

Caribbean Resilience and Prosperity Through ONE HEALTH





























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CaribVET - The Caribbean Animal Health Network

FAO - Food and Agriculture Organisation

IICA - Inter-American Institute for Cooperation on Agriculture

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Canadian Wildlife Health Cooperative

Disclaimer:

This book is intended to show the need for One Health in the Caribbean and to reveal the capacity to meet this need. It is not a complete account of all people and programmes relevant and active in One Health in the region nor is it a textbook on One Health approaches. This book draws heavily on experience gained and developed in the ACP-EU funded One Health One Caribbean One Love project. The contents of this production are the sole responsibility of the One Health One Caribbean One Love project and should in no way be taken to reflect the views of the European Union.

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List of Acronyms and Abbreviations

ACP	African Caribbean Pacific Group of States		
CaribVET	The Caribbean Animal Health Network		
CARICOM	Caribbean Community		
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement		
EU	European Union		
FAO	Food and Agriculture Organisation		
IICA	Inter-American Institute for Cooperation on Agriculture		
NCD	Non-communicable diseases		
NGO	Non-Governmental Organisation		
OIE	World Animal Health Organisation		
SDGs	Sustainable Development Goals		
UWI	University of the West Indies		
UN	United Nations		
WHO/PAHO	World Health Organization/Pan American Health Organization		
GARC	Global Alliance for Rabies Control		

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Foreword

The Caribbean is the world's most tourist-dependent region. Our islands are highly vulnerable to climate change. Our histories and economies have been tied to the seas around us. This is why health and wellness are key CARICOM priorities. The social and economic stability of the Caribbean depends on secure and thriving relationships between our people and our environment. The need for an integrated approach is demonstrated by the challenges we face from more frequent and more severe tropical storms and hurricanes, water shortages, rises in sea level, loss of fisheries, increases in mosquito-borne diseases, and chronic illnesses linked to improper nutrition and environmental pollution.

Many agencies in the region recognize the need for a more effective approach to deal with these challenges. The Caribbean Public Health Agency (CARPHA), the Pan American Health Organisation (PAHO), the Food and Agriculture Organisation (FAO), and our universities are tackling the root causes of these issues, as well as building resilience by examining the shared health factors that link people, animals and the environment. CARICOM action plans for combating obesity and other chronic diseases stipulate that food, nutrition and health goals cannot be decoupled from agricultural systems, hence making food security the linchpin of the region's health policy. The Caribbean Cooperation in Health (CCH) Initiative recognizes the need to focus not only on directly fighting disease, but also on promoting healthy lifestyles and protecting

the environment from diseases that threaten our economies as we prepare for newly emerging and re-emerging problems.

For these reasons, a CARICOM One Health policy was ratified by Ministers of Agriculture at the COTED in 2013. It was also endorsed by the Caribbean Animal Health Network (CaribVET) and by the CARICOM Chief Veterinary Officers (CVO's) in 2013, by Chief Medical Officers (CMO's) in 2014 and by the Ministers with responsibility for Human and Social Development, at the COHSOD in 2014. The One Health policy was also endorsed by Ministers of the Environment at the COTED in 2015. As nations inextricably linked by land, sea and air space, the Caribbean needs an approach that holistically addresses the health of people, plant and animal life, and the environment. There is much to be gained by combining resources, talents and expertise to work together to confront the challenges facing the Caribbean in the 21st century. A One Health approach recognizes the connections between wellbeing, prosperity and healthy environments. It also recognizes the advantages of working together by sharing resources and expertise to find better and more urgent solutions. This book demonstrates that there is a growing world-class community of One Health experts in the region who are ready to protect our prosperity and prepare our nations for a rapidly changing world.

Keith Mitchell (Dr. the Rt. Hon.)
Prime Minister of Grenada and
CARICOM Chairman

Keise





A Healthy Caribbean in the 21st Century

Clean beaches, happy children, vibrant reefs, prosperous communities. This is the ideal portrait of a healthy Caribbean. Good health is a state we all want to attain and sustain, whether for ourselves, the animals we farm, the birds in the forest or the reefs in the sea. Understandably, we typically address these disparate subjects as distinct health issues. Yet, as small island nations linked intimately with the sea, land and one another, the health of people, landscapes, communities, animals, seas and economies should not be separated. One Health is the art and science of protecting all types of health

to bolster our capacity for sustainable, prosperous communities and ecosystems that can cope with the challenges of the 21st century.

