# ‘THROUGH THE EYE OF THE…’

**ERIC C.M. VAN GORP**

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**ARTES, SCIENTIA, VERITAS; NEC SCIRE FAS EST OMNIA**

- arts, science and truth; one cannot know all -

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# 'THROUGH THE EYE OF THE...'

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SPEECH

Delivered on accepting the endowed chair in
Clinical Virology, in particular, exotic virus infections,
at Erasmus MC, Faculty of Erasmus University Rotterdam
on November 15, 2013

by

ERIC C.M. VAN GORP

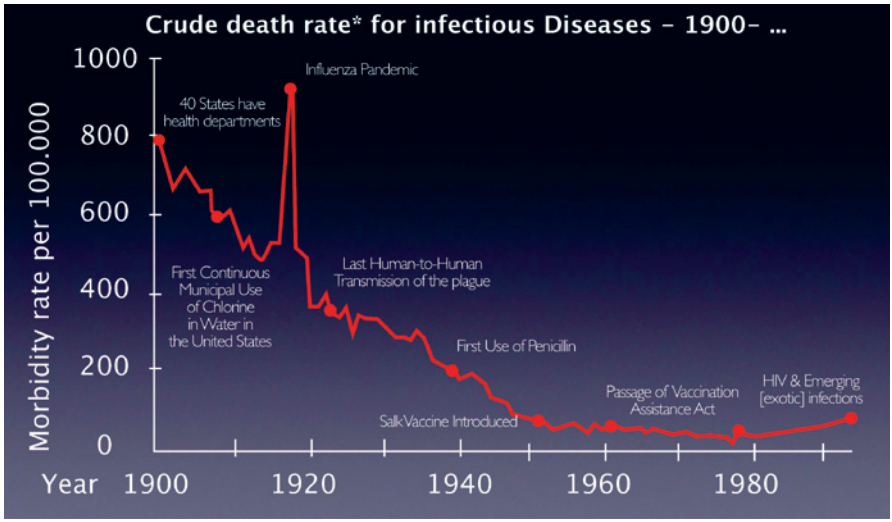
*Your Magnificence the Rector, Dean, members of the Board of Governors of Erasmus University, members of the Board of Directors of Erasmus Medical Centre, the Board of the Erasmus University Trust Fund Association, audience, family, friends, patients, colleagues.*

## Introduction

Today, I have the honour of delivering my speech at this special place and under the watchful eye of Desiderius Erasmus. Erasmus held the opinion that each truth is part of a more complex reality and that several truths can exist alongside each other. Erasmus understood that each truth is coloured, so also the generally accepted truth, which is all too often proclaimed as the absolute truth.

Our current generally accepted truth flows from a temporarily shared and therefore changeable perspective: the eye of time. In my speech, I want to take you with me, in line with the ideas of Erasmus, in the realization that in science nothing should be taken for granted and that the unknown must not be feared.

Patients' stories are an inexhaustible source of inspiration to me. The influence of patients has run like a thread throughout my scientific career. The stories of these patients have helped us to better understand diseases and their progression. The story of one patient in particular has had a strong impact on my career. In this speech, I will call her Mrs A. All things considered, it is Mrs A who has brought us together here today.




Infectious diseases still – and increasingly – form a major health risk, not only in less developed countries but also to an increasing extent in developed countries, including the Netherlands. The illusion that infectious diseases have practically been banned from the world was abandoned by us more than thirty years ago. That illusion was created because of an underestimation of the complex dynamics between infectious diseases, man and the environment, in combination with an overestimation of the power of our knowledge, knowledge acquired from science.

In the past decades, we have witnessed various outbreaks of infectious diseases: the HIV pandemic which, on a global scale, is still not under control, the Q fever outbreak in the Netherlands, the outbreak of the Norovirus and multi-resistant micro-organisms in health care institutions, including hospitals. We have also witnessed how new viruses such as the MERS-Coronavirus and a new influenza virus, the H7N9 virus, formed a


new threat in 2012 and 2013. And then there is the large group of exotic virus infections, a fast growing subcategory of infectious diseases, both in terms of geographic spread and absolute patient numbers.

Until now, we have considered exotic virus infections in the Netherlands to be imported diseases caused by viruses which are able to reach our country from far-away tropical countries. But this view seems to have been outmoded now as exotic infectious diseases have also recently occurred on the European continent. The outbreak of the Cikungunya virus in northern Italy in 2007, the recent Dengue outbreak in Portugal in 2013 and the spreading of the West Nile virus in Europe are examples of this.

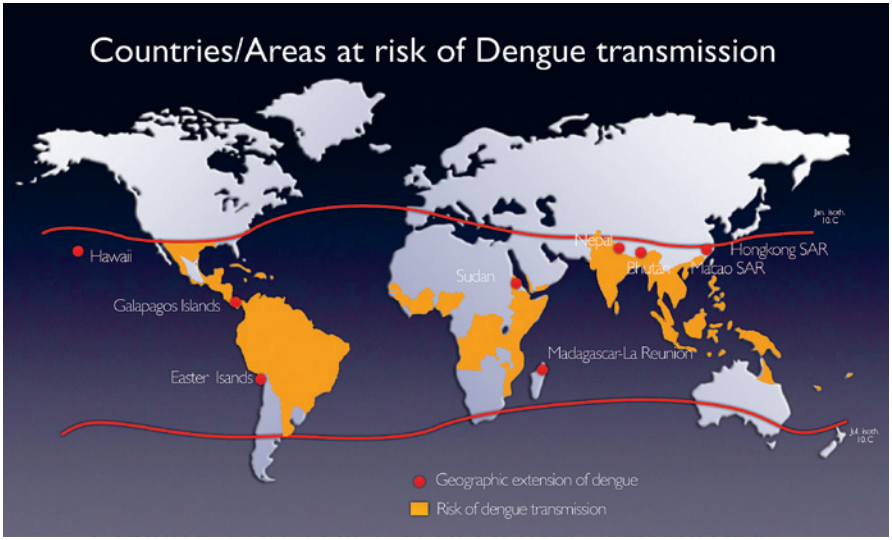
In 1990, the beginning of my internship, I worked at the infectious diseases department of the Amsterdam Medical Centre under the supervision of Professor Peter Speelman. Frequently patients who had returned from tropical countries with symptoms of fever were admitted to our department. Especially the patients with fever and skin rash invariably marked the beginning of an interesting search for the possible cause of the infection.

