This Week in Virology

with Vincent Racaniello, Ph.D. Dickson Despommmier, Ph.D., and Aidan Racaniello

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Episode 7: Viruses in video games

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Vincent Racaniello: This Week in Virology, episode seven for November 6, 2008. I'm Vincent Racaniello.

Dickson Despommier: And I'm Dick Despommier.

Vincent: Today we have a guest in the studio, the studio being your office, Dick. His name is Aidan Racaniello. Welcome Aidan.

Dickson: Sounds like a relative

Aidan Racaniello: Yeah, I'm Vincent Racaniello's son and I'm very happy to be here today.

Vincent: Aidan is an Eighth Grader. He's very interested in viruses and he's going to talk with us about some viruses that occur in some video games because that's what you do for a living, you play video games, right?

Aidan: That's right.

Vincent: We thought this would be good because it turns out that there are a number of video games that have infectious disease components to them. Aidan suggested we do this. He has been listening to this podcast and suggested we do a podcast about viruses in video games. We have three video games we're going to talk about. The first one is World of Warcraft. What is that Aidan?

Aidan: World of Warcraft is an online MMORPG, which means Massively Multiplayer Online Role Playing Game. In this game you can interact with other players all around the world.

Vincent: Where does the virus in WOW come from? Are you following this, Dick?

Dickson: Well, I am, but I want to know what the object of this is. Why would you want to play it?

Aidan: This game is very massive and very complicated.

Dickson: Sounds like my life.

Aidan: Exactly. There's a lot of different components in this game. You can choose one of two factions in this game, either the hoarder or the alliance. You start the game, then you can level up easy levels with this level of expansion. Once you've reached level sixty you can participate in these raids with at least forty people. That's a lot of people. One of the bosses you fight, which requires teamwork and communication, has the ability called cursed blood. This condition causes damage over time and can spread from player to player. Hunter players can have pets and the

pets can be infected with this curse. He dismissed his pet so it was no longer in this world, but it still had this disease. He opened up in this city and people there started getting this disease. Now people in a lower level didn't have much health and died off quickly and didn't really have a chance, but higher level people have better health and can last longer, but eventually still died. Some people called NPCs or non-playing characters, are completely immune to this infection and do not die off. This simulation of an epidemic reflects real life conditions very accurately.

Vincent: Was it ever said online that this was a virus or did they just call it an infection?

Aidan: The ability was a curse, so some players could dispel it and that would basically represent the doctors and their vaccines, but it would be hard to completely exterminate this whole breakout.

Dickson: Just like in real life.

Aidan: Yeah, exactly.

Vincent: So this whole incident which happened in 2005 was the subject of the journal article in Lancet Infectious Diseases by a couple of epidemiologists at Yale and we'll put a link in the show notes: "The Untapped Potential of Virtual Game Worlds to Shed Light On Real World Epidemics." So as Aidan said, battling by this bad guy, Hakkar, he would throw blood on you and you would get this infection and it spread through pets and other players.

Dickson: So it was a cryptozoonosis!

Vincent: Perhaps, perhaps it was a zoonosis. So the game makers installed a patch which introduced this new character.

Aidan: Correct, plus some other changes.

Vincent: So within a few hours after a patch was installed by the game makers to introduce this new character, within a few hours the infection had spread to millions of players. So how many players play this game?

Aidan: About six million then, ten million now.

Vincent: So it spread to millions and millions of players and eventually the infection became so bad that eventually the game makers had to stop the game, take away this ability and reboot the game to get rid of the infection. They had no idea it was going to spread in this manner.

Dickson: How interesting, sort of like a vaccination.

Aidan: Yeah.

Vincent: I wrote a little article on this for the next edition of our textbook called Video Games Model Infectious Disease Epidemics. In fact there are models that are made to construct epidemics and they cost millions of dollars, but they don't do as well as this WOW game did because there were real people involved in this and their actions contributed to the spread of the infection. Putting their pets away, for example, contributed because putting your pet away isn't a real world thing and when they appeared in another city with their the animal it spread the infection. So let me read what I wrote: "While enjoyment and entertainment are the central focus of such games, the players are serious and devoted and their responses to situation of danger approximate real world reactions. For example, during the corrupted blood epidemic, players with healing ability were the first to attempt to help the infected players. This action probably affected the dynamics of the epidemic since infected players survived longer and were able to travel and

spread the infections. I conclude that multi-player video games provide excellent opportunity to examine the consequences of human actions within a statistically significant and controlled computer simulation." In fact the authors of the paper in Lancet concluded that this is an excellent model to study disease transmission, better than the ones made just for this purpose, so I think this is a fascinating example.

Dickson: So Aidan how do you make money with this game; how do manufacturers of these games make their money?

Aidan: Well it's a players game that costs $15 a month.

Dickson: Ah hah; and how many people play this game?