In 2015, the United Nations adopted 17 sustainable development goals to transform our world. These goals are aimed at ending poverty, protecting the planet, and ensuring prosperity for all. They recognise that ending poverty and addressing a range of social needs cannot be achieved without tackling climate change and protecting life on land and in the seas. One Health in the Caribbean embraces this vision.



21st Century Challenges in the Caribbean

The world is experiencing unprecedented rates of social and environmental changes due to climate change, global movement of people and products, rapid urbanization and transformations in how we produce our food. The Caribbean is at the forefront of many of these changes at the nexus of communities, economies, animals and ecosystems.



Climate Change

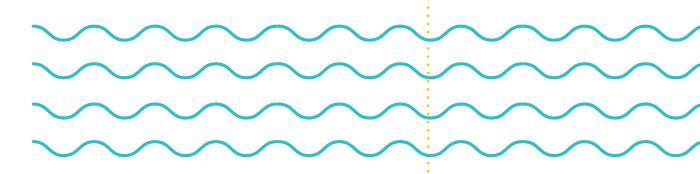
In the Caribbean, lives and livelihoods will be endangered by rising sea-levels, warmer temperatures, changes in rain patterns, and increased storm intensity and frequency due to climate change. Climate change will damage landscapes and infrastructure. It will undermine food security and increase disease risks. Droughts and rising sea levels are affecting agriculture, fisheries, coastlines, and biodiversity. The Caribbean Community (CARICOM) has prioritised environmental resilience, achieved in part by protecting the environment and natural resources, to prepare for climate change.



Food and Nutritional Security

Food security is a CARICOM priority for health and economic growth. A country's ability to trade and provide safe, good quality food for its citizens depends on secure and healthy conditions from farm to fork. Poor access to nutritious foods, as well as changing eating habits, exacerbate food security challenges in the region. Food and nutrition security cannot be achieved without cooperation and action across several fronts, including the farming, fishing, food processing and distribution, and the health, nutrition and education sectors. Production of safe and affordable protein depends on healthy fish and livestock, making animal health a fundamental part of food security programmes.





Non-Communicable Diseases

Non-communicable diseases are on the rise, causing major social and economic impacts. Eating habits in the Caribbean have shifted. People eat less local, whole foods and more refined and processed foods, resulting in increasing rates of obesity, which in turn have contributed to an increase in diseases like high-blood pressure, diabetes and heart disease. Childhood malnutrition remains at unacceptable levels. Additionally, indoor and outdoor air-pollution and environmental carcinogens in food and water contribute to the growing burden of non-communicable diseases. Preventing noncommunicable disease requires action from the physician's office to the social and environmental drivers that create the conditions for these diseases to emerge.

Infectious Diseases

Infectious diseases and the pathogens that cause them, including antimicrobial resistance, pose significant challenges for public health, agriculture and conservation. With globalization, urbanization and climate change, new infections can be expected in the region. Most emerging infections in people come from our changing relationships with the environment and animals. Preparation for the next emerging disease must consider changes in agriculture and social practices and in the ecology of vectors like mosquitoes. It also must track early warning signals from livestock, wildlife and the environment.

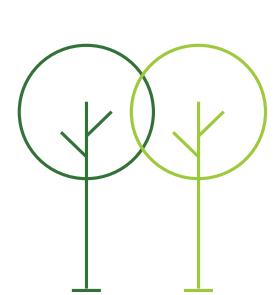
Economic Growth

The relatively small size of economies and limited natural resources constrain opportunities for economic growth in many Caribbean nations. Many countries depend on pristine natural resources to generate revenue. Tourism relies on beautiful beaches, coral reefs with abundant fish and verdant forests. Safe, secure water supplies and landscapes resilient to climate change are essential for healthy and productive agriculture. The promise of a blue economy relies on healthy oceans. A major challenge is balancing the demands of growth with the need to protect and manage environments to achieve sustainable development.