The puzzle pieces fall into place when the combination of factors increasing the risk of infection is made clearer; the patient's medical history, recent destinations and special travel circumstances, contact with fresh water and, importantly, contact with animals. Did other people in the patient's environment become ill, was the patient vaccinated and was malaria prophylaxis used? These are all important questions, and all pieces of the puzzle.


On a Wednesday in May 1991, three days after her return to the Netherlands from a trip to Indonesia, Mrs A became ill. She developed a fever and skin rash with spots that fade under pressure. These were the complaints she presented when she visited her GP. A day later, the spots that had faded under pressure had changed into tiny pinpoint blood spots. The GP therefore referred Mrs A to the hospital where I, as a young doctor, could study this patient's problem. At the time, I had no idea that Mrs A's disease would play a decisive role in my later career and development as a doctor and researcher, but it was this patient in particular who put me on a track that would take me to many places in the world. I was fascinated by the riddle of the patient with fever and skin rash.

Meanwhile, how did Mrs A fare? She developed suspected severe haemorrhagic fever which turned out to be the result of a Dengue infection, also called a Dengue haemorrhagic fever. In Bahasa Indonesia, the meaningful term 'demam berdarah' is used. This is a form of Dengue which occurs with bleeding, first at the skin but eventually also leading to serious internal haemorrhaging, shock and organ dysfunction. Each year, millions of people run the risk of getting a Dengue infection, the severe form of Dengue claiming tens of thousands of victims annually all over the world, including a relatively large group of young children.

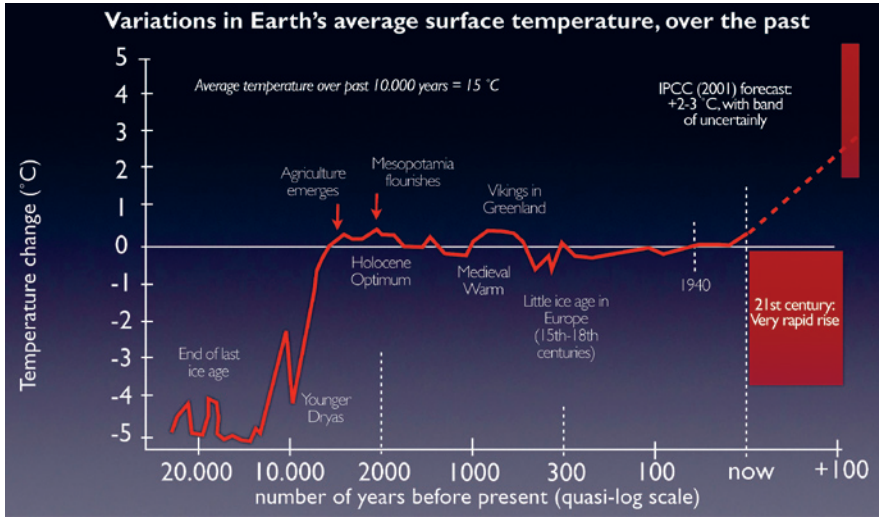
Dengue belongs to a large group of viral haemorrhagic fevers, often exotic viruses, which can cause a similar serious clinical picture.



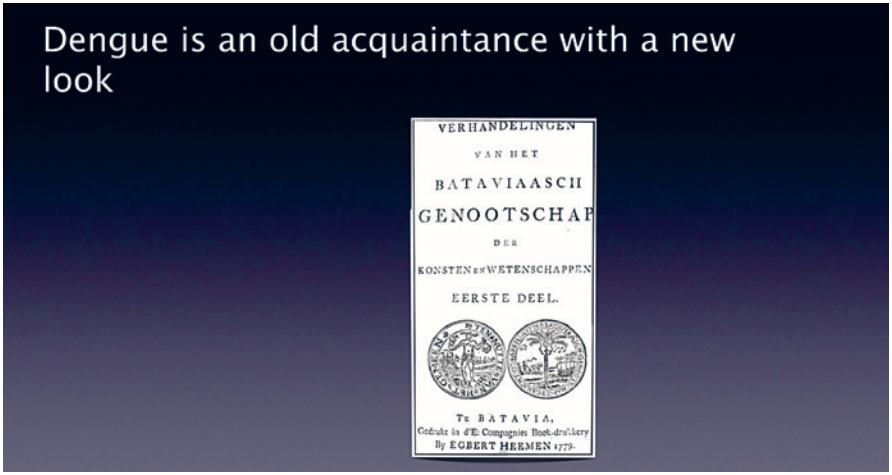

Our patient, Mrs A, had a long period of disease, but in the end made a full recovery through supportive intravenous therapy; through the eye of the IV drip needle.

At present, Dengue is the main viral infectious disease transmitted by mosquitos worldwide. In the past two decades, the epidemiology, or spreading, of viral haemorrhagic fevers has undergone significant change due to a combination of factors in which climate change, living circumstances, increasing urbanization and increasing passenger traffic play an important role. Infectious diseases can spread quickly as a result of intensive passenger traffic. However, most infectious diseases are capable of

spreading quickest in areas of great poverty and poor living circumstances. Poverty is, and will continue to be, the main breeding ground for infectious diseases.




Dengue has since become an 'old familiar disease', an old condition with a new look. In the 18th century, the clinical picture had already been described by Dutch doctors working in Indonesia. The typical joint pains or 'knokkelpijnen' so typical of Dengue caused doctors to describe it as 'knokkelkoorts' or 'knuckle fever', the name by which this infection is still known today.