Aidan: About ten million.

Dickson: Well let's see, ten million times $15 a month.

Vincent: Do the math and we'll get back to you later. Of course if you made a game on just with infectious disease, it wouldn't do as well. This is an interesting game because of battle and war are represented. It's not just the infection that you like, obviously. So now there's no more infection around anymore, right?

Aidan: Well, not true; there no more infection that can break out, but in some Dungeons, for example, there are diseases that give a rash or itching, but it's not spreadable and doesn't really have a symptom. So Blizzard, the gaming manufacturer has done a really good job making other abilities that don't spread.

Vincent: Before we move on to the next video game, let's review a couple of things. The first infection happened when this guy threw blood at people, right?

Aidan: Yes.

Vincent: So while some infections could do that, such as Ebola, normal infection doesn't spread by having blood thrown at you, so that is a little bit of a fantasy. In some situations, something comes to mind such as a case of a young technician in a Government animal facility years ago that had a monkey spit in her eye and she contracted a herpes infection that was lethal. So spitting is like having blood thrown at you, but then when the pets in the game got the infection, how did they spread the infection to people in other cities? Do you know?

Aidan: Very good question.

Vincent: Did they bite them?

Aidan: Well, it's possible that they could have dueled with another player and the blood spread that way. After a duel is over most of the debuffs are damaged over time. Skulls and players go away after the duals are over. So maybe Hakkar the Boston actually attacked someone by throwing it at them, maybe, like an aura that automatically jumped from player to player.

Vincent: So this is a good transmission model, but the...

Aidan: Like airborne.

Vincent: The details I guess…

Dickson: Maybe the dogs had fleas.

Vincent: Maybe they peed on them and urine transmitted it.

Dickson: You said jumped, so I just thought of fleas.

Vincent: Maybe respiratory. The precise mechanisms of transmission aren't so well developed. We'll see in our next example that they are far more developed. Sorry, Dick, go ahead.

Dickson: No, I was just going to interrupt for just a moment to note that I had two sons and when they were your age, Aidan, they both got wrapped up with Dungeons and Dragons, but these were board games and not as sophisticated as what you have today. They had all these characteristics like Righteous, Good, and Evil that you could put onto these characters and then you played out according to these rules, a fascinating game that never had an end, but you didn't have to pay anything to play.

Aidan: Exactly. This game has no real goal or end. Like I said, there are going to be two expansions out and next week the second one is coming out and it's going to raise the level of the cap to 80 instead of 60 and the game just keeps going on and on.

Dickson: At $15 a shot that's what I'd do. Vince, I think we're in the wrong business.

Aidan: There are more and more things to do. They keep adding new content to the game. Leveling up is lots of fun, but gets boring after awhile. Leveling up from 1 to 80 is a lot to level.

Vincent: Anything else we should say before we move on?

Aidan: One more thing, not relating to diseases; along with this expansion there is going to be a new class called the Hero Class that will allow players to start at Level 55, instead of Level 1, so that will cut back a lot of leveling, so maybe that will attract more players. There will be less Level.

Vincent: Could you introduce an infection yourself in this game in some way?

Aidan: No.

Vincent: That's too bad. It would be interesting if you could do that.

Dickson: That's another game, called The Mad Scientist.

Vincent: Yes. Well, Dick, maybe we need to have some ideas about that. I don't need ten million players, but a million at $15 a month would be OK.

Dickson: That would support our habit in the lab, that's for sure.

Vincent: What's our second game now.

Aidan: Our second game is called Pandemic Two. This game does not have to be purchased. Just go on the internet and find it.

Vincent: We'll put a link in the show notes. It's by a company called New Grounds.

Dickson: What was the other company, by the way.

Aidan: The other company is Blizzard Entertainment, a big company with lots of games out. So this game can be found on lots of other game sites, but like Vincent said, we'll put a link in the show notes. The goal of this game is to destroy the whole human race.

Dickson: Now you're talking.

Vincent: So when you start this game what's the first screen you see?

Aidan: The first screen you get is the main menu..

Dickson: With little humans, big humans, females, males…

Aidan: Naw, alright. When you start the game you go to a screen where you select a disease class, and the three diseases are viruses, bacteria or parasites.

Vincent: And it says something about each one.

Aidan: Right.

Vincent: Can you read what it says?

Dickson: Will you read it, though?

Aidan: Yeah, right. Good point. So the viruses have the fastest evolution; bacteria have medium and parasites have the slowest evolution.

Vincent: Would you agree with those characteristics?

Dickson: Well, it's all based on reproductive rates. The quicker you divide, the more mutants you'll create, a random process, so I would agree with that entirely. That teaches a good lesson.

Vincent: I think that's great, that right off the bat you learn something important.

