

History

Antiviral, antifungal and antiprotozoal agents in the cinema

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SUMMARY

Among the antimicrobial agents, antibacterials are the most frequently mentioned in cinematographic plots. Nevertheless, it is not uncommon to come across other antiviral agents, especially antiretrovirals and antiprotozoals. We analyzed the presence of antiviral and antifungal agents in different commercial films, both when they were merely mentioned in passing and when they played a major role in the film. This review essentially aims to address the historical portrayal of these agents in film and to list their appearances. The fictional treatments that appear in some films are not addressed.

Key words: Cinema - Antiinfective therapy - Antimicrobial agents

Antivirales, antifúngicos y antiprotozoarios en el cine

RESUMEN

De todos los fármacos antimicrobianos, los antibacterianos son los que con más frecuencia se encuentran en los argumentos cinematográficos. A pesar de todo, no es raro encontrar otros fármacos antivirales, sobre todo antirretrovirales, y fármacos antiprotozoarios. Aquí analizamos la aparición de éstos y otros antifúngicos en distintas películas comerciales, tanto cuando sólo se mencionan como cuando desempeñan un papel fundamental en la película. El objetivo de esta revisión básicamente es valorar aspectos históricos y de enumeración. No se tratan aquellos tratamientos de ficción que aparecen en algunas películas.

Palabras clave: Cine - Tratamiento enfermedades infecciosas - Antimicrobianos

ANTIVIRAL AGENTS

The antiviral agents most frequently mentioned in the cinema are undoubtedly the antiretrovirals. Films with characters infected with HIV and with AIDS are numerous (1). From the point of view of therapy, they can be divided into three groups: i) those which recount stories that take place before the introduction of zidovudine; ii) those that

reflect the times after the introduction of the drug; and iii) those whose plot includes combination therapy.

The Cure (1995) portrays the hope raised in people with AIDS, and their friends and families, after an effective treatment was developed. In the film, a boy who is inspired by the plot of *Medicine Man* (1992) is searching for a plant remedy for his friend who is HIV-positive. As could happen

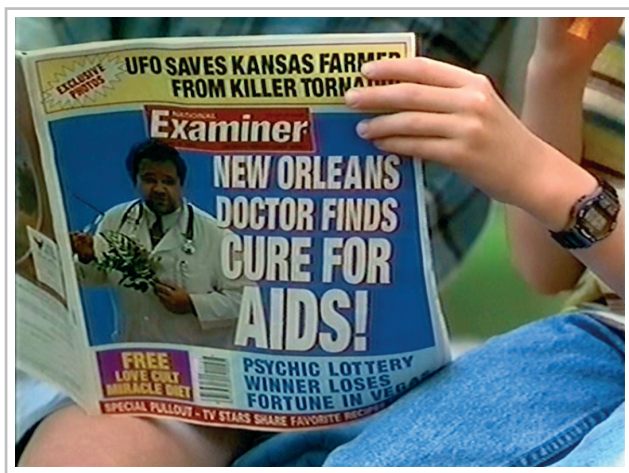


Figure 1. *The Cure* (1995): A sensationalist news story about an assumed cure for AIDS.

in real life, one of the plants tested proves to be toxic. The film also explores the false expectations that some people whose only interest lies in their own pockets may offer to patients with incurable diseases. In this case, a physician from New Orleans was brazenly offering a miraculous treatment for AIDS on the front page of a sensationalist newspaper (Fig. 1). Clearly contradicting the rules of good medical practice, he did not release any information about what the product contained; only he knew this.

The AIDS film par excellence is *And the Band Played On* (1993), a docudrama narrating the very beginnings of the pandemic, but not the introduction of zidovudine (AZT). In this film, we learn of the urgent need to have effective drugs to treat the growing number of AIDS cases.

