternata* (Lour.) Merr. and Sheriff. —A nutrient-rich leafy vegetable from Western Ghats of India. Appl Biochem Biotechnol. 167(6): 1795-1801.

34. Zahara K, Bibi Y, Tabassum S, Mudrikah, Bashir T, Haider S, Araa A, Ajmal M. 2015. A review on pharmacological properties of *Bidens biternata*: A potential nutraceutical. Asian Pac J Trop Dis 5(8): 595-599.

35. Nakama S, Tamaki K, Ishikawa C, Tadano M, More N. 2012. Efficacy of *Bidens pilosa* extract against herpes simplex virus infection *in vitro* and *in vivo.* Evid Based Complement Alternat Med. 2012.

36. Mangifera persiciformis [Internet]. The IUCN red list of threatened species; c1998 [cited 2017 January 22]. Available from: http://www.iucnredlist.org/details /37516/0

37. REVIEW: Human Herpes Simplex Virus: Life Cycle and Development of Inhibitors [Internet]. BioProt Network c2016 [cited 30 January 2017]. Available from: http://www.protein.bio.msu.ru/biokhimiya/contents/v79/full/79130457.htmL

38. Pathogenesis of Herpes Simplex Ocular Disease [Internet]. Oculist c2016 [cited 30 January 2017]. Available from: http://www.oculist.net/downaton502/prof/ ebook/duanes/pages/v8/v8c089.htmL

39. Herpes Simplex Virus and Cancer [Internet]. Microbe Wiki c2015 [cited 20 February 2017]. Available from: https://microbewiki.kenyon.edu/index.php/ File:Image_10.jpg

40. Herpes on Finger [Internet]. HealthHQ c2014 [cited 20 February 2017]. Available from: http://healthhq.org/herpes-and-cold-sores/herpes-on-finger/

41. How does solid phase extraction differ from solvent extraction? [Internet] Socratic c2014 [cited 20 February 2017]. Available from: https://socratic.org/ questions/how-does-solid-phase-extraction-differ-from-solvent-extraction

42. Mechanism of Separation in Open Column Chromatography. [Internet] Science of Chromotography c2013 [cited 20 February 2017]. Available from: http:// chromatography science.blogspot.com/2012/08/mechanism-of-separation-in-open-column.htmL#.WKsoh7GZNE4

43. Yuan R, Lin Y. 2000. Traditional chinese medicine: an approach to scientific proof and clinical validation. Pharmacol Ther. 86: 191–198.

44. Efferth T, Davey M, Olbrich A, Rucker G, Gebhart E, Davey R. 2002. Activity of drugs from traditional Chinese medicine toward sensitive and MDR1- or MRP1-overexpressing multidrug-resistant human CCRF-CEM leukemia cells. Blood Cells Mol Dis. 28 (2): 160-168.

45. Efferth T, Romero M R, Wolf D G, Stamminger T, Marin J G, Marschall M. 2008. The antiviral activities of artemisinin and artesunate. Clin Infect Dis. 47 (6): 804-811.

46. House M. 2013. Evaluation of extracts used in Traditional Chinese Medicine for antiviral potential against herpes simplex virus type 1 [thesis]. Middle Tennessee State University. 90 p.

47. Huynh T. 2016. Assessment of traditional chinese herbal medicine plant extracts' potential to inhibit activity of herpes simplex virus type 1 [thesis]. Middle Tennessee State University. 79 p.

48. Cuhadar S, Koseoglu M, Atay A, Dirican A. 2012. The effect of storage time and freeze-thaw cycles on the stability of serum samples. Biochemia Medica. 23 (1): 70-7.

49. Zhou R, Yang Z, Wang J, Tian L, Zhang Y. 1995. Chemical constituents from leaves of Mangifera persiciformis. Zhongguo Zhong Yao Za Zhi. 20 (5): 295-6.

50. Kratz J, Andrighetti-Frohner C, Leal P, Nunes R, Yunes R, Trybala E, Bergstrom T, Barardi C, Simoes C. 2008. Evaluation of anti-hsv-2 activity of gallic acid and pentyl gallate. Biol Pharm Bull. 31 (5): 903-7.

APPENDIX

19-Feb						
Group: Med only						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	A1	0	1444.781	1516.297	44.874	2.959
	A2		1505.95			
	A3		1494.674			
	B1		1527.576			
	B2		1562.954			
	B3		1561.849			
Group Summaries						
~End						
Group: Bb stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	A4	0		10763.8114	3424.687	8.500542087
	A5		10275.576			
	A6		10435.593			
	B4		11463.435			
	B5		11298.889			
	B6		10345.564			
Group Summaries						
~End						
Group: Bb 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	C4	0	10465.757	9636.165	1408.221	14.614
	C5		12028.24			
	C6		9412.998			
	D4		9172.165			
	D5		8250.079			
	D6		8487.751			
Group Summaries						
~End						
Group: Bba 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	E4	0	7298.199	9569.102	1344.41	14.049
	E5		10182.065			
	E6		10550.614			
	F4		8830.27			
	F5		9571.841			
	F6		10981.625			
Group Summaries						
~End						
Group: Bba 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	G4	0	11653.365	10789.055	749.585	6.948
	G5		9883.534			
	G6		10040.683			
	H4		10621.257			
	H5		11580.699			
	H6		10954.792			
Group Summaries						
~End						
Group: Bba 1:8						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	A7	0	10257.437	9992.711	390.459	3.907
	A8		9315.947			
	A9		9906.369			
	B7		10467.815			
	B8		10023.75			

	B9		9984.947			
Group Summaries						
~End						
Group: Bbb 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	C7	0	9304.485	10419.84225	2589.781	11.4245055
	C8					
	C9		10376.768			
	D7					
	D8		10393.393			
	D9		11604.723			
Group Summaries						
~End						
Group: Bbb 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	E7	0	8691.262	10244.539	873.696	8.528
	E8		10120.004			
	E9		10797.687			
	F7		11011.26			
	F8		9959.479			
	F9		10887.539			
Group Summaries						
~End						
Group: Bbb 1:8						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	G7	0	10721.318	10697.374	538.863	5.037
	G8		10946.065			
	G9		11364.65			
	H7		10976.119			
	H8		9839.119			
	H9		10336.975			
Group Summaries						
~End						
Group: Bbc stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	A10	0	3854.133	7951.876	2374.234	29.858
	A11		7749.232			
	A12		7454.471			
	B10		9164.654			
	B11		11010.868			
	B12		8477.9			
Group Summaries						
~End						
Group: Bbc 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	C10	0	5120.132	9235.472	2717.014	29.419
	C11		9691.635			
	C12		9479.566			
	D10		13337.531			
	D11		10041.829			
	D12		7742.137			
Group Summaries						
~End						
Group: Bbd stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	E10	0		9289.9435	2810.684	21.02938609
	E11					
	E12		9336.629			
	F10		10456.545			
	F11		10079.689			
	F12		7286.911			
Group Summaries						
~End						
Group: Cells + Med						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	C1	0	12871.12	11763.798	574.107	4.88

	C2		11542.83			
	C3		11615.487			
	D1		11625.025			
	D2		11740.015			
	D3		11188.312			
Group Summaries						
~End						
Group: Cells + Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	CV%
1	E1	0	5956.384	6213.003	264.38	4.255
	E2		6002.178			
	E3		6219.885			
	F1		6565.917			
	F2		6500.058			
	F3		6033.595			