Aidan: So viruses are most affected by the environment and you have a bonus to infectivity, which means they infect people faster, but since they are most affected by the environment, it means they are going to have a hard time infecting people quickly. Bacteria are normally affected by the environment, which means you don't have to make them resistant to the environment as much as viruses. What I like about bacteria is that they also have a bonus to drug resistance which means that if you upgrade to…

Dickson: Hah, hah, hah; this sounds like your course, Vince.

Vincent: Right. It's a great game to play in the course; you'll see.

Aidan: Skipping ahead to end game; you can upgrade resistances to heat, cold and drug. Since bacteria has a bonus to drug resistance, when you upgrade all four tiers of the resistance, it takes awhile for the World Health Organization to make a vaccine. So after awhile when your virus or bacteria or parasite infects lots of countries, the World Health Organization will start crating a vaccine and the more drug resistance the more days it will take. Well, if they do manage to finish the vaccine it will also take more days to deploy the vaccine by the hospitals that are still open.

Vincent: So that's what you are racing against, right? You're trying to kill everyone and the human race is trying to create vaccines or drugs to save themselves, so you win by killing everyone and you lose whenever a drug or vaccine is made.

Aidan: That's right. You also lose or don't finish the game if a region closes off airports, shipyards -- we'll get into that later.

Vincent: Ok. What's the next thing you do?

Aidan: No, wait. I'm not done yet. The third class is a parasite.

Vincent: You know Dick is a parasitologist. He studies them.

Aidan: Ok, Dick, would you agree that parasites are the slowest evolving.

Dickson: Sure do.

Aidan: They're least affected by the environment.

Dickson: Some are; some ain't.

Aidan: And have the lowest visibility.

Dickson: Why is that?

Aidan: I'm not sure, but in the game you get symptoms that raise or lower visibility

Dickson: Oh, I see what you mean.

Aidan: So this would make the symptoms less visible.

Dickson: Well, you know that's actually pretty accurate. I'm right in the middle of teaching this to medical students in parasitic diseases and one of the big lessons I'm trying to teach the medical students is that for viruses and bacterial infections, and even fungal infections, there are often symptoms that you can associate with those diseases, but with parasitic infections, a lot of them are silent infections; that they remain below the critical horizon -- that's what that's called -- as you can't recognize their presence. Maybe the inventor of this game has read some original microbial literature and based this game on reality, because I would agree with those characteristics.

Vincent: Yeah, I think they had some advisors.

Dickson: It's pretty good.

Vincent: You'll see as we move in its very good stuff.

Dickson: This is a great way to learn. Maybe I should get my medical students to play this game.

Vincent: You learned a lot playing this, didn't you?

Aidan: Yes I did.

Vincent: Because you make more sense to me, now.

Dickson: Hah, hah, hah.

Vincent: Next screen.

Aidan: Alright, so the next screen. After you chose your class, the next screen is where you name your disease.

Vincent: Anything you want.

Aidan: Yes, anything you want.

Dickson: Including Vincent, by the way.

Aidan: Yes. We've named this disease Vincent.

Vincent: OK.

Dickson: Right.

Aidan: Then you get into the game. A tutorial screen will pop up and you can use that if you want. Then close that. So your screen is a picture of the world, basically. Up in the upper left-hand corner you get a mini-map. You can drag it around to view different parts of the world. Below that is breaking news, which advertises, for example, Canada is going to exterminate insects because they transfer the virus; or, if droughts are in effect.

Vincent: What does it say right now.

Aidan: It says our disease started in North Africa.

Vincent: Does it always starts somewhere in the world.

Aidan: Yes, but it's completely random. It can start anywhere in the world.

Dickson: So is **Vincent** a virus, or bacteria or parasite?

Aidan: Right now he's a virus, so he can evolve fairly fast.

Dickson: That's appropriate. And is he a vector borne virus, or is he a dispersed in person virus?

Vincent: Well, you can choose those characteristics.

Dickson: You said insects. If they wiped out all the insects.

Aidan: Oh, yeah.

Vincent: You have a menu.

Dickson: So is Vincent a vector borne virus?

Vincent: We'll get to that.

Dickson: I'm sorry. I'm jumping ahead of you.

Aidan: Alright, so the disease spreads through North Africa. One second; we'll get right into that. The disease can be spread thru boarders, say a car or train. It can be spread through planes through an airport, or by boat. There are hospitals in almost every region that basically deploy the vaccine and if they are closed off, they can't deploy the vaccine in that country. There are also water plants. I'm going to infect the water and then the Government has to hand out the water. Ok, if you click on an infected or non-infected region, it will bring up a region information screen that tells you information about the region. It tells you if riots are in effect, floods, hurricanes, or earthquakes. I've never gotten a riot.

Dickson: You're lucky.

Aidan: Well, if you're the virus, that's bad.

Vincent: It tells you the number of cases, right?

Aidan: It also tells you the services that are active: airports, shipyards, boarders, schools, hospitals, and transit. So I'm going to close schools.