However, in *Philadelphia* (1993), which was released the same year, the main character, the lawyer Andrew Beckett (Tom Hanks), had already received AZT. This film portrayed the now unusual way in which AIDS appeared at the beginning of the late 1980s–early 1990s and the scarce efficacy of antiretroviral monotherapy (2). It is noteworthy that Andrew's partner (Antonio Banderas) considered it essential for Andrew to take his medication and that at one point in the film he received AZT intravenously.

Combination therapy changed the prognosis of the disease, and HIV infection has now become a chronic illness. This change is reflected in the social interest in AIDS that has been developed in the cinema, and in this sense the number of movies about AIDS and HIV infection has diminished in recent years. The introduction of penicillin had the same effect in its day, with films involving syphilis. *V.D.* (1961) was probably the last of the films to address the dangers of sexually transmitted diseases, even though by that time penicillin was already available.

The Argentinean film *A Year Without Love/Un año sin amor* (2005) takes place in 1996, the year of the Vancouver conference where the effectiveness of triple therapy was established, but the character does not want to start taking it. This film has many interesting aspects related to HIV infection. Pablo Pérez (Juan Minujín), the main character, is infected by HIV and when his CD4 cells reach 310 cells/mm³ his doctor advises him to take AZT, but he refuses to do so and prefers to continue taking vitamins and plant products. At this point, a conversation takes place that is not to be missed: “*When do we start the medication?*” / “*I’m not going to take AZT.*” / “*That’s a pity because the cocktail of three drugs [AZT, didanosine (ddi) and indinavir] (Fig. 2) is giving results.... While you’re thinking about it we’ll do the paperwork*”.

In *The Adventures of Felix/Drôle de Félix* (2000) in the doctor's office the character has a conversation with a woman. She is worried because she is about to start the triple therapy and he tells her that he is taking it and that he is doing very well. Among the drugs he is taking is *Combivir*[®] (zidovudine plus lamivudine). A third person, who comes out of the doctor's office, enters the conversation and comments that tetra therapy has failed for him. He says that he has started a five-drug combination and that although his defenses have not improved he feels better.

The Constant Gardener (2005) shows an HIV-infected breast-feeding woman who is treated with tablets of nevirapine, a drug that belongs to the non-nucleoside reverse transcriptase inhibitor class of antiretroviral agents. In this case nevirapine may prevent mother-to-child transmission during breast-feeding (nevirapine passes into human breast milk). However, if this antiretroviral is administered as monotherapy, HIV rapidly develops resistance. Therefore, the recommended therapy consists of a combination of three or more nucleoside analogues with a proven synergic or additive action. The use of this drug is mentioned in the film,



Figure 2. *A Year Without Love/Un año sin amor* (2005): Triple therapy for HIV/AIDS [AZT, didanosine (ddi) and indinavir].

but it is not explained whether it is used alone or in combination with other antiretroviral agents (3, 4).

The efficacy of triple therapy is seen in *Runaway Jury* (2003), where an HIV-seropositive individual, attempts to conceal his infection because he feels well after taking treatment with indinavir, zidovudine and lamivudine. However, later he is blackmailed about his condition to obtain his vote on a jury.

Some films contain plots that could influence public opinion. In *The Next Best Thing* (2000), there is a comment assessing the effect of antiretroviral therapy: "If you want to see the effectiveness of antiretroviral medication, stop taking it". *Red Ribbon Blues* (1996) addresses one of the problems of antiretroviral treatment, *i.e.*, the elevated cost of antiretroviral drugs. *The Constant Gardener* (2005) harshly criticizes the dishonesty of the suppliers of nevirapine since it was supposed to be delivered at no cost to the patient. By serving their own ends, they were not serving the public because they deprived the patients of their drugs while keeping the money. Similarly, among many other aspects related to AIDS, *Yesterday* (2004) addresses the catastrophic health situation in Africa, in particular in South Africa. The film speaks more about the treatment of the infection than the possibility of accessing treatment.