26-Feb						
Group: Bb stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	A4	0		17501.96	5234.061	-0.35658147
	A5		15763.22			
	A6		17713.843			
	B4		19136.19			
	B5		19078.966			
	B6		15817.581			
Group Summaries						
~End						
Group: Bb 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	C4	0	19071.347	17900.856	1764.867	-2.644
	C5		16962.364			
	C6		19808.626			
	D4		14855.938			
	D5		18320.241			
	D6		18386.62			
Group Summaries						
~End						
Group: Bba 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	E4	0	19005.79	15484.025	3549.708	11.214
	E5		9990.709			
	E6		12318.35			
	F4		17041.503			
	F5		18159.405			
	F6		16388.39			
Group Summaries						
~End						
Group: Bba 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	G4	0	15700.317	16274.079	894.528	6.684
	G5		17225.128			
	G6		16980.89			
	H4		14814.854			
	H5		16277.351			
	H6		16645.933			
Group Summaries						
~End						
Group: Bba 1:8						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	A7	0	17225.39	18789.101	1112.013	-7.737
	A8		19544.065			
	A9		19804.765			
	B7		19865.03			
	B8		17868.7			
	B9		18426.653			
Group Summaries						
~End						
Group: Bbb 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	C7	0	12881.637	15787.504	1683.26	9.474
	C8		16015.923			
	C9		17190.046			
	D7		14850.425			
	D8		16458.23			
	D9		17328.759			
Group Summaries						
~End						
Group: Bbb 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	E7	0	13351.415	15659.393	1535.966	10.209

	E8		16797.935			
	E9		15744.235			
	F7		16583.856			
	F8		14273.465			
	F9		17205.452			
Group Summaries						
~End						
Group: Bbb 1:8						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	G7	0	16813.884	16546.005	813.405	5.125
	G8		17147.812			
	G9		17608.026			
	H7		16319.987			
	H8		16039.968			
	H9		15346.353			
Group Summaries						
~End						
Group: Bbc stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	A10	0	9264.655	15337.841	3302.741	12.053
	A11		14757.645			
	A12		15034.048			
	B10		17120.708			
	B11		18500.593			
	B12		17349.396			
Group Summaries						
~End						
Group: Bbc 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	C10	0	16284.958	17448.43	776.067	-0.05
	C11		18243.105			
	C12		17694.511			
	D10		18179.048			
	D11		17495.97			
	D12		16792.989			
Group Summaries						
~End						
Group: Bbd stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	E10	0	18058.647	17946.258	997.42	-2.904
	E11		18493.315			
	E12		18157.909			
	F10		19107.628			
	F11		16154.366			
	F12		17705.679			
Group Summaries						
~End						
Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.		
1	C1	17104.833	17439.773	440.579		
	C2	17586.11				
	C3	17319.944				
	D1	16854.239				
	D2	18086.946				
	D3	17686.565				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	% cell death
1	E1	6784.162	6964.004	318.057	4.567	60.068
	E2	7000.559				
	E3	6476.69				
	F1	6913.658				
	F2	7316.101				
	F3	7292.852				
Group Summaries						

~End						
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4-Mar						
Group: Cells and Media						
Sample	Well	Values	MeanValue			
1	C1	15315.545	14453.616			
	C2	13145.04				
	C3	14511.344				
	D1	14147.336				
	D2	14379.297				
	D3	15223.135				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Virus Cell Death		
1	E1	8437.95	8532.379	40.967		
	E2	7640.32				
	E3	7442.209				
	F1	8002.298				
	F2	9625.483				
	F3	10046.013				
Group Summaries						
~End						
Group: Bb stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A4	0	11727.679	11943.962	17.364	
	A5		11513.259			
	A6		12590.948			
Group Summaries						
~End						
Group: Bba 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B4	0	7849.516	11598.025	19.757	
	B5		14641.856			
	B6		12302.703			
Group Summaries						
~End						
Group: Bbb 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C4	0	1969.675	9864.547	31.75	
	C5		13134.322			
	C6		14489.644			
Group Summaries						
~End						
Group: Bbc stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D4	0	6510.4	11281.885	21.944	
	D5		13662.94			
	D6		13672.317			
Group Summaries						
~End						
Group: Bbd stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E4	0	11194.095	12894.691	10.786	
	E5		13340.125			
	E6		14149.853			
Group Summaries						
~End						
Group: Bb stock + Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A7	0	6229.064	7126.052	50.697	-23.751
	A8		7455.333			
	A9		7693.76			
Group Summaries						
~End						
Group: Bba 1:2 + virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B7	0	6586.015	6962.127	51.831	-26.519

	B8		5908.852			
	B9		8391.514			
Group Summaries						
~End						
Group: Bbb 1:2 + virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C7	0	3134.347	5151.631	64.357	-57.095
	C8		7304.962			
	C9		5015.585			
Group Summaries						
~End						
Group: Bbc stock + virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D7	0	5339.22	7788.714	46.112	-12.559
	D8		8380.695			
	D9		9646.229			
Group Summaries						
~End						
Group: Bbd stock + virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E7	0	6385.719	6866.604	52.492	-28.132
	E8		7737.407			
	E9		6476.686			
Group Summaries						
~End						

18-Mar						
Group: Cells and Media						
Sample	Well	Values	Mean Value			
1	C1	19565.558	19450.716			
	C2	17331.451				
	C3	18617.896				
	D1	19576.607				
	D2	20872.285				
	D3	20740.496				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	Mean Value	Virus Cell Death		
1	E1	17495.836	16236.677	16.524		
	E2	18003.781				
	E3	18343.756				
	F1	16059.519				
	F2	13980.51				
	F3	13536.663				
Group Summaries						
~End						
Group: Bb stock						
Sample	Well	Concentration	Values	Mean Value	Cytotoxicity	
1	A4	0	18049.32	16954.301	12.835	
	A5		16621.209			
	A6		16192.373			
Group Summaries						
~End						
Group: Bba 1:2						
Sample	Well	Concentration	Values	Mean Value	Cytotoxicity	
1	B4	0	20344.031	19893.181	-2.275	
	B5		20303.791			
	B6		19031.722			
Group Summaries						
~End						
Group: Bbb 1:2						
Sample	Well	Concentration	Values	Mean Value	Cytotoxicity	
1	C4	0	17562.674	17662.099	9.196	
	C5		17662.656			
	C6		17760.968			
Group Summaries						
~End						
Group: Bbc stock						
Sample	Well	Concentration	Values	Mean Value	Cytotoxicity	
1	D4	0	19276.822	18598.992	4.379	
	D5		18754.605			
	D6		17765.549			
Group Summaries						
~End						
Group: Bbd stock						
Sample	Well	Concentration	Values	Mean Value	Cytotoxicity	
1	E4	0	17769.203	18201.604	6.422	
	E5		18154.193			
	E6		18681.416			
Group Summaries						
~End						
Group: Bb stock + Virus						
Sample	Well	Concentration	Values	Mean Value	Cell Death	% Virus Inhibition
1	A7	0	8458.219	9334.922	52.007	-214.738
	A8		10780.75			
	A9		8765.796			
Group Summaries						
~End						
Group: Bba 1:2 + virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B7	0	12044.001	11145.435	42.699	-158.406

	B8		11200.947			
	B9		10191.356			
Group Summaries						
~End						
Group: Bbb 1:2 + virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C7	0	15425.668	13466.068	30.768	-86.203
	C8		12507.157			
	C9		12465.379			
Group Summaries						
~End						
Group: Bbc stock + virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D7	0	18833.644	18017.473	7.369	55.407
	D8		18789.099			
	D9		16429.677			
Group Summaries						
~End						
Group: Bbd stock + virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E7	0	18655.904	16710.134	14.09	14.731
	E8		15986.164			
	E9		15488.334			
Group Summaries						
~End						