Vincent: So I assume that if actions proceed, things get closed down.

Aidan: Right, if your visibility is high, they'll close them sooner than if it's low.

Vincent: I see.

Dickson: Got it.

Vincent: So if they can't tell that people are infected, they'll react slower.

Dickson: So they would close schools slower if it was a parasite, than if it was a virus.

Aidan: Exactly. Also it depends on other things. It also includes Government affairs, such as handing out masks and water, exterminating rodents or insects, curfews and martial law, and if dead bodies are being burned.

Dickson: Or eaten…

Aidan: Then about the population it shows how many people are healthy, how many are infected, how many are dead and how many are alive.

Vincent: And those numbers change quickly.

Aidan: Right. Closing that and going back to the main screen. On the bottom there's a menu, which brings it up; World which shows the world information: alive population, infected population, start date and rate, starting region and a bunch of stuff like that. It also shows you the vaccine status, how many hospitals are open, how many hospitals are active, the approximate days until completion of a vaccine. At the start you aren't going to be making a vaccine, so you don't need to worry about the approximate days until completion. It also show the clean regions, the infection regions and the forsaken regions.

Vincent: What does forsaken mean?

Aidan: Everyone is dead.

Vincent: Very dramatic, isn't it?

Dickson: Very dramatic.

Aidan: Another tab is the Disease tab. It brings up the tab to evolve and alter your disease.

Vincent: This is very interesting.

Aidan: You're going to like this.

Vincent: See the one that's up early on doesn't have very many tabs on it.

Aidan: Yeah. So, in Symptoms there are four tiers. The first one is simple. It's sneezing, coughing, fever, sweating and vomiting, but those are all very visible. I like to get solved, so I always start with one. I like to solve them, so there's no visibility. So we started with coughing..

Dickson: You like stealth organisms.

Aidan: Yeah. Definitely

Dickson: And they like that, too. Do you know any stealth organisms.

Aidan: I do not.

Dickson: You've listened to our TWIV's. How about HIV?

Aidan: Yeah; that's stealthy.

Dickson: Pretty stealthy.

Vincent: You said you sell some of these characters.

Aidan: It costs evolution points to sell symptoms, which will make them less visible.

Vincent: How do you get evolution points?

Aidan: You get evolution points by the number of days that pass by, by how many infected days, by how many regions you infect every day, by how many you kill every day. It all varies. Viruses get this faster because they have the fastest evolution. Bacteria are slower and parasites are the slowest.

Vincent: As you get points you can get more tiers. What's below symptoms?

Aidan: After symptoms, there are four tiers. The higher the tier, the more lethal it is. You can get to kidney failure, to heart failure.

Vincent: This is called resistance.

Aidan: You can also upgrade its resistance.

Vincent: The virus' resistance?

Aidan: Yeah. So you can upgrade it to cold, heat, moisture and drug.

Vincent: They have everything here.

Dickson: They do.

Vincent: It's pretty good.

Aidan: Yeah. It depends on your starting region. It automatically gets one resistance depending on where your starting region is, so if you start in Russia it then would be cold.

Vincent: So here we have heat resistance.

Aidan: Right. If you start in North Africa, you'd have heat.

Vincent: What's this about transmission? I like that one.

Aidan: You can upgrade to All Transmission to rodent, insect, waterborne, slush or airborne.

Vincent: That's a bit unrealistic to be transmitted all these ways. I wanted you to know that, Aidan. In real life usually a virus is transmitted one or maybe two ways at the most; respiratory… what's that.

Aidan: That's why our virus is special.

Dickson: Hah, hah, ha.

Aidan: But I see your point. OK.

Dickson: The disease.

Vincent: What's this last one?

Aidan: The last column is the traits. It basically tells you the traits for your classes. Right now we have a virus and it's durable.

Vincent: I see. So you're playing the game, cases are appearing and viruses are being detected. What do you do next?

Aidan: One more thing about the disease, the disease information: how many evolution points you have, average infections per day, and average deaths a day. It also has three bars and however full those are: the first bar is lethality, the second bar is, infectivity, and the third bar is visibility. You want your visibility to be lowest, while your lethality and your infectivity to be the highest.

Vincent: Right. Perfect pathogens. You want high lethality, high infectivity and the low visibility.

Aidan: Exactly.

Vincent: That makes perfect sense as far as we know, right Dick?

Dickson: Yep. People are dying, but they don't know why.

Vincent: If they knew why, they'd mobilize vaccines and the like.

Dickson: How about people that get infected, that don't die right away and take the disease away to other places and give to people and then they start to die? Wouldn't that be better? Then you'd never know who did it.

Aidan: Exactly.

Vincent: There is a travel component.