One of the problems that has plagued antiretroviral treatment over the years is its complexity: many pills and often. This is reflected in the treatment schedules that patients should have, as reflected in *Philadelphia* (1993) and in *Year Without Love/Un año sin amor* (2005). The latter film also clearly portrays the poor acceptance of some of these antiretroviral drugs by patients: "They call it a cocktail to make it sound nice and so that you imagine a delicious crystal glass of nectar with two little cherries. Just seeing the pill makes me sick. Yesterday I waited for 15 minutes before it had completely dissolved. I tried taking it with different sodas and juices so that it would be better, but I think it dissolves faster in water. Strangely, I love the AZT pills, it's like swallowing a work of art from the nineties, a charging unicorn greets me." In the same film, we become keenly aware of the treatment schedules that have to be followed by patients with HIV: "The CD4 values remain stable; you will continue with the treatment. In three months you come back to see me; you get your analyses and then you bring me the results." *The Adventures of Felix/Drôle de Felix* (2000) shows the number of pills these patients must take. The availability of new treatments is one of the reasons that make people emigrate from poorer to richer countries. This is what is seen, together with the treatment failure, in *The Other Side/Del otro lado* (1999). The character is HIV-positive and plans to go to the United States to re-

ceive new drugs since those given to him in Mexico are failing.

Other antiviral agents are uncommon in the cinema, not counting the fictitious ones, which are not analyzed here and will be discussed in a later article. In *Philadelphia* (1993), besides zidovudine, Andrew Beckett (Tom Hanks) takes acyclovir and ganciclovir. However, despite the latter antiviral, he loses sight in his right eye due to an infection caused by cytomegalovirus (Fig. 3).

ANTIFUNGAL AGENTS

Antifungal agents are not commonly seen in commercial cinema, and when they do appear they tend to be merely mentioned in passing.

Antifungal azoles are present in *Courage Under Fire* (1996), where they are sold in a pharmacy; in *Smilla's Sense of Snow* (1997), Smilla (Julia Ormond) recommends that her stepmother should use miconazole for athlete's foot, and the main character in *Princesas* (2005) is a prostitute who buys intravaginal ovules of clotrimazole. In *Philadelphia* (1993), Andrew Beckett takes ketoconazole for his candidiasis. Polyene antibiotics are mentioned in *Cachorro* (2004), in which a dentist prescribes oral nystatin for candidiasis.

Pneumocystis pneumonia has historically been one of the leading causes of disease among persons with AIDS. The introduction of highly active antiretroviral therapy has brought about dramatic declines in the incidence of AIDS-associated complications, including pneumocystis pneumonia (5). One of the characters in *Boys on the Side* (1995) is Robin (Mary-Louise Parker) who has AIDS. In the course of the plot she develops two bouts of pneumonia related to her HIV infection. She recovers from the second one after receiving treatment with pentamidine. As another character, Jane Deluca (Whoopi Goldberg), comments: "It was

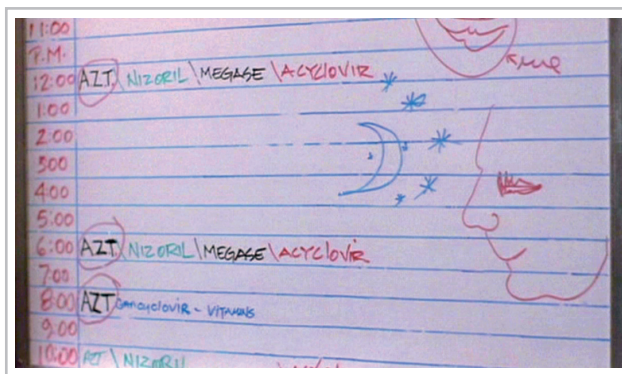


Figure 3. *Philadelphia* (1993): AIDS treatment.

rough going in there. But she managed to pull herself through, you know. And the next day the pentamidine kicked in, so....”

ANTIPROTOZOAL AGENTS

The impact of malaria on public health has been enormous. This was even more the case in the past, when it also affected some countries now considered first world countries. There are many commercial films in which malaria is seen to have a greater or lesser impact, from being either a casual mention or central to the plot (1). Its presence in documentaries and its use as a public health tool has also been reviewed (6).