25-Mar							
Group: Cells and Media							
Sample	Well	Values	MeanValue	Std.Dev.	CV%		
1	C1	24742.65	23374.61	1245.734	5.329		
	C2	22073.105					
	C3	23980.709					
	D1	21617.865					
	D2	23640.414					
	D3	24192.933					
Group Summaries							
~End							
Group: Cells and Virus							
Sample	Well	Values	MeanValue	Std.Dev.	CV%	Virus Cell Death	
1	E1	10249.577	10270.179	245.969	2.395	56.063	
	E2	10306.532					
	E3	9985.873					
	F1	10541.513					
	F2	10539.253					
	F3	9998.326					
Group Summaries							
~End							
Group: Bb stock							
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death	% Virus Inhibition
1	A4	0	13433.574	12962.097	406.843	44.546	20.542
	A5		12954.471				
	A6		12243.665				
	B4		13191.847				
	B5		12840.31				
	B6		13108.712				
Group Summaries							
~End							
Group: Bba 1:2							
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death	% Virus Inhibition
1	C4	0	13600.388	13171.894	422.585	43.649	22.143
	C5		12656.772				
	C6		13542.551				
	D4		13071.453				
	D5		12706.198				
	D6		13454.001				
Group Summaries							
~End							
Group: Bbb 1:2							
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death	% Virus Inhibition
1	E4	0	10254.198	10905.666	581.009	53.344	4.849
	E5		10952.241				
	E6		10193.482				
	F4		11026.547				
	F5		11613.342				
	F6		11394.186				
Group Summaries							
~End							
Group: Bbc stock							
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death	% Virus Inhibition
1	G4	0	10893.65	14595.869	7473.25	37.557	33.009
	G5		29811.824				
	G6		11945.498				
	H4		12345.951				
	H5		11115.67				
	H6		11462.621				

~End							
Group: Bbd stock							
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death	% Virus Inhibition
1	A7	0	9437.378	10074.052	508.135	56.902	-1.497
	A8		10660.317				
	A9		10284.195				
	B7		9864.082				
	B8		9623.548				
	B9		10574.794				

19-May						
Group: Cells and Media						
Sample	Well	Values	MeanValue			
1	C1	20659.222	21536.914			
	C2	21830.707				
	C3	21836.849				
	D1	21994.521				
	D2	21502.181				
	D3	21398.006				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Virus Cell Death		
1	E1	14007.992	15067.196	30.04		
	E2	15313.569				
	E3	15965.27				
	F1	14926.824				
	F2	15186.447				
	F3	15003.072				
Group Summaries						
~End						
Group: DMSO Cyto						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A4	0	20399.131	18242.287	15.298	
	A5		21394.709			
	A6		12933.021			
Group Summaries						
~End						
Group: DMSO Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B4	0	13658.478	14014.928	34.926	-16.265
	B5		14274.412			
	B6		14111.894			
Group Summaries						
~End						
Group: Acyclovir, Cyto, 5 µg						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C4	0	21830.283	21834.549	-1.382	
	C5		21831.685			
	C6		21841.679			
Group Summaries						
~End						
Group: Acyclovir, Cyto, 10 µg						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D4	0	21335.992	21745.347	-0.968	
	D5		21768.062			
	D6		22131.988			
Group Summaries						
~End						
Group: Acyclovir, Cyto, 15 µg						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E4	0	21269.654	20880.969	3.046	
	E5		19877.215			
	E6		21496.039			
Group Summaries						
~End						
Group: Acyclovir, Virus, 5 µg						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F4	0	21811.908	21492.426	0.207	99.312
	F5		21461.279			
	F6		21204.092			
Group Summaries						
~End						
Group: Acyclovir, Virus 10 µg						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G4	0	20845.939	21111.61	1.975	93.426

	G5		21252.879			
	G6		21236.013			
Group Summaries						
~End						
Group: Acyclovir, Virus, 15 µg						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A7	0	20314.404	20957.324	2.691	91.041
	A8		21257.42			
	A9		21300.148			
Group Summaries						
~End						
Group: 16C, Cyto, stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B7	0	13960.285	13331.809	38.098	
	B8		13129.977			
	B9		12905.166			
Group Summaries						
~End						
Group: 16C, Cyto, 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C7	0	16803.4	16558.153	23.117	
	C8		16607.418			
	C9		16263.642			
Group Summaries						
~End						
Group: Bbc, cyto, stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D7	0	20280.613	19654.517	8.74	
	D8		20082.244			
	D9		18600.695			
Group Summaries						
~End						
Group: 16C, Virus, stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E7	0	14526.606	13615.535	36.78	-22.438
	E8		12464.93			
	E9		13855.068			
Group Summaries						
~End						
Group: 16C, Virus, 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F7	0	15848.697	15388.227	28.55	4.962
	F8		15691.331			
	F9		14624.654			
Group Summaries						
~End						
Group: Bbc, Virus, stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G7	0	12716.988	13612.923	36.793	-22.478
	G8		15607.527			
	G9		12514.254			
Group Summaries						
~End						
Original Filename: Darcy, May 19, Control Testing; Date Last Saved: 5/19/2016 4:40:06 PM						

Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	C1	17549.197	16590.955	843.921	5.087	
	C2	15298.974				
	C3	15900.371				
	D1	17045.72				
	D2	16623.093				
	D3	17128.375				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	% cell death
1	E1	18068.412	18800.857	651.427	3.465	-13.32
	E2	18716.314				
	E3	19175.138				
	F1	19424.775				
	F2	17991.787				
	F3	19428.716				
Group Summaries						
~End						
Group: 23B-03W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A4	0	15983.136	17426.181	-5.034	
	A5		18049.248			
	A6		18246.16			
Group Summaries						
~End						
Group: 23B-03W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B4	0	19450.982	19751.984	-19.053	
	B5		18877.81			
	B6		20927.16			
Group Summaries						
~End						
Group: 23B-04W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C4	0	13041.338	13058.033	21.294	
	C5		13264.398			
	C6		12868.363			
Group Summaries						
~End						
Group: 23B-04W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D4	0	16017.625	16435.909	0.935	
	D5		17268.072			
	D6		16022.031			
Group Summaries						
~End						
Group: 23B-05W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E4	0	5854.423	5762.554	65.267	
	E5		5710.118			
	E6		5723.122			
Group Summaries						
~End						
Group: 23B-05W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	F4	0	16475.121	19508.515	-17.585	
	F5		20453.972			
	F6		21596.453			
Group Summaries						
~End						
Group: 23B-06W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	G4	0	15794.382	15380.377	7.297	
	G5		14836.965			

	G6		15509.783			
Group Summaries						
~End						
Group: 23B-06W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	H4	0	14743.29	17547.814	-5.767	
	H5		19378.759			
	H6		18521.394			
Group Summaries						
~End						
Group: 23B-07W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A7	0	16225.759	16207.458	2.311	
	A8		15486.278			
	A9		16910.336			
Group Summaries						
~End						
Group: 23B-07W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B7	0	16585.722	16571.812	0.115	
	B8		16298.675			
	B9		16831.039			
Group Summaries						
~End						
Group: 23B-08W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C7	0	19871.375	19566.267	-17.933	
	C8		19553.742			
	C9		19273.683			
Group Summaries						
~End						
Group: 23B-08W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D7	0	18097.084	18064.91	-8.884	
	D8		18732.347			
	D9		17365.3			
Group Summaries						
~End						
Group: 23B-09W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E7	0	18270.14	18578.934	-11.982	
	E8		17280.353			
	E9		20186.31			
Group Summaries						
~End						
Group: 23B-09W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	F7	0	20791.3	20315.655	-22.45	
	F8		18081.978			
	F9		22073.687			
Group Summaries						
~End						
Group: 23B-10W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	G7	0	14067.683	18315.295	-10.393	
	G8		20038.004			
	G9		20840.197			
Group Summaries						
~End						
Group: 23B-10W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	H7	0	23200.185	23158.985	-39.588	
	H8		23551.521			
	H9		22725.25			
Group Summaries						
~End						