WHY ONE HEALTH?

Promoting Health and Protecting Prosperity

The problems found at the nexus of animals, environments and people can be hard to resolve and slow to respond to solutions. This is why a new approach is needed to make better use of information, resources and expertise in order to get ahead of the curve and stop problems before serious and irreversible effects arise. One Health cultivates and supports people and processes to deal with complex problems that cross species, disciplines, management strategies, ecosystems, and communities. One Health relies on cooperation and partnerships to protect shared interests.

This book offers a vision of how a cooperative One Health approach can help solve problems that will limit prosperity and health for people, animals and environments in the Caribbean.





The Three Phases of One Health Development

Connecting Disease Across Species



The Wildlife Conservation Society first used 'One World One Health' to define an integrated, holistic and preventative approach. What started as a plan to reduce over-exploitation of wildlife became a framework for collaboration to combat emerging diseases. As new human diseases continued to emerge from animal sources, the logic of preventing these diseases by focusing on their animal origin spread. Early work focused on building new capacity to find bacteria and viruses that could jump between species. Efforts to control infectious diseases of animal origin inspired re-investment in veterinary public health around the world.

Moving Beyond Infections



The Ottawa Charter of Health Promotion established the inextricable link between human health and the health of the world around us. One Health began to grow beyond its initial focus on new infections to harnessing the benefits that people derive from animals. Getting rid of the age-old diseases that people get from animals was recognised as a critical component of poverty reduction. Eliminating livestock diseases helped produce more affordable and available food to combat food insecurity and malnutrition. Sustaining wildlife populations not only met conservation goals, but maintained ecological services like pest control and protected traditional uses of wildlife by indigenous populations.

Building Resilience



Climate change drives the latest phase of One Health. Climate change planning has highlighted how environments are significantly influenced by decisions we make about resource management, which in turn are affected by health, economic, and political priorities. In 2010, the World Animal Health Organisation (OIE) noted the importance of co-managing the relationships between animal production systems, human influence on the environment, climate change and emerging diseases. In addition to maximising short-term human benefits, One Health ideas were extended to the protection of animal and environmental health as a moral good and for long-term human benefit.

Energy and investment continue to be directed at each of these One Health phases. Common to all is the need for people and processes which can deftly link information, expertise and perspectives to benefit the inter-related health of people, animals and environments.

Finding sustainable solutions to interconnected health problems involving people, animals and the environment through partnerships and cooperation across sectors

The Purpose of One Health

Both One Health and the UN Sustainable Development Goals see the intimate relationship between our health and prosperity and the health of the world around us.

The purpose of the sustainable development goals is to end poverty, protect the planet and ensure that all people enjoy peace and prosperity

SUSTAINABLE GOALS





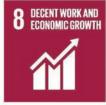






































Case Study Combating Mosquitoes and Poor Nutrition - St. Lucia







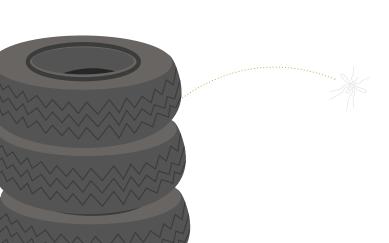
Is there a link between non-communicable diseases like diabetes and mosquitoes? The team of One Health leaders from St. Lucia saw connections and found shared solutions by focusing on the relationship between community, nutrition, and health.

The small fishing village of Anse La Raye in St. Lucia has one of the highest prevalence of vector-borne illnesses in the country. The villagers also have very high rates of chronic non-communicable diseases,