However, the riddle of the patient with fever and skin rash has not been solved yet. Important questions are: how can we explain that some infectious diseases sometimes manifest themselves with severe haemorrhage, and furthermore: why do some patients develop an innocent clinical picture with fever whereas others die from the effects of serious viral haemorrhagic fever? These are important questions, the answers to which need to be found in both patient-related and basic scientific research, or to put it another way: through the eye of the pipette needle.

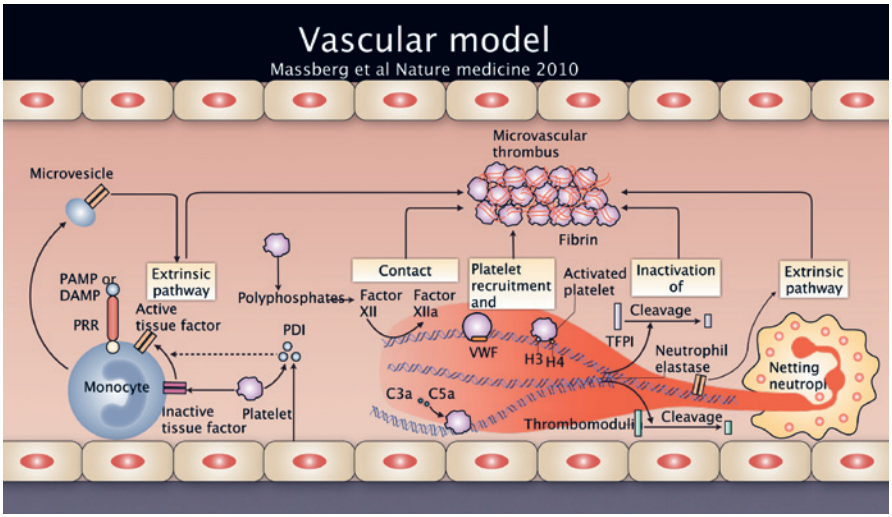
The riddle of the patient with fever and skin rash was the motivation for my postgraduate research, in which we investigated the causes of haemorrhage in patients with serious haemorrhagic Dengue infection in Semarang, Indonesia.

Together with our colleagues in Semarang, we examined fifty seriously ill young children who had been admitted to the children's intensive care of the Dr Kariadia hospital in Semarang. In the acute stage, patients can die from the effects of severe haemorrhaging. In Semarang, thirteen out of the fifty children died from the effects of the infection, in spite of intensive treatment. This high mortality underlines the gravity of the clinical picture.

Better and more specific treatment is needed, but in order to be able to offer this treatment, we need more knowledge. In this study, we could prove that the patients who survived the acute stage with haemorrhage and possible shock, did not die from haemorrhage but from the effects of a strongly activated coagulation system, in other words, they died from the effects of thrombosis. At first sight, this seems contradictory.

The *pas de deux* between the blood coagulation system and the immune system is an important defence mechanism of the body. But in some cases, as in serious infections, the *pas de deux,* the interaction, can be so strong as to lead to 'derailment' of the system: instead of offering protection, damage is done to several organs, resulting in death. You can imagine that interfering in this delicate balance, which is indeed theoretically possible, is extremely difficult in practice. This dilemma is one of the most important research questions that we are trying to answer in our current research.

My PhD research led to follow-up research in which we paid more detailed attention to the haemorrhaging and its relationship with the body's protective response as the infection progressed. This research was carried out by researchers from Indonesia and the Netherlands: Catharina Suharti, Tatty Setiati, Ronne Mairuhu and Penelope Korake. In studying the Dengue virus, they specialized in specific aspects of the serious infections. At present, Cox van de Weg is engaged in this research and has developed a unique laboratory model in which she infects vascular wall cells with the Dengue virus. The vascular wall cell plays an essential and leading role in the infection. This model enables us to make a detailed study of the haemorrhaging at cell level in the earliest stage of the infection. In this way, we hope to find answers to the crucial question of which factors are decisive for the progress of the disease.



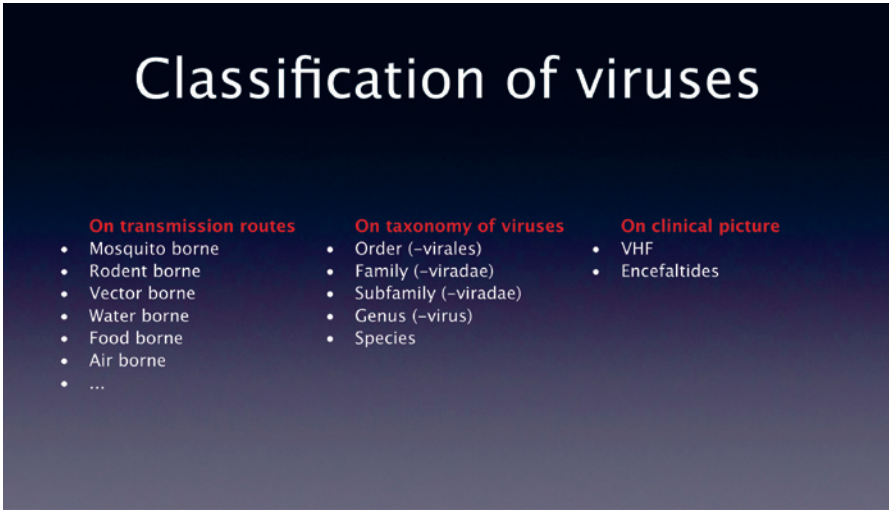
At present, there is no effective treatment with antiviral drugs for Dengue or for other viral haemorrhagic fevers. For most infections in this group, with the exception of the yellow fever virus, there is no effective vaccine either. This underlines the necessity of further research even more; through the eye of the pipette needle.


At the Viroscience department of Erasmus Medical Centre, EVI is the research group that engages in the study of Exotic Viral Infectious diseases. I have the honour of supervising this group together with Byron Martina. It consists of talented researchers from various clinical and basic scientific disciplines.