Aidan: When I'm playing this game what confuses me is that I don't have any symptoms at all, so you could be sick right now and you wouldn't even know, so you're like a carrier. So there'd be no symptoms, but the Governments could close down their boarders even though they didn't know if people had the disease.

Vincent: But how would they find out?

Aidan: I have no idea.

Vincent: Maybe they were doing serology.

Dickson: What do they do for SARS?

Vincent: Kill all the civets.

Dickson: Don't they have a little temperature measuring monitor device they can put up against your forehead?

Vincent: That's right, but a fever's not a very visible indicator.

Dickson: So that's how they detect at the boarder, by looking at fever.

Vincent: Yeah, that's true. A friend of mine went thru Beijing airport and there all these temperature monitors. You'd walk through the metal detector and then thru the temperature detector. If you had a fever they wouldn't let you travel.

Aidan: Wow.

Vincent: So that might answer your question how in this game they might know you're infected. So fever is a low visibility symptom. In fact in this chart there is actually a list of all these symptoms that you can print out as a game guide. They have a list of all the symptoms. I like this fever description: "A fever occurs in a person when a threat is found within the body resulting in higher than normal temperature. In fact fevers have the potential for being deadly while barely being noticeable." It goes through all of these symptoms. This is really pretty good, actually, for a game. Some of them are quite accurate: necrosis, diarrhea, hemorrhaging, sores, ataxia. It's pretty well done. Anyway, go ahead Aidan.

Aidan; There's three different speed options in the game: slow, medium and fast. Basically what that does is make all types of travel -- planes, boats, time travel -- faster. And also the time of real life, it starts in January of 2008 and it goes up by hours, rather than days or months. The fastest time setting goes fairly fast. Slowest still does go…

Vincent: What do you usually play?

Aidan: I usually go Fast.

Dickson: What are you racing? Are you racing against the development of a vaccine?

Aidan: Before its started to be developed, you're racing against countries closing off everything. Once it has been developed, you're racing against that.

Dickson: What would you call that closing off of a country? What would you call that activity? I'll tell you where that came from.

Vincent: I hear sirens in the background and it sounds like we're going to be quarantined, here.

Dickson: Quarantine, yes. Now what are they quarantined for? Where the heck did that get started, anyway?

Aidan: I don't know.

Dickson: We can tell you which disease caused the term to come into vogue. Can you guess? What color is that shirt over there?

Vincent: Yellow Fever.

Aidan: Yellow Fever.

Dickson: Exactly. So, do you think that can stop a disease that is borne by mosquitoes?

Aidan: No.

Vincent: That's a good one; if you quarantine people, the mosquitoes can still fly. Here's an even harder question: is quarantine effective to control a viral disease where only one in a hundred of infected individuals show any symptoms of the disease?

Aidan: I don't know.

Vincent: No. That's what we tried that with polio in the US where we quarantined all the paralyzed people and meanwhile there were other ninety-nine people walking around still spreading the disease.

Dickson: So what are some of the diseases that quarantine does work for?

Vincent: What would be a good one?

Dickson: Well I think it works for diseases like Ebola, Lhasa.

Vincent: Measles, too.

Dickson: Measles, yes.

Vincent: Measles transmitted by contact between people.

Dickson: And rapid development.

Vincent: Apparent penetration.

Dickson: Smallpox would be a good one.

Vincent: Absolutely.

Dickson: So any rapidly evolving disease is easy to quarantine for. Any slowly developing disease is very difficult to quarantine for. So your game takes advantage of that.

Aidan: Definitely.

Dickson: So you're the virus in this case. You're the enemy. We're the people and we are trying to kill you.

Aidan: Exactly.

Vincent: What else you got there, Aidan; some more screen shots to explain?

Aidan: Where was I: all right, different symptoms cause a different number of evolution points and towards the end of the game when everything is being infected, it's kind of annoying to get a lot of evolution points that come in one's.

Dickson: These are evolution points from the disease, right, but what about the people? I want to ask you a few questions. I need to ask these.

Aidan: OK.

Dicksen: When the Spaniards came to the New World, do you know how many people lived here?

Aidan: Not that many.

Dickson: Fifty million people.

Aidan: Really.

Dickson: You know why you don't think many people lived here, cause there weren't many alive when the Spanish left here. When the Spanish left, there were only four million people left. So what happened?

Aidan: They got diseases?

Dickson: They did. They didn't shoot them. They didn't kill them with their swords. They killed them with common colds. They killed them with smallpox and several other common diseases. In return they gave us syphilis. They also interbred with people here and that gave immunity to the next generation of people and there were no more outbreaks like that when the next wave of people came over. So this mimics a lot of those characteristics.

Vincent: As the game evolves when does the vaccine come into play?

Aidan: The vaccine comes into play when most regions in the world are infected and you know it. What will happen is that a screen will pop up saying "vaccine" and it will let you know that the world leaders are working on a vaccine.