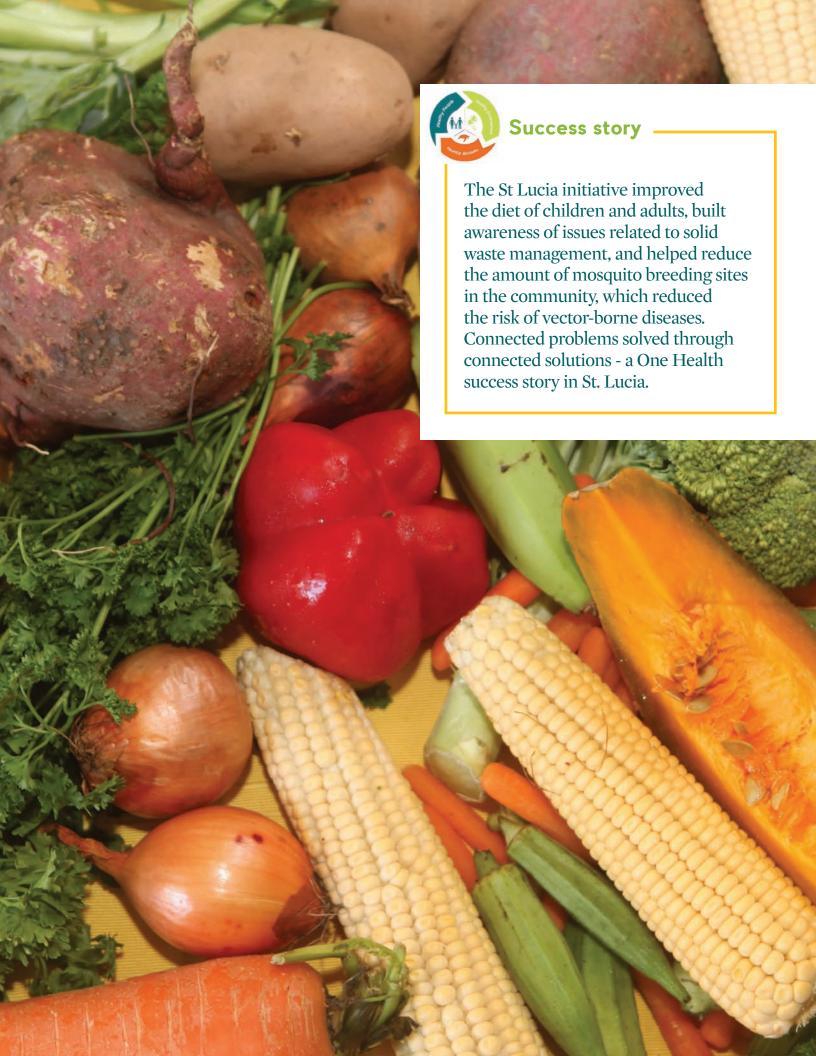


which were thought to be related to their poverty, poor nutrition and high levels of obesity. The village also has challenges with solid waste management. Piles of used car tyres, uncovered or unused drums and other waste products provide mosquitoes with breeding sites.

The St. Lucia team coordinated a multi-sectoral approach in the village to simultaneously address all these problems. Partnering with the Ministries of Health, Agriculture and Education, as well as the Parent Teachers Association of the local primary school, the team worked with staff and students to build a greenhouse and plant a nursery on the school grounds using organic farming principles. Students, parents and teachers involved in maintaining the nursery and greenhouse were shown how to make use of recycled materials such as tyres and containers as planters for backyard gardens in their homes. By recycling plastic containers, drums and tyres, the team removed breeding sites for mosquitoes and improved access to healthy food options. Crops were harvested and used for the School Feeding Programme, providing a sustainable, locally produced supply of fresh fruit and vegetables for the children.