Exotic viral infections are viral infections that traditionally occur in the tropics and subtropics. A characteristic of this group of viruses is that they circulate permanently, are endemic, or are present in smaller or larger outbreaks with an epidemic or even pandemic nature. This means that infectious diseases spread within a district, country or even worldwide.

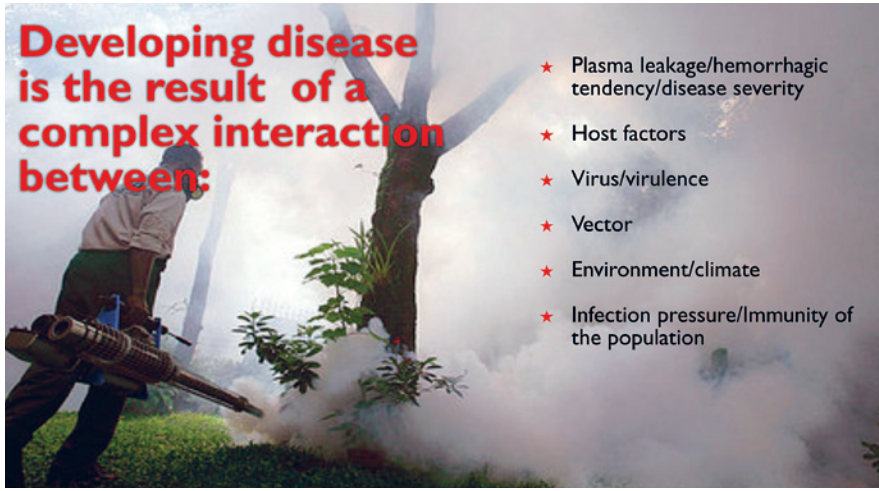
On the basis of several examples, we have seen that the circulation area, the epidemiology of these viral infections, is quickly changing. That is why we cannot rule out the possibility that some of these infectious diseases will also occur in the Netherlands in the future. After all, it is only some sixty years ago that malaria, a disease transmitted by mosquitos, was last detected in the Netherlands. The risk of mosquito populations which have traditionally lived in the tropics also settling in the Netherlands is now increasing. If this happens, conditions will have been created for exotic viral infections to spread along the North Sea coast.

How do these mosquito populations reach the Netherlands? One way is by importing lucky bamboo and car tyres from China. These mosquito populations are not yet capable of settling in the Netherlands permanently, but this is perhaps only a matter of time. Once we know which mosquito populations occur, we will know which viruses may, theoretically, be transmitted, enabling us to predict which potential infections and problems may occur in the future. On the basis of this knowledge, we can take proper measures to prepare in terms of preventing infection and disease; prevention but also diagnostics and treatment of patients. A national study group initiated by the RIVM (National Institute for Public Health and Environmental Protection) and several university hospitals, including Erasmus Medical Centre, are studying the significance and impact this may have for the Netherlands.

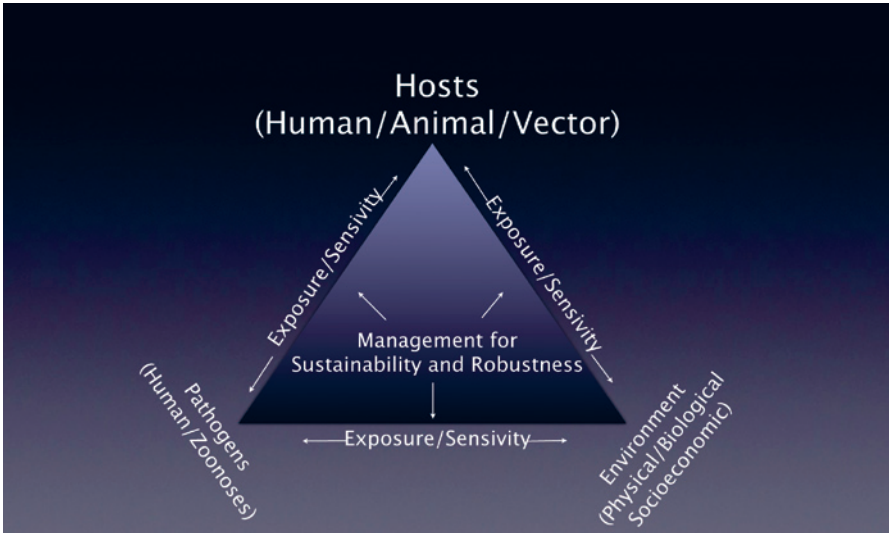



Exotic viruses can be classified in various ways: according to viral family, taxonomy, or the mode of transmission, for example transmittable by mosquitos or rodents, mosquito or rodent-borne. Another important classification is from the patient's angle, according to the clinical symptoms presented by the patient. The main clinical symptoms caused by exotic viral infections are encephalitis, infection of the brain tissue, and haemorrhagic fever. The EVI Study Group for Exotic Viral Infections therefore focusses mainly on these two important clinical manifestations.

Each epidemic starts on a small scale but can spread quickly, like ripples on a pond. In the past decade, we were confronted with the 'threat' of new viruses such as the new Influenza and Corona viruses, which carry the potential threat of large-scale distribution. That same threat exists for existing, 'old' viruses including many exotic viruses with appealing names such as Dengue, yellow fever, west Nile, cikungunya, rabies, and Japanese encephalitis.




In large parts of the world, man and animals live in close proximity, often on small surface areas. A large number of exotic viral infections are hosted by animal species, so transmission can take place easily. When a virus is transmitted from animal to man, this is called a zoonosis. Zoonoses are responsible for 70% of the new infectious diseases that we are faced with, so the way in which we live together with our pets, but also the way in which we have contact with and handle wild animals, is a crucial factor with regard to the transmission and risk of spreading these viruses. However, transmission from animal to man often requires an important variable: the vector. Many of these viral infections are transmitted through mosquitos, ticks or rodents, and only if the host, man, is vulnerable to the virus, will infection actually lead to disease. Transmission, large-scale distribution and the development of disease will only take place if all these crucial conditions have been fulfilled.