Vincent: If it were only so easy, right, a screen just pops up. That's great. The world leaders are working on a vaccine.

Dickson: Right. That would be a switch.

Aidan: Yeah.

Vincent: Then, in this screen shot you have here it says the recently deployed vaccine has worked as well as the humans had hoped and you are now no longer to infect anyone new.

Aidan: Yeah. That's basically telling you that you've lost.

Vincent: How long does it take for a vaccine to be deployed.

Aidan: It depends on how much drug resistance you have and if you chose bacteria.

Vincent: Let's say virus.

Aidan: Alright, if you have virus and you have full drug virus resistance before they started to work on the vaccine, it will take about 300 days to complete the vaccine.

Vincent: They actually talk about resistance to a vaccine in terms of drug resistance in the game, because that's not correct. A drug is different than a vaccine.

Aidan: I think the game actually makes the difference between drug resistance and vaccines

Vincent: Because here's the issue. Most vaccines there are very few examples of viruses that become resistance to vaccines because it's an antibody or cellular response. I know of one example, influenza virus, which evolves to escape the vaccine on a yearly basis.

Dickson: That's right.

Aidan: Well, the drug resistance and bacteria bonus to drug resistance doesn't actually make it immune, but in one game where it actually infected everything. I was pretty proud about that.

Vincent: Every person on earth was infected?

Aidan: Not every person, but every region, but that doesn't matter about every person. What gave me more power was that I had all four drug resistances and I was a bacteria and then I looked on the World Menu and it took a thousand days to complete the vaccine.

Dickson: Forget about it.

Aidan: Right, and by then you'd all be dead.

Dickson: Right, but wait a minute.

Vincent: That's what you have to do, you see.

Dickson: I want to come back to we'll all be dead thing, alright. When I told you about the Spanish that there were 50 million people in the New World when they left and 4 million when the Spanish left, why do you think they all didn't die? When the plague first hit Europe in 1100 almost a third of Europe lived meaning two-thirds died. Why did one-third live? They should have all died, right?

Aidan: I have two thoughts about that. Maybe some of them didn't have contact with the ones that were infected.

Dickson: Right. So they were livening in the country they didn't get exposed. That was true for smallpox. That was very true for smallpox.

Aidan: Also, since it was transmitted by fleas, maybe…I don't know; maybe they still could have been infected. Another thing, maybe some people were immune to them, but I doubt it.

Dickson: No, I wouldn't doubt that if I were you. I wouldn't doubt that; hint, hint, nudge, nudge, wink, wink. Really, if bacteria can mutate and viruses can mutate and parasites can mutate, why can't we mutate?

Aidan: We do mutate.

Dickson: Not only do mutate, do we all look alike at this table? We're all mutants. You're sitting here with a bunch of mutants or an whole office full of mutants.

Vincent: Some of us are resistant to some infections. They survive and propagate and in the next round of infection they are also resistant.

Dickson: Exactly, exactly. To bad you can't program that into your game because if you could, then you could play a game where you're the virus and I'm the person and let's see who can evolve faster. I can outthink a virus, but the virus can out divide me. So you have these thinking processes viruses these dividing processes. Now you've got a game. Now you can do this for money. In fact it's called Merck.

Aidan: Right.

Dickson: We tried to outsmart the influenza virus, but we're not doing too well.

Aidan: When I was playing this game I saw some comments from people who have played this before. They said it was depressing to see a country close early on in the game. For example Madagascar. All they have is a shipyard to infect them by. You know it's an island, so the virus can't travel across the ocean. It's not too realistic at all.

Dickson: Right.

Aidan: Madagascar is right by Africa.

Dickson: I wouldn't want to try to swim it if I was you.

Vincent: A bird could carry the virus. Could a mosquito fly that far?

Dickson: No. That's really far for a mosquito.

Vincent: I think you've said the farthest a mosquito can fly is 25 miles.

Dickson: Yeah, that's the New Jersey salt marsh mosquito can travel 25 miles.

Vincent: But the Madagascar mosquito can't.

Dickson: No, I wouldn't bet on that one. That's why there are so many endemic species in Madagascar, that you don't find anywhere else, like lemurs. They're not found anywhere else but there. Or the baobab tree. You've seen that TV show called Madagascar, haven't you?

Aidan: Oh, you mean the movie?

Dickson: Looks like there's a new one coming out now.

Vincent: Anything else about Pandemic II?

Aidan: Nothing else.

Dickson: Wait a minute. Wait a minute. What do you get if you win?

Aidan: Actually I never won. I was going to cause I infected everything, but I accidentally hit Back and it rebooted me.

Dickson: Darn, just at the last minute. But what if you didn't hit Back, what would you have won?

Aidan: Since the vaccine had like a thousand days to complete, basically never. I would have wiped out the human race.

Dickson: Right, and then?