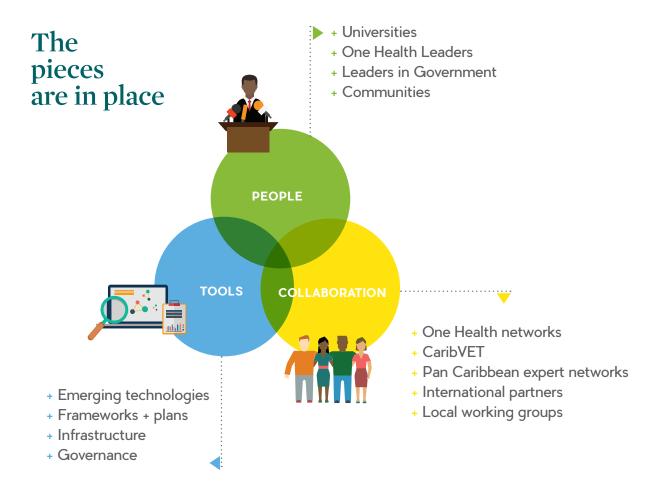




Caribbean Capacity - People, Tools & Collaborations

By coordinating strategies and by pooling resources, One Health facilitates different groups working together towards a shared goal. To do this, One Health needs processes and polices to develop collaborative plans and shared visions. They need a network to exchange information and relationships that make working together effective and enjoyable. Local access to technology and methods which can provide the information needed to answer shared questions supports One Health activities and outcomes. This approach helps ensure that reliable data informs One Health solutions.

International, regional, and national institutions have begun to develop policies and strategies to promote and support One Health. Caribbean universities are delivering programmes to train students as well as providing continuing education for early career professionals to assimilate One Health skills and perspectives. New investments in training and technology are producing high quality capacity for rapid, reliable science support. The Caribbean is poised and ready to take One Health forward, with the right people, tools and collaborative networks in place.



People, Tools and Collaborations

People

A CARICOM endorsed regional One Health policy, together with a supporting six-year Caribbean One Health strategic framework, maps the way forward for One Health. But a policy or a strategic plan cannot be turned into action without a structure able to coordinate, follow-up and monitor the implementation process or without skilled people with the capacity, enthusiasm and permission to act. The people are in place across the Caribbean, because many Caribbean governments are actively embracing the One Health concept. Guyana, for example, has formed multidisciplinary teams across Ministries to address priority health issues. The ACP-EU funded *One Health One Caribbean* One Love project produced a skilled group of professionals from multiple disciplines who are now championing One Health in 12 countries. In Trinidad, the Blue Flag programme promotes healthy, safe beaches through collaborative, community-based initiatives. Staff in Caribbean-based universities and research institutions such as the University of the West Indies, University of Guyana, CIRAD, St. George's and Ross Universities are incorporating One Health ideas in their teaching and research. International organisations, such as PAHO/WHO, IICA and FAO are promoting One Health principles in their approach and training activities. One Health is spreading from the top levels of government to community levels.





Tools

There are many and varied tools currently available within the Caribbean region to enable and support One Health. Veterinary diagnostic laboratories across the Caribbean are improving their capacity and capability through training programmes coordinated by the laboratory working group of the Caribbean Animal Health Network (CaribVET) and with the introduction of new innovative technologies. This is making more rapid and accurate disease diagnosis a reality. CaribVET has also developed tools to improve coordination and communication across programmes to ease decision making and raise awareness of disease risks. Further examples of technical innovations to better prepare the Caribbean to tackle One Health problems include a disease prioritisation tool known as 'VacciCost' used to cost vaccination campaigns; a 'Swine Risk' tool for the evaluation of risks associated with the introduction of exotic swine diseases; AmiqualSud, a quality assurance training module for animal health laboratories; "CaribVETmaps", an online programme to support spatial analysis and GIS mapping using a Lizmap application; and diagnostic keys to identify adult mosquitoes in Guadeloupe. Additionally, there is ongoing development of collaborative tools which are intended to be shared by CaribVET partners with the aim of easing coordination mechanisms and improving the cost-efficiency of collaborative work carried out across the region.

Collaborations

Successful collaborations depend heavily on social relationships. Opportunities to learn about one another, engage in conversations, and share experiences and ideas help promote innovation and make working together easier. Caribbean One Health networks are emerging to serve these purposes. Leading the charge are participants from the UWI's ACP-EU funded One Health One Caribbean One Love project Leadership Series, international organisations such as PAHO/WHO, IICA, CIRAD and FAO, and Caribbean universities, including the UWI and the University of Guyana. National One Health networks have spun off from the pan-Caribbean relationships built between these partners. The REDesastres network in Cuba is an example of a national One Health network in action. Local cross-disciplinary One Health working groups have been set up in most Caribbean countries to address the major challenge of antimicrobial resistance. The Caribbean Animal Health Network (CaribVET), encompassing 34 Caribbean countries/ territories, has been in place for many years. Its members include veterinary services, Ministries of agriculture and health, universities and schools of veterinary medicine, research institutes, regional and international organisation in agriculture and health, public health agencies, private industries and non-governmental organisations.