Recent developments have shown that in increasingly large areas of the world, all conditions for the distribution of viruses are increasingly being met. If we want to prevent the distribution of exotic viral infections, it is of major importance that we pay attention to all these aspects. This requires a multidisciplinary collaboration and approach like the one we strive for within the study group for exotic viral infections (EVI).

## The Academic Triad

I would now like to explain the academic triad between patient care, research and education from my perspective, based on the teaching and research duties in clinical virology, exotic viral infections in particular, assigned to me. I would like to add a fourth theme, namely the social embedding of the professorial Chair; through the eye of the professor.

### Research

**Through the eye of the pipette needle**

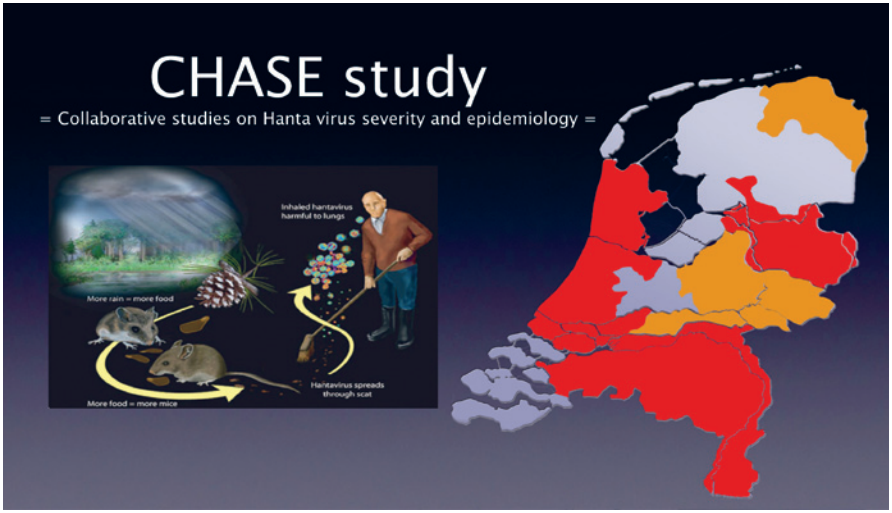
The research within the study group Exotic Viral Infections is characterized by its translational nature, a patient-oriented question is translated into a basic research question and vice versa: the translation from the laboratory back to the patient, in other words: 'from bench to bedside and vice versa'. As we have already mentioned, the research focusses on the relationship between the different viruses and the inflammatory and coagulation cascade; a relationship which is important in the development of disease. Another important area is the development of diagnostic techniques and vaccine development. Furthermore, EVI acts as a World Health Organization reference centre for the diagnosis of these special viral infections.

I would like to outline some of the most important projects which are currently underway within different research collaborations and carried out by various researchers.

*SEMESTER study Indonesia*

The SEMESTER study is a collaboration with the Airlanga University in Surabaya. In this study, patients with symptoms of fever seeking medical treatment in hospitals are questioned and examined according to standardized methods including lab tests. The purpose of this study is to discover which viral pathogens in Indonesia are responsible for the clinical pictures of encephalitis, infection of the brain tissue, and haemorrhagic fever. At this moment, we do not have complete knowledge about this, which makes it difficult to determine which patients benefit from treatment with antibiotics or treatment with antiviral medicine. The answers enable us to determine which diagnostic methods are the most useful to implement locally, to improve the treatment of patients and to study the occurrence and progression of the often serious infections. This study is being carried out in close collaboration with researchers from Indonesia and the Netherlands.

*CHASE study*




On a world scale, Dengue is the main mosquito-borne viral infection. In addition to the mosquito-borne infections, there is a second important group, that of infections transmitted to man by rodents, the rodent-borne infectious diseases. One of the infections occurring worldwide, also in the Netherlands, is the Hanta virus. The Hanta virus occurs worldwide and manifests itself in a wide range of forms, from mild and reversible to very severe clinical pictures with haemorrhage and lung, heart and kidney damage coupled with high mortality. The virus is transmitted through

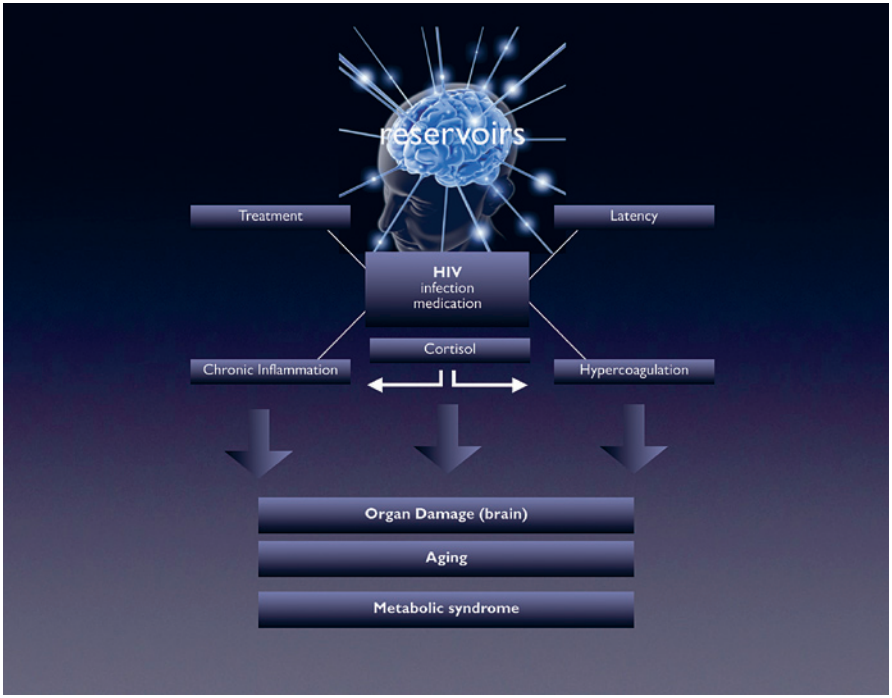
the dried faeces of rodents, especially mice and rats. We define this as a zoonosis. Unfortunately, there is no effective antiviral treatment, nor is a good protective vaccine available. In the Netherlands, particularly in the region bordering on Germany, the Hanta viral infection is a well-known infection, especially the type with high fever and kidney damage but with full recovery. In the rest of the Netherlands, the Hanta viral infection is unknown. In the Netherlands, Marco Goeijenbier has investigated whether this assumption is correct and if there may be underdiagnosis, and consequently underreporting, in those areas where the Hantavirus is less well-known. This appears to indeed be the case. In other parts of the Netherlands, the Hantavirus infection has also been found as a cause of fever and kidney failure. This study is being carried out in collaboration with the KIT (Royal Tropical Institute), RIVM (National Institute of Public Health and Environmental Hygiene), the research group of the Beijing Institute for Microbiology and Epidemiology, and colleagues in Sweden and Finland.