Quinine was the first drug prepared to combat malaria. It was first obtained at the beginning of the 19th century by Caventou and Pelletier, who isolated it from the bark of the cinchona tree, which was introduced into Europe in the 17th century by the Jesuits, who had seen how it was used by the Peruvian natives (7). The fact that it was obtained from the cinchona tree sometimes influenced its scarcity (8). The importance of the synthetic procedure used to produce quinine is reflected in *A Trade Secret* (1915), by William Haddock. This is a silent film in which the main character, a scientist, obtains this drug synthetically and his assistant steals the procedure from him (9).

The presence of quinine in films focuses on the treatment and prevention of malaria. Nevertheless, its anti-pyretic properties have been reflected in some films, such as *They Came to Cordura* (1959), in which it is used to treat the high temperature that characterizes typhoid fever (Fig. 4). In *The Torch* (1950), it was used against influenza, and in *Mogambo* (1953) to combat a febrile reaction to tsetse fly vaccine (?).

During WWII, malaria vented its anger on the soldiers who were fighting on fronts located in endemic zones, as is shown in *Patton* (1970), where we see how the illness dec-



Figure 4. *They Came to Cordura* (1959): “What’ll take the fever down?”/ “Quinine, rubbing alcohol and water”.

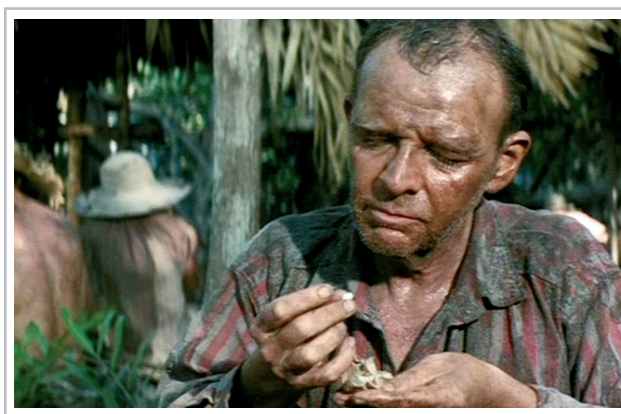


Figure 5. *Papillon* (1973): Prophylactic quinine.

imated the troops of Marshal Montgomery (Michael Bates) in Sicily. Quinine has thus been present as a therapeutic and prophylactic agent in many films whose plot takes place during this war. Some movies filmed during those times portray the perceptions about this alkaloid at the time. Some examples of films that portray the use of quinine in different places during the war include: *Never So Few* (1959) and *Objective Burma* (1945) in Burma; *Cry ‘Havoc’* (1943), *Bataan* (1943) and *The Eve of St. Mark* (1944) in the Philippines; *Paradise Road* (1997) in Sumatra; *Three Came Home* (1950) in Borneo; and *None But the Brave* (1965) in the Pacific Islands. Quinine was not only used in Asian countries, but also in Europe as is mentioned in *Captain Corelli’s Mandolin* (2001). In *Bataan* (1943), the need to take the effective prophylactic dose is emphasized.

Films of other genres whose plots take place in locations where malaria is or has been endemic also reflect the consumption of quinine, as is the case of *Appointment in Honduras* (1953) in Central America; *María Candelaria* (1944) in Mexico; *Papillon* (1973) (Fig. 5) on Devil’s Island (French Guyana); *Mambí* (1998) in Cuba; *White Cargo* (1942) and *The Sins of Rachel Cade* (1961) in the Congo; *Nirgendwo in Afrika/Nowhere in Africa* (2001) and *Out of Africa* (1985) in Kenya; *When Strangers Marry* (1933) in Malaysia; *Red Dust* (1932) in Indochina; and the western *They Rode West* (1954) in the USA. This western shows that malaria was endemic in the USA, and it was only controlled at the end of the 1940s (10).