Group: 23B11W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A10	0	15808.695	15554.496	6.247	
	A11		15367.334			
	A12		15487.458			
Group Summaries						
~End						
Group: 23B-11W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B10	0	9388.302	11320.299	31.768	
	B11		10405.996			
	B12		14166.6			
Group Summaries						
~End						
Group: 23B-12W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C10	0	18250.295	18521.407	-11.636	
	C11		18940.222			
	C12		18373.703			
Group Summaries						
~End						
Group: 23B-12W1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D10	0	20465.341	21611.428	-30.26	
	D11		22759.982			
	D12		21608.961			
Group Summaries						
~End						
Group: 23B-13W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E10	0	19390.203	19270.231	-16.149	
	E11		19429.129			
	E12		18991.361			
Group Summaries						
~End						
Group: 23B-13W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	F10	0	18460.074	18078.965	-8.969	
	F11		17497.244			
	F12		18279.576			
Group Summaries						
~End						
Group: 23B-14W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	G10	0	17261.603	17168.444	-3.481	
	G11		16229.894			
	G12		18013.834			
Group Summaries						
~End						
Group: 23B-14W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	H10	0	15144.045	16654.03	-0.38	
	H11		16128.816			
	H12		18689.23			
Group Summaries						
~End						
Original Filename: Darcy June 23 New Plant Cyto; Date Last Saved: 6/23/2016 4:54:58 PM						

~End						
Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	C1	7009.681	7781.287	822.954	10.576	
	C2	7016.234				
	C3	7720.783				
	D1	7458.887				
	D2	8383.568				
	D3	9098.573				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	% cell death
1	E1	8652.211	8570.391	719.81	8.399	-10.141
	E2	7981.736				
	E3	9382.43				
	F1	9389.163				
	F2	7636.939				
	F3	8379.872				
Group Summaries						
~End						
Group: 23B-03W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A4	0	7398.116	8912.007	-14.531	
	A5		9979.851			
	A6		9358.055			
Group Summaries						
~End						
Group: 23B-04W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B4	0	6608.335	8154.971	-4.802	
	B5		9370.144			
	B6		8486.434			
Group Summaries						
~End						
Group: 23B-05W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C4	0	10184.729	10056.67133	-29.24174797	
	C5		9774.329			
	C6		10210.956			
Group Summaries						
~End						
Group: 23B-06W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D4	0	7506.265	7214.886	7.279	
	D5		5450.906			
	D6		8687.487			
Group Summaries						
~End						
Group: 23B-07W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E4	0	9141.626	8609.355	-10.642	
	E5		8156.278			
	E6		8530.163			
Group Summaries						
~End						
Group: 23B-08W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	G4	0	6639.464	8283.375	-6.453	
	G5		7743.367			
	G6		10467.295			
Group Summaries						
~End						
Group: 23B-09W Stock						

Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	H4	0	4164.73	5656.26	27.309	
	H5		5686.014			
	H6		7118.037			
Group Summaries						
~End						
Group: 23B-10W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A7	0	4988.609	4862.639	37.509	
	A8		4505.869			
	A9		5093.44			
Group Summaries						
~End						
Group: 23B-11W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B7	0	8968.68	9431.737	-21.21	
	B8		10199.378			
	B9		9127.153			
Group Summaries						
~End						
Group: 23B-12W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C7	0	10642.997	10791.568	-38.686	
	C8		10784.328			
	C9		10947.381			
Group Summaries						
~End						
Group: 23B-13W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D7	0	10939.412	10560.217	-35.713	
	D8		9400.356			
	D9		11340.885			
Group Summaries						
~End						
Group: 23B-14W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E7	0	8825.03	8805.265	-13.159	
	E8		8248.777			
	E9		9341.989			
Group Summaries						
~End						
Original Filename: Darcy July 2 New Plant Cyto #2; Date Last Saved: 7/2/2016 9:32:46 PM						

Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	C1	12900.345	16195.994	2739.484	16.915	
	C2	15911.467				
	C3	19317.572				
	D1	13108.145				
	D2	18681.226				
	D3	17257.21				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	% cell death
1	E1	9194.554	10587.238	1225.098	11.571	34.631
	E2	12270.259				
	E3	11078.546				
	F1	9680.493				
	F2	9738.525				
	F3	11561.053				
Group Summaries						
~End						
Group: 23B-03W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A4	0	11922.762	11874.312	26.684	
	A5		13198.133			
	A6		10502.04			
Group Summaries						
~End						
Group: 23B-04W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B4	0	17065.026	17757.866	-9.644	
	B5		17208.71			
	B6		18999.861			
Group Summaries						
~End						
Group: 23B-05W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C4	0	16272.974	16898.589	-4.338	
	C5		21049.958			
	C6		13372.836			
Group Summaries						
~End						
Group: 23B-06W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D4	0	12777.877	14804.334	8.593	
	D5		14535.08			
	D6		17100.048			
Group Summaries						
~End						
Group: 23B-07W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E4	0	17508.98	15990.166	1.271	
	E5		15863.264			
	E6		14598.255			
Group Summaries						
~End						
Group: 23B-08W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	F4	0	15065.894	15451.674	4.596	
	F5		15645.315			
	F6		15643.815			
Group Summaries						
~End						
Group: 23B-09W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	G4	0	18339.648	15484.317	4.394	
	G5		14601.115			

	G6		13512.19			
Group Summaries						
~End						
Group: 23B-10W 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	H4	0	15290.244	15214.756	6.059	
	H5		16209.16			
	H6		14144.863			
Group Summaries						
~End						
Group: 23B-11W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	A7	0	15685.452	15439.394	4.672	
	A8		15233.089			
	A9		15399.641			
Group Summaries						
~End						
Group: 23B-12W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	B7	0	14372.491	16441.556	1.516	
	B8		20043.916			
	B9		14908.261			
Group Summaries						
~End						
Group: 23B-13W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	C7	0	16399.347	15177.054	6.291	
	C8		13701.146			
	C9		15430.669			
Group Summaries						
~End						
Group: 23B-14W Stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	D7	0	13138.793	13017.291	19.626	
	D8		13148.022			
	D9		12765.058			
Group Summaries						
~End						
Original Filename: Darcy July 16 New Plant Cyto #3; Date Last Saved: 7/16/2016 5:27:36 PM						

Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	C1	18017.955	16753.615	1249.552	7.458	
	C2	14885.384				
	C3	16267.916				
	D1	18183.789				
	D2	17018.496				
	D3	16148.148				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	Virus Cell Death
1	E1	8513.288	8567.761	1079.153	12.596	48.86
	E2	7717.167				
	E3	7705.857				
	F1	7790.482				
	F2	9333.554				
	F3	10346.216				
Group Summaries						
~End						
Group: 03 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A4	0	7009.507	6793.824	59.449	-21.671
	A5		7159.236			
	A6		6212.729			
Group Summaries						
~End						
Group: 04 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B4	0	8357.276	9021.323	46.153	5.541
	B5		9054.812			
	B6		9651.881			
Group Summaries						
~End						
Group: 05 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C4	0	12165.94	11885.2	29.059	40.526
	C5		11469.196			
	C6		12020.463			
Group Summaries						
~End						
Group: 06 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D4	0	12374.398	13619.7	18.706	61.715
	D5		13023.603			
	D6		15461.097			
Group Summaries						
~End						
Group: 07 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E4	0	11786.006	13296.465	20.635	57.767
	E5		14396.968			
	E6		13706.419			
Group Summaries						
~End						
Group: 08 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F4	0	10251.049	11899.425	28.974	40.7
	F5		10058.562			
	F6		15388.663			
Group Summaries						
~End						
Group: 09 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G4	0	13993.146	13662.081	18.453	62.233
	G5		12732.543			

	G6		14260.552			
Group Summaries						
~End						
Group: 10 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H4	0	15321.332	15055.44	10.136	79.255
	H5		14566.421			
	H6		15278.565			
Group Summaries						
~End						
Group: 11 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A7	0	12055.736	12114.673	27.689	43.33
	A8		11684.679			
	A9		12603.602			
Group Summaries						
~End						
Group: 12 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B7	0	11617.401	12097.561	27.791	43.121
	B8		11912.702			
	B9		12762.58			
Group Summaries						
~End						
Group: 13 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C7	0	9693.604	10703.393	36.113	26.089
	C8		11660.084			
	C9		10756.491			
Group Summaries						
~End						
Group: 14 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D7	0	9064.263	8512.233	49.192	-0.678
	D8		7491.652			
	D9		8980.783			
Group Summaries						
~End						
Group: 03 1:2 Cyto						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E7	0	16102.086	16199.538	3.307	93.231
	E8		14670.774			
	E9		17825.754			
Group Summaries						
~End						
Group: 14 1:2 Cyto						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F7	0	16758.017	17250.985	-2.969	106.076
	F8		16717.654			
	F9		18277.283			
Group Summaries						
~End						
Group: 03 Stock Cyto						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G7	0	14397.557	13481.602	19.53	60.028
	G8		12604.847			
	G9		13442.402			
Group Summaries						
~End						
Group: 14 Stock Cyto						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H7	0	18040.949	17223.461	-2.804	105.74
	H8		16577.787			
	H9		17051.646			
Group Summaries						
~End						

Group: 03 Stock + Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A10	0	5561.83	4835.597	71.137	-45.593
	A11		4279.99			
	A12		4664.97			
Group Summaries						
~End						
Group: 14 Stock + Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B10	0	12811.577	13015.54	22.312	54.335
	B11		13532.335			
	B12		12702.706			
Group Summaries						
~End						
Original Filename: 27 May 2016 Virus 1; Date Last Saved: 7/27/2016 9:07:55 PM						

Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	C1	21853.266	21420.036	500.373	2.336	
	C2	21669.281				
	C3	21085.314				
	D1	22042.221				
	D2	20807.568				
	D3	21062.566				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	Virus Cell Death
1	E1	19366.461	19475.353	861.553	4.424	9.079
	E2	18420.559				
	E3	19057.439				
	F1	19984.316				
	F2	19123.43				
	F3	20899.914				
Group Summaries						
~End						
Group: 03 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A4	0	17015.727	16979.326	20.732	-128.351
	A5		17723.203			
	A6		16199.049			
Group Summaries						
~End						
Group: 04 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B4	0	11584.631	16084.492	24.909	-174.366
	B5		20507.291			
	B6		16161.553			
Group Summaries						
~End						
Group: 05 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C4	0	21965.189	21487.816	-0.316	103.485
	C5		21032.785			
	C6		21465.475			
Group Summaries						
~End						
Group: 06 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D4	0	16770.275	17154.892	19.912	-119.323
	D5		17719.881			
	D6		16974.521			
Group Summaries						
~End						
Group: 07 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E4	0	17420.428	17554.608	18.046	-98.769
	E5		17886.025			
	E6		17357.373			
Group Summaries						
~End						
Group: 08 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F4	0	18825.48	18829.449	12.094	-33.214
	F5		19273.154			
	F6		18389.713			
Group Summaries						
~End						
Group: 09 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G4	0	20030.34	20131.416	6.016	33.736
	G5		21411.541			

	G6		18952.367			
Group Summaries						
~End						
Group: 10 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H4	0	22496.801	21737.15	-1.48	116.307
	H5		21802.81			
	H6		20911.838			
Group Summaries						
~End						
Group: 11 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A7	0	19320.627	17795.14	16.923	-86.4
	A8		16830.551			
	A9		17234.242			
Group Summaries						
~End						
Group: 12 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B7	0	17180.699	17646.402	17.617	-94.049
	B8		18794.949			
	B9		16963.559			
Group Summaries						
~End						
Group: 13 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C7	0	19164.594	19519.133	8.874	2.251
	C8		19304.391			
	C9		20088.414			
Group Summaries						
~End						
Group: 14 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D7	0	18432.525	18682.28	12.781	-40.782
	D8		18644.727			
	D9		18969.588			
Group Summaries						
~End						
Original Filename: 26 Aug 2016 Virus #2; Date Last Saved: 8/26/2016 9:44:27 AM						

Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	C1	20889.785	21148.045	968.117	4.578	
	C2	20376.182				
	C3	20538.711				
	D1	20679.057				
	D2	22980.014				
	D3	21424.52				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	Virus Cell Death
1	E1	6727.222	8221.082	1101.845	13.403	61.126
	E2	8345.668				
	E3	8489.991				
	F1	7555.991				
	F2	8168.374				
	F3	10039.25				
Group Summaries						
~End						
Group: 03 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A4	0	2443.467	2604.623	87.684	-43.448
	A5		2765.779			
Group Summaries						
~End						
Group: 04 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B4	0	2275.728	6639.983	68.602	-12.231
	B5		11004.238			
Group Summaries						
~End						
Group: 05 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C4	0	13283.457	13288.093	37.166	39.197
	C5		13522.804			
	C6		13058.018			
Group Summaries						
~End						
Group: 06 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D4	0	13682.192	15592.56	26.269	57.024
	D5		17221.061			
	D6		15874.428			
Group Summaries						
~End						
Group: 07 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E4	0	11500.809	9388.579	55.605	9.031
	E5		7768.72			
	E6		8896.209			
Group Summaries						
~End						
Group: 08 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F4	0	8723.123	9019.514	57.351	6.176
	F5		8463.594			
	F6		9871.827			
Group Summaries						
~End						
Group: 09 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G4	0	18986.207	17229.472	18.529	69.687
	G5		18283.567			
	G6		14418.644			
Group Summaries						

~End						
Group: 10 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H4	0	14458.15	15058.714	28.794	52.894
	H5		17750.27			
	H6		12967.724			
Group Summaries						
~End						
Group: 11 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A7	0	16817.907	15684.493	25.835	57.735
	A8		17472.2			
	A9		12763.373			
Group Summaries						
~End						
Group: 12 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B7	0	17262.114	17091.746	19.18	68.621
	B8		17178.285			
	B9		16834.84			
Group Summaries						
~End						
Group: 13 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C7	0	13657.476	12764.694	39.641	35.148
	C8		11819.766			
	C9		12816.842			
Group Summaries						
~End						
Group: 14 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D7	0	10780.696	11022.031	47.882	21.667
	D8		11886.353			
	D9		10399.045			
Group Summaries						
~End						
Original Filename: 2 Sep 2016 Virus #3; Date Last Saved: 9/2/2016 2:41:44 PM						

Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	C1	20215.579	18803.237	1038.647	5.524	
	C2	18768.684				
	C3	18202.796				
	D1	19644.016				
	D2	17279.532				
	D3	18708.815				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	Virus Cell Death
1	E1	12301.159	12364.866	880.517	7.121	34.241
	E2	12495.496				
	E3	10649.931				
	F1	12836.272				
	F2	12951.456				
	F3	12954.879				
Group Summaries						
~End						
Group: 03 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A4	0	12538.672	12749.679	32.194	5.977
	A5		12960.686			
2	A6	0	13941.752	13941.752		
Group Summaries						
~End						
Group: 04 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition

1	B4	0	12314.791	12736.132	32.26627947	5.767122833
	B5					
2	B6	0	13157.473			
Group Summaries						
~End						
Group: 05 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C4	0	19995.981	20100.359	-6.898	120.147
	C5		20465.073			
	C6		19840.022			
Group Summaries						
~End						
Group: 06 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D4	0	18289.512	17838.588	5.13	85.017
	D5		17687.048			
	D6		17539.204			
Group Summaries						
~End						
Group: 07 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E4	0	15358.127	15992.011	14.951	56.336
	E5		16264.516			
	E6		16353.389			
Group Summaries						
~End						
Group: 08 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F4	0	16946.227	16597.567	11.73	65.742
	F5		16065.177			
	F6		16781.296			
Group Summaries						
~End						
Group: 09 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G4	0	18580.561	18460.623	1.822	94.679
	G5		19646.858			
	G6		17154.448			
Group Summaries						
~End						
Group: 10 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H4	0	20892.151	20998.956	-11.677	134.104
	H5		21255.637			
	H6		20849.079			
Group Summaries						
~End						
Group: 11 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A7	0	19149.264	16762.544	10.853	68.304
	A8		17430.684			
	A9		13707.682			
Group Summaries						
~End						
Group: 12 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B7	0	16089.446	15867.165	15.615	54.397
	B8		16153.161			
	B9		15358.887			
Group Summaries						
~End						
Group: 13 Stock						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C7	0	14613.011	14442.977	23.189	32.277
	C8		14042.913			
	C9		14673.005			

Group Summaries						
~End						
Group: 14 1:2						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D7	0	15306.288	15306.288	18.598	45.686
Group Summaries						
~End						
Original Filename: 9 Sep 2016 Virus #3; Date Last Saved: 9/9/2016 1:35:54 PM						

Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	E1	11963.661	14584.45	1603.934	10.998	
	E2	14351.818				
	E3	15873.589				
	F1	14293.657				
	F2	14399.945				
	F3	16624.03				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	% cell death
2	C1	8013.768	9302.437	941.142	10.117	36.217
	C2	8597.238				
	C3	9057.385				
	D1	9453.53				
	D2	10411.061				
	D3	10281.643				
Group Summaries						
~End						
Group: 09A						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	A4	0	10179.586	10653.153	411.228	26.955
	A5		10920.091			
	A6		10859.781			
Group Summaries						
~End						
Group: 09B						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	B4	0	-1438.748	-1124.52	441.381	107.71
	B5		-1314.916			
	B6		-619.896			
Group Summaries						
~End						
Group: 09C						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	C4	0	-1436.744	-1101.462	331.898	107.552
	C5		-1094.588			
	C6		-773.054			
Group Summaries						
~End						
Group: 09D						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	D4	0	-677.009	-502.555	208.479	103.446
	D5		-558.987			
	D6		-271.669			
Group Summaries						
~End						
Group: 10A						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	E4	0	4525.507	5122.933	850.421	64.874
	E5		6096.573			
	E6		4746.718			

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Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
1	E1	17837.278	18984.065	1938.84	10.213	
	E2	17533.183				
	E3	19227.54				
	F1	17194.708				
	F2	19727.358				
	F3	22384.323				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	% cell death
2	C1	15307.918	16884.838	953.984	5.65	11.058
	C2	16127.94				
	C3	17354.145				
	D1	17353.421				
	D2	17386.944				
	D3	17778.663				
Group Summaries						
~End						
Group: 09A stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	A4	0	12504.651	13722.208	1399.5	27.717
	A5		13410.787			
	A6		15251.186			
Group Summaries						
~End						
Group: 09A 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	B4	0	14557.489	15291.053	821.305	19.453
	B5		15137.304			
	B6		16178.368			
Group Summaries						
~End						
Group: 09A 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	C4	0	16645.895	17925.025	1176.632	5.579
	C5		18167.94			
	C6		18961.241			
Group Summaries						
~End						
Group: 09B stock						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D4	0	4840.988	4002.326	78.917	
	D5		3537.457			
	D6		3628.533			
Group Summaries						
~End						
Group: 09B 1:2						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E4	0	13429.473	13237.122	30.272	
	E5		12869.561			
	E6		13412.334			
Group Summaries						
~End						
Group: 09B 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	F4	0	13683.206	13561.423	409.296	28.564
	F5		13105.058			
	F6		13896.006			
Group Summaries						
~End						
Group: 09C stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	G4	0	1988.455	2025.892	162.322	89.328

	G5		2203.662			
	G6		1885.56			
Group Summaries						
~End						
Group: 09C 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	H4	0	9527.897	9347.925	368.12	50.759
	H5		8924.443			
	H6		9591.437			
Group Summaries						
~End						
Group: 09C 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	A7	0	11568.176	9837.617	1532.21	48.18
	A8		8653.679			
	A9		9290.997			
Group Summaries						
~End						
Group: 09D stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	B7	0	9764.35	9501.028	228.321	49.953
	B8		9358.119			
	B9		9380.615			
Group Summaries						
~End						
Group: 09D 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	C7	0	11736.549	11320.981	367.794	40.366
	C8		11037.367			
	C9		11189.029			
Group Summaries						
~End						
Group: 09D 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	D7	0	13176.82	13369.877	1038.69	29.573
	D8		14491.552			
	D9		12441.261			
Group Summaries						
~End						
Group: 10A stock						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	E7	0	9001.092	7848.54	1068.396	58.657
	E8		7653.3			
	E9		6891.228			
Group Summaries						
~End						
Group: 10A 1:2						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	F7	0	11973.313	10753.664	2099.966	43.354
	F8		11958.833			
	F9		8328.846			
Group Summaries						
~End						
Group: 10A 1:4						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	G7	0	13421	15022.032	1670.992	20.87
	G8		14889.954			
	G9		16755.144			
Group Summaries						
~End						
Original Filename: 14 Oct cyto #1; Date Last Saved: 10/14/2016 10:10:14 AM						

21 Oct						
Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	
2	E1	16717.007	17467.707	478.989	2.742	
	E2	17896.987				
	E3	17458.489				
	F1	17567.974				
	F2	17157.071				
	F3	18008.714				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	CV%	Virus Cell Death
1	C1	9449.557	8808.832	780.49	8.86	49.571
	C2	8387.649				
	C3	7876.664				
	D1	8357.394				
	D2	8796.037				
	D3	9985.692				
Group Summaries						
~End						
Group: 9A 25						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
2	A4	0	16565.95	13335.384	2812.941	23.657
	A5		12012.023			
	A6		11428.179			
Group Summaries						
~End						
Group: 9B 12.5						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	B4	0	17432.106	16312.839	1054.751	6.611
	B5		16169.056			
	B6		15337.355			
Group Summaries						
~End						
Group: 9B 6.25						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	C4	0	11175.686	11440.909	2390.299	34.503
	C5		13952.758			
	C6		9194.283			
Group Summaries						
~End						
Group: 9C 12.5						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	D4	0	13934.327	14728.894	748.874	15.679
	D5		14830.695			
	D6		15421.66			
Group Summaries						
~End						
Group: 9C 6.25						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	E4	0	17381.208	15677.375	2226.285	10.249
	E5		16492.511			
	E6		13158.407			
Group Summaries						
~End						
Group: 9D 12.5						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	F4	0	13814.142	13952.217	361.858	20.126
	F5		14362.785			
	F6		13679.725			
Group Summaries						
~End						
Group: 9D 6.25						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	G4	0	13095.719	15072.621	1904.346	13.712