In the second part of the CHASE study, the emphasis lies on the interaction between the Hantavirus and the vascular wall cell. In this model, just as in the Dengue study, we are studying the virulence or the ability of various virus species to cause disease and their role in developing severe disease symptoms. Our final goal is to achieve a specific intervention.

*DECIDE study Indonesia*

I have already spoken at great length about the Dengue study. This is a research programme that has lasted for many years, taking place in collaboration with various universities in Indonesia: Semarang, Jakarta and Surabaya, and recently also Brazil. The study is a continuation of the Dengue study which has been ongoing in Indonesia since 1994, partly under the flag of the KNAW (Royal Netherlands Academy of Arts and Sciences) and DIKTI, the sister organization in Indonesia. Several researchers from Indonesia and the Netherlands have obtained their PhDs in this collaborative study over the past twenty years and are still taking part in this research programme.

*TREVI study*




HIV infection manifests itself differently in different populations, in different 'shades' as it were. These shade differences can be seen particularly in the various long-term effects of HIV infection in general and vascular damage in particular.

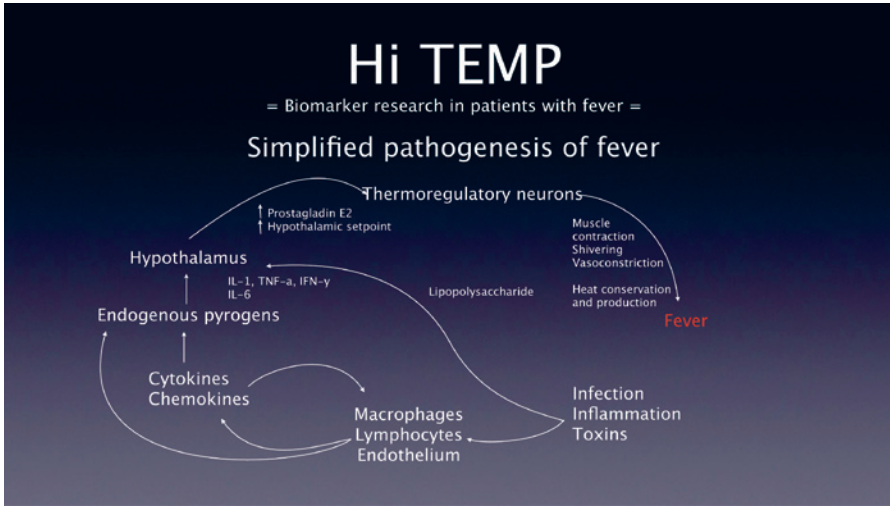
As with haemorrhagic viral infections, the HIV virus also has an impact on the coagulation cascade but in precisely the reverse direction. HIV does not result in haemorrhage but in increased vulnerability for the development of thrombosis. This can cause a thrombotic leg, pulmonary embolism, but also cerebral or coronary infarction. This relationship has been demonstrated in various studies, for example in a study by Eefje Jong, who examined the relationship between HIV and thrombosis in a patient group in the Netherlands and a patient group in South Africa. Eefje Jong proved that HIV does indeed lead to a pro-coagulant status, and therefore an increased thrombotic tendency, and that treatment of HIV with antiviral drugs improves this picture, but does not normalize it. Patients with a well-controled HIV infection therefore also have an increased thrombotic tendency and a slightly increased risk of developing thrombosis. I believe that these research results could, and should, be of use for the patient. HIV can be considered as an independent risk factor for thromboembolic events which means that HIV-infected patients with a history of thromboembolic events qualify for thrombosis prophylaxis, or, in other words, treatment to prevent problems in the future.

This first study instigated a follow-up study in which Lennert van den Dries is currently involved. Lennert is studying the link between the HIV virus and the brain in both adults and in children. Based on the findings that I have just shared with you, the hypothesis is that the increased risk of thrombosis with HIV infection could also be the cause of vascular damage and possibly microinfarction, small blood clots, in the brain. The brain forms a reservoir where the HIV virus can hide. Because of this, chronic HIV infection can potentially affect the brain, which, in clinical practice, may lead to cognitive functional disorders such as loss of concentration. This may lead to problematic functioning in social and work situations and may have serious consequences for the quality of life of HIV patients. Obviously, loss of capacity for work may also have negative economic effects. The TREVI study investigates all of these aspects. The study has been set up by various departments of Erasmus Medical Centre in collaboration with the Chronic Disease and Labour knowledge centre of the Rotterdam University of Applied Sciences, the Institute for Policy and Management in Health Care, and Sophia Children's Hospital in Rotterdam. Lennert van den Dries, Marlies Wagener and Stefanie van Opstal are the PhD's who are working together in this project. The TREVI study is an outstanding example of translational research, from bench to bedside to society.