One of the side effects of quinine is visual disturbances, and these are mentioned in *Nirgendwo in Afrika/Nowhere in Africa* (2001), “...if you take quinine every day you will end up blind,” and in *The Nun’s Story* (1959), where the doctor who is in charge of training Sister Luke (Audrey Hepburn) in tropical medicine has vision problems as a re-

sult of taking quinine over a long period of time for prophylactic purposes while he was in the Congo.

The limitations of quinine against malaria are explored in *Ingiusta Condanna/Guilt Is Not Mine* (1952). In this film, an Italian doctor finds an effective treatment for malaria, which he uses without authorization. He is sent into jail until he is able to demonstrate the efficacy of his antimalarial agent.

Excluding fictitious pharmaceutical products, other drugs to combat malaria have also been shown in films. In *Von Ryan's Express* (1965), the main character searches for *Atabrine*[®] quinacrine to treat allied prisoners of war who have malaria in an Italian concentration camp. *Atabrine*[®] produces a yellow pigmentation of the skin and, as a result of this Sherlock Holmes (Basil Rathbone) discovers that an individual had malaria in *The Woman in Green* (1945).

The first effective treatment against sleeping sickness was suramin, or *Germanin*[®], introduced in 1922 (11). Its discovery was fictionalized in *Germanin – Die Geschichte einer kolonialen Tat* (1943), clearly a propaganda film of the Third Reich.

At the beginning of the last century, Dr. Mazza investigated different aspects of American trypanosomiasis in Argentina. By the end of the 1930s, he introduced bis quinaldine, or Bayer 7602, for the treatment of the acute phase of Chagas disease (12). The life of Dr. Mazza was made into a film, *Casas de fuego/Houses of Fire* (1995) (Fig. 6).

On occasion, other types of antiprotozoan agents have appeared in the plot of some films. Vaginal metronidazole is regularly used by a prostitute in *La vida alegre* (1987) whenever she has a bout of trichomoniasis.

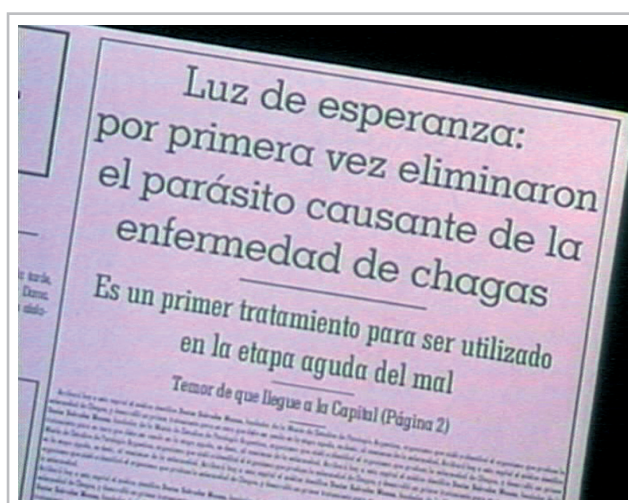


Figure 6. *Casas de fuego* (1995): First treatment of the acute phase of Chagas disease.

CONCLUSIONS

There are few films in which the antimicrobial agents addressed here have had much significance to the plot. With regard to references to antiretrovirals, for the reasons mentioned and because they are available, the following are key references: *A Year Without Love/Un año sin amor* (2005), *Philadelphia* (1993), *The Adventures of Felix Drôle de Felix* (2000), *The Cure* (1995) and *Yesterday* (2004). In films in which antiprotozoal drugs are featured, the following are of interest: *Nirgendwo in Afrika/Nowhere in Africa* (2001), *Casas de fuego/Houses of Fire* (1995), *Germanin – Die Geschichte einer kolonialen Tat* (1943), which can be found in video or DVD format, the latter in German. *Casas de fuego/Houses of Fire* (1995) is of the biopic genre that glorifies national heroes (13) and *Germanin* (1943) is one in which history is revised for political purposes. Both films provide us with information about rare diseases in Western countries (14).

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