	G5		16894.995			
	G6		15227.148			
Group Summaries						
~End						
Group: 10A 25						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cytotoxicity
1	H5	0	12440.499	11750.817	975.358	32.728
	H6		11061.134			
Group Summaries						
~End						
Group: 9A 25 Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
1	A7	0	15298.401	15765.521	769.131	9.745
	A8		15344.932			
	A9		16653.231			
Group Summaries						
~End						
Group: 9B 12.5 Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
1	B7	0	16526.8	17539.183	899.195	-0.409
	B8		18245.028			
	B9		17845.722			
Group Summaries						
~End						
Group: 9B 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
1	C7	0	19592.05	18841.51	1261.307	-7.865
	C8		19547.171			
	C9		17385.309			
Group Summaries						
~End						
Group: 9C 12.5 Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
1	D7	0	14755.673	15174.753	751.516	13.127
	D8		14726.224			
	D9		16042.362			
Group Summaries						
~End						
Group: 9C 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
1	E7	0	19002.532	18376.256	929.045	-5.201
	E8		17308.825			
	E9		18817.411			
Group Summaries						
~End						
Group: 9D 12.5 Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
2	F7	0	16888.909	14951.765	1727.038	14.403
	F8		14393.395			
	F9		13572.992			
Group Summaries						
~End						
Group: 9D 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
1	G7	0	16349.647	15925.976	724.326	8.826
	G8		16338.661			
	G9		15089.621			
Group Summaries						
~End						
Group: 10A 25 Virus						
Sample	Well	Concentration	Values	MeanValue	Std.Dev.	Cell Death
1	H7	0	16473.245	15777.778	608.472	9.675
	H8		15516.545			
	H9		15343.545			
Group Summaries						
~End						

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28 Oct						
Group: Cells and Media						
Sample	**Well**	Values	MeanValue	Std.Dev.		
3	**C1**	12101.173	11663.167	530.722		
	C2	11385.695				
	C3	10864.217				
	D1	12067.77				
	D2	11386.288				
	D3	12173.858				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	**Well**	Values	MeanValue	Std.Dev.	Virus Cell Death	
1	**E1**	4459.677	4223.783	526.977	63.785	
	E2	4604.655				
	E3	3682.429				
	F1	4812.957				
	F2	4295.711				
	F3	3487.27				
Group Summaries						
~End						
Group: 9A 12.5						
Sample	**Well**	Concentration	Values	MeanValue	Cell Death	
2	**A4**	0	11753.092	11745.107	-0.703	
	A5		11356.329			
	A6		12125.903			
Group Summaries						
~End						
Group: 9B 6.25						
Sample	**Well**	Concentration	Values	MeanValue	Cytotoxicity	
2	**B4**	0	10049.896	10513.532	9.857	
	B5		10459.318			
	B6		11031.382			
Group Summaries						
~End						
Group: 9C 12.5						
Sample	**Well**	Concentration	Values	MeanValue	Cytotoxicity	
2	**C4**	0	12792.048	12611.06	-8.127	
	C5		12527.442			
	C6		12513.691			
Group Summaries						
~End						
Group: 9D 6.25						
Sample	**Well**	Concentration	Values	MeanValue	Cytotoxicity	
2	**D4**	0	13235.44	12046.698	-3.288	
	D5		11867.117			
	D6		11037.538			
Group Summaries						
~End						
Group: 10A 12.5						
Sample	**Well**	Concentration	Values	MeanValue	Cytotoxicity	
1	**E4**	0	10890.574	10625.537	8.897	
	E5		11141.289			
	E6		9844.747			
Group Summaries						
~End						
Group: 10A 6.25						
Sample	**Well**	Concentration	Values	MeanValue	Cytotoxicity	
1	**F4**	0	11387.163	11158.146	4.33	
	F5		11381.091			
	F6		10706.186			
Group Summaries						
~End						
Group: 10A 3.125						
Sample	**Well**	Concentration	Values	MeanValue	Cytotoxicity	
1	**G4**	0	11685.787	11908.159	-2.101	

	G5		12569.949			
	G6		11468.741			
Group Summaries						
~End						
Group: 9A 25 Virus						
Sample	**Well**	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	**A7**	0	3359.308	4003.118	65.677	-2.966
	A8		3976.177			
	A9		4673.869			
Group Summaries						
~End						
Group: 9B 6.25 Virus						
Sample	**Well**	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
2	**B7**	0	3137.841	3688.329	68.376	-7.198
	B8		3081.905			
	B9		4845.243			
Group Summaries						
~End						
Group: 9C 12.5 Virus						
Sample	**Well**	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
2	**C7**	0	3818.318	3729.975	68.019	-6.638
	C8		3913.099			
	C9		3458.507			
Group Summaries						
~End						
Group: 9D 6.25 Virus						
Sample	**Well**	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
2	**D7**	0	3608.183	4215.75	63.854	-0.108
	D8		5143.936			
	D9		3895.13			
Group Summaries						
~End						
Group: 10A 12.5 Virus						
Sample	**Well**	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
2	**E7**	0	3721.376	4033.113	65.42	-2.563
	E8		4530.487			
	E9		3847.478			
Group Summaries						
~End						
Group: 10A 6.25 Virus						
Sample	**Well**	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	**F7**	0	2607.676	3435.144	70.547	-10.601
	F8		3295.693			
	F9		4402.063			
Group Summaries						
~End						
Group: 10A 3.125 Virus						
Sample	**Well**	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	**G7**	0	3260.578	4267.557	63.41	0.588
	G8		4533.737			
	G9		5008.356			
Group Summaries						
~End						
Original Filename: 28 Oct Cyto #3 Virus #2; Date Last Saved: 10/28/2016 10:03:20 AM						

4 November						
Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.		
3	C1	20976.943	19659.868	798.869		
	C2	19098.543				
	C3	20035.449				
	D1	19822.211				
	D2	19274.73				
	D3	18751.332				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	Virus Cell Death	
1	E1	18066.144	18390.069	1560.166	6.459	
	E2	16674.613				
	E3	20665.793				
	F1	19839.541				
	F2	17087.814				
	F3	18006.508				
Group Summaries						
~End						
Group: 10A 25						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A7	0	21438.164	20709.658	-5.34	
	A8		20641.955			
	A9		20048.853			
Group Summaries						
~End						
Group: 10A 12.5						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B7	0	19024.816	19991.567	-1.687	
	B8		20512.266			
	B9		20437.619			
Group Summaries						
~End						
Group: 10A 6.25						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C7	0	18863.732	19112.175	2.786	
	C8		20562.297			
	C9		17910.496			
Group Summaries						
~End						
Group: 10A 3.125						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D7	0	19076.795	19838.152	-0.907	
	D8		20231.75			
	D9		20205.91			
Group Summaries						
~End						
Group: 9A 25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A4	0	17882.799	18549.285	5.649	12.539
	A5		19853.521			
	A6		17911.533			
Group Summaries						
~End						
Group: 9B 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B4	0	16961.502	17259.399	12.21	-89.043
	B5		17514.478			
	B6		17302.217			
Group Summaries						
~End						
Group: 9C 12.5 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C4	0	20107.119	18690.302	4.932	23.644