*HIV and eye diseases in SA*


Another, less common, complication of HIV infection is visual impairment or even blindness. At the beginning of the HIV epidemic, this was a frequent, invalidating complication of HIV infection which also occurred in the Netherlands. Fortunately, this complication has become rare in the Netherlands due to good treatment and, in particular, a good health care system. At first sight, this may sound strange to you, but this complication may be a result of the success of the treatment. I will explain this to you presently. Together with the Rotterdam Eye Hospital and ANOVA, a local NGO working in the Mopani district of South Africa, an infrastructure has been set up to provide eye care to patients with HIV infection; an infrastructure which has not yet been completed. Today, treatment with antiviral therapy is possible and available for most HIV-infected patients in South Africa. This is a big step forward. However, patients in South Africa begin treatment at a relatively advanced stage of the HIV infection, when their immune system has already been seriously weakened. By this stage, eye diseases are a major problem. Just when effective HIV treatment has been started and the immune system starts to recover, a strong immune response in the eye may develop, with damage resulting in visual impairment and even blindness. In this project, an infrastructure is now being set up for proper care and treatment. The occurrence and progression of the most frequent eye infections are being studied in conjunction with this. Eric Schaftenaar, PhD researcher and resident ophthalmologist, works at this location and is conducting this study.

*HI TEMP study*




Finally, I want to discuss the HI TEMP study. Should patients with symptoms of high fever, possibly as a result of an infection, who seek medical aid at the emergency department, be treated with antibiotics?

Despite much technological progress, this seemingly simple question still remains difficult to answer for the attending physician. HI TEMP is a collaboration between the Erasmus University departments of Viroscience, Internal Medicine and Clinical Chemistry together with the Institute of Health Policy & Management (iBMG), which is also part of the Erasmus university. Within the setting of the emergency department, Yuri van der Does, as a PhD, is studying the added value of Procalcitonin, a new biomarker, as a predictor of infection and especially as a marker for distinguishing between infections caused by a bacteria or a different pathogen, for example a virus. Previous studies in primary and intensive care settings have already shown that Procalcitonin is a reliable marker as an instrument for making a safe choice as to whether antibiotics should be prescribed or not. Earlier, Martijn de Kruif and Maarten Limper studied the role of different biomarkers including Procalcitonin in various patient populations and in various infections in the Netherlands, Indonesia and the Caribbean. In addition to the importance of Procalcitonin, the HI TEMP study also includes innovative research into possible new biomarkers for the future.

If the results of this biomarker study advocate the introduction of Procalcitonin, it is expected that this will lead to more efficient diagnostics and fewer unnecessary antibiotics being prescribed. This will reduce cost reduction and prevent large-scale antibiotic insensitivity.

With these examples of current research, I have taken you behind the scenes of the EVI study group. In addition to the studies already mentioned, my colleagues Byron Martina and Penelope Korake, members of the study group Exotic Viral Infections, coordinate projects in the field of rabies, Chikungunya and West Nile virus.

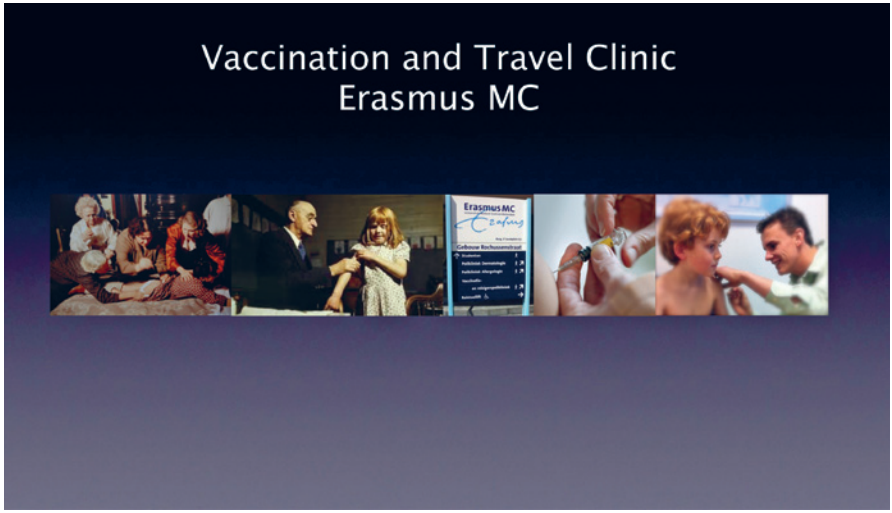
*The RGHI*


An important initiative in Rotterdam is the Rotterdam Global Health Initiative (RGHI). The RGHI unites national and international parties in and outside of Rotterdam to create new possibilities for a multidisciplinary approach, also in the field of infectious diseases. The SEMESTER study in China and Indonesia and the study of eye diseases in South Africa are funded by the RGHI.

**Through the eye of the patient**

Patients inspire, intrigue and fascinate. Everything starts with the patient: the patient visits the doctor and has a story; the patient has a complaint, with his or her own perception of the truth. As doctors and as researchers, we should, entirely in the spirit of Erasmus, open our minds to things that deviate from what is normal. We keep searching for deviant patterns that point to a new, more universal, yet unknown truth. The deviant story may offer that crucial piece of information giving us the insight required to find solutions for larger patient groups and populations. Each individual story is the reflection of an extremely fascinating interaction between disease, body, spirit and environment. In this way, the patient continues to be the source of inspiration.

At the outpatient department for infectious diseases of Erasmus Medical Centre, we see patients with various problems resulting from their infections. The diversity of infectious diseases but surely also the various ethnic and cultural backgrounds offer a colourful range of different stories. What is the right choice for a patient from Rotterdam is not necessarily the best choice for a patient who returned to the Netherlands from Eritrea five years ago. We must remain open to the differences, to the 'otherness'.



## Vaccination and Travellers outpatient clinic

### Through the eye of the vaccination needle

Two years ago, we started a special vaccination and travellers policlinic at Erasmus Medical Centre for 'special' travellers. This policlinic is a collaboration with the travel clinic of the Harbour Hospital. At this special policlinic, Erasmus Medical Centre expertise on special and exotic infectious diseases is made available to the special patient population which visits Erasmus Medical Centre. This population comprises patients with complex co-morbidity, a compromised immune system due to underlying disease or treatment, and young children who are being treated at the Sophia Children's Hospital. Another important group is formed by students doing their work placement abroad. Often, perhaps intentionally, those work placements take place in far-away tropical areas where exotic infections are endemic.