Aidan: I don't know what would happen, but comparing it to when I lost, it said that you have wiped out everyone you can, but the vaccine prevented you from wiping out anyone else. So I would assume that when you win it would say, "Congratulations, you have wiped out the human race." It would post the score and say you can play again.

Dickson: Ok. So you get your name at the top of a list and you're the hero virus or bacteria for

the world. How many people play this game, do you think?

Vincent: That's a good question. It's what's called a flashed based game, an on-line game. You just play them in your browser. I was looking at the comments and it looks like a lot of people play them. You play this game and you learn something. It's the best kind of game because as you play you absorb knowledge. I've noticed Aidan learning things about infectious diseases from this game, so it's a really great game.

Dickson: Right. Plus it comes at us from a unique perspective. How many of us teach from the perspective of the virus, or bacteria or parasite? None of us. I can tell you right now that we all come at it from the human standpoint.

Vincent: Right and this game treats it the other way.

Dickson: Exactly the opposite. I think if you're not the parasite, you don't understand the disease. I think that's a wonderful perspective to start with because (A), you're never going to kill off everybody and (B), the biggest fear is from these very fast spreading viruses which infect multiple age groups and produce lots of symptoms right away. We're talking now about influenza and that's the biggest fear on the planet right now. To have a game that simulates the spread of influenza based on transport and airplanes and ships and all those things; that's a wonderful deal. Maybe I'll start playing some of these games.

Vincent: The thing with this game is that it's fun. It's an adversarial game that kids and adults enjoy, and you learn in the process. We have one more we'll talk about very briefly, then we'll wrap it up. What's the third game?

Aidan: It's called BioShock.

Vincent: BioShock. What's BioShock? You have to buy this game, right?

Aidan: Yes, you have to purchase this game. Sorry. BioShock is about plasmids.

Dickson: What's a plasmid? It's about plasmids? That's a rough start for a game.

Vincent: Do you know what a plasmid is?

Aidan: Plasmid is DNA.

Dickson: Most kids wouldn't know that, would they?

Aidan: No.

Vincent: But it's a nice game. What do you do with plasmids in this game?

Aidan: This is kind of unrealistic. Plasmids alter your DNA. That's a weird look, Dick.

Dickson: Thanks very much for that. I'm waiting for the drop of truth, here.

Vincent: They alter your DNA. That's OK.

Dickson: They do alter your DNA, integrating into it, perhaps.

Aidan: In this game the plasmids alter your DNA so you can physically battle your adversaries.

Dickson: How do they give you attributes? That's interesting.

Aidan: For example there's an electric plasmid where you direct plasma, I guess. You can zap.

Dickson: This has a superhero component to it.

Aidan: Yes. There's one where you can burn people. Another lets you shoot bugs from your arm.

Dickson: Like Spiderman.

Aidan: Yeah. Little like hives appear on your arm that you can see while you're walking around and you can shoot wasps at people and if they annoy you, you can blow them away with a shotgun.

Vincent: The concept is based on some reality, that you can put DNA into organisms, which take it up and express it. Of course this brings in fantasy, which is fine; we need fantasy, right?

Aidan: The story line of the game: this man is in a plane that crashes into the Atlantic in 1961. He's the only one that survives. He finds this tower in the middle of the water. He has to swim to it. There's an elevator in it that he takes that brings him to a city under water, which is called Rapture. You go into the city and you can pick up this radio. This guy gives you directions and advice over the radio about where to go and what to do. He ultimately wants to take over the city, but you don't know that because he's tricking you. You think his name is Atlas, but his real name is Frank Fontaine. Whoever plays this game I'm sorry for giving that away. He basically guides you along this city and explains how science is unstoppable in the city, how the Government won't bother you and you can develop anything.

Vincent: Were that only true today.

Dickson: Hah.

Aidan: I thought dad would love that.

Dickson: Maybe your dad is Frank Fontaine!

Aidan: It's controlled by a man named Andrew Ryan and he runs something called Ryan Industries that basically develops these plasmids. In addition to the plasmids, there are Tonics, like Physical Tonics, and Engineering Tonics and they can help you. For example my favorite one is the Camouflage Tonic. If you stand still for a few seconds, you go invisible, just like a chameleon. So you basically do rounds and in your first one you inject yourself with an electric plasmid. There are a lot of side effects and basically he passes out. So when he wakes up: you guys know what gene splicers are, don't you?

Vincent: We are, we are.

Aidan: I'm glad I asked that. So the citizens of Rapture are using these plasmids normally. So instead of cooking food they can heat it by holding it in their hands. They use it for everyday situations.

Vincent: That would be a heat plasmid.

Aidan: Yeah, a fire or heat plasmid.

Dickson: That would be useful in the woods, but not so good if you are a politician and have to shake a lot of hands. Sorry, but I'm just taking the down side here, but I like it.