	C5		15853.246			
	C6		20110.539			
Group Summaries						
~End						
Group: 9D 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D4	0	20982.793	19125.345	2.719	57.905
	D5		19200.109			
	D6		17193.133			
Group Summaries						
~End						
Group: 10A 25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E4	0	18736.865	18755.923	4.598	28.812
	E5		18551.699			
	E6		18979.203			
Group Summaries						
~End						
Group: 10A 12.5 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F4	0	16654.01	18072.647	8.073	-24.998
	F5		18237.5			
	F6		19326.43			
Group Summaries						
~End						
Group: 10A 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G4	0	20184.812	19058.23	3.06	52.619
	G5		20009.935			
	G6		16979.943			
Group Summaries						
~End						
Group: 10A 3.125 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H4	0	19747.32	19404.83	1.297	79.915
	H5		20733.996			
	H6		17733.172			
Group Summaries						
~End						
Original Filename: November 4 Cyto #3 Virus #2a; Date Last Saved: 11/4/2016 1:38:04 PM						

11 November						
Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.		
3	C1	15665.662	16173.871	715.895		
	C2	16321.132				
	C3	17137.273				
	D1	16859.478				
	D2	15695.393				
	D3	15364.289				

Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	Virus Cell Death	
1	E1	6386.731	6636.757	275.052	58.966	
	E2	6422.487				
	E3	6459.683				
	F1	6638.146				
	F2	7086.553				
	F3	6826.939				
Group Summaries						
~End						
Group: 10A 25						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A7	0	19104.314	19058.678	-17.836	
	A8		18518.533			
	A9		19553.185			
Group Summaries						
~End						
Group: 10A 12.5						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B7	0	18788.728	18266.146	-12.936	
	B8		17341.628			
	B9		18668.081			
Group Summaries						
~End						
Group: 10A 6.25						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C7	0	16701.156	17316.88	-7.067	
	C8		18569.97			
	C9		16679.513			
Group Summaries						
~End						
Group: 10A 3.125						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D7	0	16846.716	16710.089	-3.315	
	D8		16422.982			
	D9		16860.568			
Group Summaries						
~End						
Group: 9A 25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	A4	0	5751.786	5941.949	63.262	-7.285
	A5		6114.532			
	A6		5959.529			
Group Summaries						
~End						
Group: 9B 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	B4	0	6616.62	6465.096	60.028	-1.8
	B5		6013.822			
	B6		6764.846			
Group Summaries						
~End						
Group: 9C 12.5 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	C4	0	7387.208	7735.79	52.171	11.524
	C5		7707.882			
	C6		8112.28			
Group Summaries						
~End						
Group: 9D 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	D4	0	8547.167	7914.809	51.064	13.401
	D5		7461.187			
	D6		7736.072			

Group Summaries						
~End						
Group: 10A 25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E4	0	8697.491	7559.969	53.258	9.68
	E5		6568.32			
	E6		7414.096			
Group Summaries						
~End						
Group: 10A 12.5 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F4	0	8099.01	8108.438	49.867	15.431
	F5		9125.411			
	F6		7100.892			
Group Summaries						
~End						
Group: 10A 6.25 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G4	0	8496.241	8222.783	49.16	16.63
	G5		8741.768			
	G6		7430.34			
Group Summaries						
~End						
Group: 10A 3.125 Virus						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H4	0	8870.894	8453.729	47.732	19.052
	H5		7904.602			
	H6		8585.692			
Group Summaries						
~End						
Original Filename: November 11 Cyto #3 Virus #2a; Date Last Saved: 11/11/2016 10:46:17 AM						

18 November						
Group: Cells and Media						
Sample	Well	Values	MeanValue	Std.Dev.		
3	C1	19896.992	19626.215	703.565		
	C2	19633.453				
	C3	18478.111				
	D1	20531.832				
	D2	19970.893				
	D3	19246.006				
Group Summaries						
~End						
Group: Cells and Virus						
Sample	Well	Values	MeanValue	Std.Dev.	Virus Cell Death	
1	E1	7888.921	7413.214	424.523	62.228	
	E2	7121.258				
	E3	6843.032				
	F1	7756.68				
	F2	7164.917				
	F3	7704.477				
Group Summaries						
~End						
Group: 23B10 cyto 100						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	A4	0	6229.115	6085.265	68.994	
	A5		6002.081			
	A6		6024.597			
Group Summaries						
~End						
Group: 23B10 cyto 50						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	B4	0	18532.369	18341.798	6.544	
	B5		17949.496			
	B6		18543.529			
Group Summaries						
~End						
Group: 23B10a cyto 25						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
2	C4	0	21794.764	20176.376	-2.803	
	C5		19874.635			
	C6		18859.727			
Group Summaries						
~End						
Group: 23B10a cyto 12.5						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D4	0	19583.809	18836.064	4.026	
	D5		18731.242			
	D6		18193.141			
Group Summaries						
~End						
Group: 23B10 Virus 100						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	E4	0	7790.744	7927.641	59.607	4.212
	E5		8391.495			
	E6		7600.684			
Group Summaries						
~End						
Group: 23B10 Virus 50						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F4	0	11198.474	10836.362	44.786	28.029
	F5		10607.574			
	F6		10703.038			
Group Summaries						
~End						
Group: 23B10aVirus 25						

Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G4	0	5887.317	5955.49	69.655	-11.936
	G5		5837.11			
	G6		6142.043			
Group Summaries						
~End						
Group: 23B10a Virus 12.5						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H4	0	7075.926	6748.301	65.616	-5.444
	H5		6077.174			
	H6		7091.802			
Group Summaries						
~End						
Group: DMSO cyto 100						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	A7	0	20506.227	20261.909	-3.239	
	A8		20018.979			
	A9		20260.52			
Group Summaries						
~End						
Group: DMSO Cyto 50						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	B7	0	19962.971	19665.085	-0.198	
	B8		19466.965			
	B9		19565.318			
Group Summaries						
~End						
Group: Acyclovir cyto 10						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	C7	0	19907.375	19787.602	-0.822	
	C8		20347.57			
	C9		19107.859			
Group Summaries						
~End						
Group: Acyclovir cyto 5						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	D7	0	18338.686	18347.475	6.515	
	D8		18028.205			
	D9		18675.533			
Group Summaries						
~End						
Group: Acyclovir cyto 2.5						
Sample	Well	Concentration	Values	MeanValue	Cytotoxicity	
1	E7	0	19485.984	19403.953	1.132	
	E8		19443.369			
	E9		19282.504			
Group Summaries						
~End						
Group: Acyclovir Virus 10						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	F7	0	12001.217	12218.784	37.743	39.348
	F8		12206.847			
	F9		12448.287			
Group Summaries						
~End						
Group: Acyclovir Virus 5						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	G8	0	10510.385	12532.834	36.142	41.919
	G9		14555.282			
2	G10	0	-548.211	-548.211		
Group Summaries						
~End						

Group: Acyclovir Virus 2.5						
Sample	Well	Concentration	Values	MeanValue	Cell Death	% Virus Inhibition
1	H7	0	10095.525	10387.233	47.075	24.351
	H8		10394.73			
	H9		10671.444			
Group Summaries						
~End						
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