Based on the academic triad, the policlinic combines patient care with scientific research. The vaccination and travellers policlinic studies the risk of infection and disease as well as the effectiveness of vaccinations in these specific groups of travellers.

## Teaching

### Through the eye of the master

Education is the transfer and passing on of knowledge, but at the same time it is the reception of knowledge. Education is interaction; it is interactive.

The field of the exotic viral infectious diseases is a dynamic field. The range of both intracurricular and extracurricular educational activities in the field of exotic viral infectious diseases is increasing. Examples include a Minor in 'tropical infectious diseases', the course organized by the STOLA foundation which prepares students for their stay abroad, a NIHES course on 'infectious diseases in low income countries', a Master course on 'Infection and Immunity', courses for fellows in infectious diseases, microbiology research assistants, GPs and medical specialists, and an LCR basic training and refresher course on travel vaccinations and travel advice that we organize in collaboration with the NSPOH at Erasmus Medical Centre.

An increasing number of students spend part of their student years abroad for study or work placements, which has resulted in an increasing need for knowledge and information about infectious diseases and, in particular, about exotic viral infections. EVI frequently counsels students to help prepare them for a clinical or scientific work placement abroad. In this way, education is inextricably linked with patient care and research.

Finally, I would like to mention my appointment as visiting professor at Airlanga University in Surabaya. Through the contact with the students in Indonesia, a link has been made between research, education and patient care also in Indonesia.

## Public communication

**Through the eye of the Viruskenner**

A special initiative is the *Viruskenner* project – 'viruskenner' meaning 'virus expert'– which carries the slogan 'knowledge as antivirus'. This started as an initiative in which doctors, sometimes together with a patient, visit schools to provide small-scale and direct information about infectious diseases. Without losing sight of this small-scale aspect, the project has now expanded widely. In 2013, 500 pupils from a total of eight primary schools and secondary schools in the provinces of North and South Holland participated in the *Viruskenner* project with a kick-off and closing day at Erasmus Medical Centre. The final results were surprising: pupils, supervised by a group of enthusiastic young doctors and scientists, acquired information and knowledge about infectious diseases and presented this knowledge in an original and attractive form. They spread the acquired knowledge as if it were a virus, so to speak, with the purpose of reaching and informing their peers. While acquiring and spreading that knowledge, and in their contacts with young doctors and scientists, pupils learned about the world of health care and disease, and the world of science, in an appealing way. Just like viruses do, the *Viruskenner* reaches across borders, and this school year, *Viruskenner* will also start at a primary school in Suriname.


## Societal embedding and future perspectives

In the past 45 minutes, I have taken you to the magical world of exotic viral infections. It started with a patient that had a fever and skin rash, with unusual spots and a deviant progression of the disease. The patient was unique, was different.

An important aspect of my teaching and research duties is the triad within the academic setting of patient care, education and research, with patient care as a point of departure, and the triad's connection with education and research in the Netherlands and abroad, with researchers from different continents and from different disciplines who collaborate and enhance each other's qualities. This includes the education of pupils, students and professionals, and communication with patients and the public; the full spectrum.

I consider the social embedding of my teaching and research duties as a special assignment which I want to carry out in my own way, focussing on what I consider to be the natural connection between science, art, culture and religion. Where these worlds seem, at times, to be at odds with each other, I find it challenging to try and connect them. This background and my conviction will lead to explorations, to research questions to be formulated and will ensure that the steps taken by me will be socially embedded. I think this explains my preference for the broad multidisciplinary approach within the different projects.

## Word of gratitude

I would now like to express my gratitude to a number of people.

In short;
I wish to thank those I encountered both indirectly and in person, and who guided me, and are still guiding me in the right direction.

And, more explicitly;

I would like to thank patients, colleagues, students and PhD students.

The trust shown to me by patients when sharing their stories and complaints with me. Patients who inspire and feed me, the human test; I am glad that some of them are present here today. I also wish to thank all the patients who participated in the examinations and, in doing so, put their trust in the research group.

The training and supervision of, and collaboration with, a younger generation of doctors and scientists is a great privilege. The first researchers supervised by me have now spread their wings and have found their place in the professional field, both in the Netherlands and abroad.

I think it is an honour to be able to contribute to the development of Erasmus Medical Centre as a centre of expertise for patient care, education and research in the field of virology with the emphasis on the exotic viral infections.

I would like to express my special thanks to the Dean of Erasmus Medical Centre, Professor Jaap Verwey, and in particular to the former Dean of Erasmus Medical Centre, Professor Huib Pols. Professor Ab Osterhaus, dear Ab, our paths have been crossing since the start of my PhD study in 1994 and our relationship has strengthened constantly since 2009, when I started to work in the virology department for one day a week, and since my full appointment in 2011. Dear Huib, dear Ab, thank you for the trust that you have shown in me by establishing this Chair.

Byron Martina, together, and each from our own angle, we supervise the Exotica group and together have a beautiful and colourful range of projects, collaborations and above all, a group of talented, globally-oriented young researchers.

My coaches and trainers, the late Professor Johan Vreeken, Professor Peter Speelman and Professor Dees Brandjes who, each at an important moment in my career, put their trust in me.

My tutors, Professor Jos van der Meer and Professor Robert Djokomoeljanto and my co-tutor Professor Wil Dolmans.


My father, a source of inspiration, and my mother, still waters run deep. My parents-in-law, Greet, Jeanne, Ger; beacons at sea. My sister Desiree, invisibly present. Valéry, the dancer, Steven, the psychologist, Daniel, the architect, Camiel, the philosopher, and Loek, the artist. Alice, my first great love, Inez, my great first love, or maybe the other way around!

**Occasio mihi fertur**
**- I was given the opportunity -**

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