Aidan: So these are used every day. These plasmids alter their lives completely, for the better

and the worse. They drove the city to madness. Your biggest threat while walking around the tunnels are the Big Daddies. These are people who are physically altered to be bulkier and stronger than the other people. They have these suits drilled on their hands and they basically protect these little sister as long as they have Adam. Adam is genetic material that basically runs Rapture. In the game you use Adam like a DNA or genetic currency that's used to buy plasmids and slots to put plasmids in.

Dickson: So what did Adam say upon seeing Eve? " Madam I'm Adam." Do you know what that is?

Aidan: It's a riddle.

Vincent: No, it's a palindrome.

Dickson: It's a genetic thing: you can read it the same frontward and backwards.

Aidan: Did you just think of that?

Dickson: No, it's an old one.

Aidan: That's probably where that came from in the game.

Dickson: Maybe.

Aidan: So the goal in Rapture now that it has fallen into madness and everyone is butchering one another is to get the most Adam and whoever has the most Adam is the strongest. Unfortunately the person with the most Adam is Ryan. Atlas tells you to kill Ryan. You use a golf club to kill Ryan and then you take this computer chip and upload all the Adam to Atlas. Then you realize Atlas is Frank Fontaine. So he has all the Adam now and that is bad. The Little Sisters are protected by the Big Daddy and you have to kill the Big Daddy to get to Atlas.

Vincent: It's interesting that so many games are based in science now, right?

Aidan: What I love about BioShock is that you can make the environment work for you. For example the telekinesis plasmid lets you pick things up.

Dickson: Without actually picking them up; you just think about it. Got it.

Aidan: Right. Another one of your weapons is a grenade launcher and you can use it to put proximity mines on a propane tank, then pick it up with telekinesis and throw it at Big Daddy blowing him up so you can get to Atlas and get all the Adam. You can make everything work for you.

Vincent: Excellent, just like the real world. Another time we'll talk about another game called Spore. Have you heard about that?

Dickson: I have and in fact a lot of scientists are upset about that game. You want to know why, Vince?

Vincent: Why.

Dickson: Because their names are being used in the game and they weren't told about this and they guy who is selling the game is using their names to sell the game and that's not good. That's what I've heard.

Vincent: The concept of the game is very interesting.

Dickson: The concept of the game is very good because it concerns evolution.

Vincent: That's too bad. You haven't played Spore, right?

Aidan: I haven't played it.

Vincent: When you've played it, you'll have to come back and tell us about it.

Dickson: Have you ever played Myst?

Aidan: Yes.

Dickson: We loved Myst and there's no violence in Myst, right?

Vincent: We loved Myst. It was a hugely popular game even without the violence.

Dickson: It's a thought game where you're trying to find out where that next door was.

Vincent: You know, Dick, it's very easy to make a violent game. To make a non-violent game thats interesting, is hard.

Aidan: No one likes thinking games.

Vincent: It sold millions of copies and it's a thinking game.

Aidan: How many copies did World of Warcraft sell?

Dickson: Ask me what my son does for a living.

Vincent: What does your son do?

Dickson: He does voice-overs for video games. You've probably got a few video games that have my son's voice on. He loves playing the villains; he loves them.

Vincent: We need to get his voice for This Week on Virology.

Dickson: He's a voice in Grant Theft Auto III.

Vincent: We don't let **Aidan** play those. They're too violent. Ok, we're going to wrap up our show after a few things. We have a science podcast of the week. You can have picks, too. Do you have any?

Dickson: I don't have any.

Vincent: We can have two, if you have. Mine is called Microbiology Bytes. It's a podcast by a virologist whom I know, A.J. Kahn, in the UK. These are very short, three to four minute, podcasts about viruses, bacteria, parasites and fungi. Every now and then he has some video thrown in as well. I like it. They are directed at students, but they are very straight forward and quick, not like our podcasts that can go on for some time. We are now listed at SciencePodcasters.org which is run by Dr Ginger Campbell who has her own podcast, BrainScience podcast, which we picked last time. She is collecting science podcasts and she listed us now, which is great. We are also on the New and Noteable List at iTunes. If you go to the podcast listings in iTunes and select Science and Medicine, there's a bar at the top for New and Noteworthy and we are there along

with the fifteen other new and noteworthy topics. So that is very nice.

Dickson: That is nice.

Vincent: Well, Aidan, thanks for coming today. Did you enjoy it? We enjoyed hearing about it.

Dickson: Yes, really enjoyed it.

Aidan: Yes.

Vincent: Maybe we'll have you Skype in from home sometime in the future. It's easier than coming in. I know you have a day off from school today and that's why you are here. Remember if you have questions; if you want to tell us what to talk about, send us an email at TWIV at TWIV.TV. You've been listening to This Week in Virology. Thanks for joining us. See you next time.

Dickson: See you next time; that's right.