Case Study One Health First Responders

First responders are those likely to be among the first people to arrive and assist at the scene of an urgent or emerging problem, like a disease outbreak or the incursion of a new disease. Rapid and accurate diagnosis of new and emerging diseases is essential to enable first responders to provide a timely and appropriate response. If not stamped out early, diseases like avian influenza and foot and mouth disease can spread at devastating speeds, affecting whole countries before they are accurately detected. One of the main activities of the UWI's ACP-EU One Health One Caribbean One Love project was to improve the ability of Caribbean countries to accurately recognise animal and zoonotic diseases in livestock in the field and to correctly diagnose the disease causing pathogens in their laboratories.

Professionals from 14 Caribbean countries have been trained by international, regional and local disease experts in the recognition and response to priority animal and zoonotic diseases. The diseases were







selected through consultation with Chief Veterinary Officers from all Caribbean countries. Attendees were selected according to their ability and interest in subsequently disseminating their training and new knowledge to veterinary colleagues, farmers and livestock producers in their home country. Further training sessions were held in Trinidad and Tobago, the Dominican Republic, St Lucia and Guyana. To date, over 500 'One Health first responders' from across the Caribbean region have been trained.

For Caribbean veterinary laboratories to ensure that they are delivering accurate results, it is essential that they follow certain rules in relation to Quality Assurance and Biosafety. Representatives from 11 Caribbean veterinary diagnostic labs have attended a Quality Assurance and Biosafety training workshop organized by CIRAD in the new facilities in Guadeloupe. This workshop provided the trainees with the skills and tools necessary to ensure accurate and timely diagnosis of diseases in their home labs.







One Health Leadership Series

Caribbean Leaders need the skills to match a world where challenges and solutions are multidimensional, complex and connected. The One Health Leadership Series was designed to fulfil this need. Over a two-year period, 29 Caribbean professionals from diverse backgrounds across 12 Countries took part in the One Health Leadership Series. The series provided support and built capacity of these emerging leaders to solve shared problems, address interdependent challenges and create a network of Caribbean change agents to cope with the demands of a changing world. The series built on their enthusiasm and expertise to foster a healthy, sustainable Caribbean.

Participants attended five intensive training modules on One Health and its application from global to local. Between modules, participants turned knowledge into action. They were tasked with building teams and implementing a locally relevant One Health project within their country. Training modules took place in various Caribbean countries:





MODULE #1

Introduction to One Health: Tobago, November 2014

MODULE #2

Interconnectivity for Food Security and Food Safety: Jamaica, June 2015

MODULE #3

Environment and Health: Guyana, December 2015

MODULE #4

Society and Health: Grenada, May 2016

MODULE #5

The Way Forward for One Health: Trinidad, November 2016



The One Health Leadership Series helped emerging leaders develop skills and perspectives to work in the messy middle of human-animal-environment interactions. Participants were immersed in systems thinking, multidimensional problem solving and change management. Leaders engaged in self-development and analysis and understood the need to expand personal boundaries when navigating One Health problems. Participants learned about adaptive leadership and creative ways of empowering action from the middle and margins.

Shared regional challenges like antimicrobial resistance or climate change are not circumscribed by boundaries. Such challenges demand that we work across cultural, political, and geographical lines. The One Health Leaders gained both practical and academic insights on working across boundaries in multi and trans-disciplinary teams. Leaders began to build relationships to address shared challenges and capitalised on opportunities to build bridges and cross divides. This resulted in the formation of the Caribbean One Health family, a pan-Caribbean, One Health peer-to-peer support network.

The One Health Leadership Series

The One Health Leadership Series was a component of the One Health One Caribbean One Love project, implemented by the University of the West Indies (UWI), St. Augustine, Trinidad and Tobago and its project partners. The project was funded by the European Union (EU) and managed by the African Caribbean Pacific Group of States (ACP) Science and Technology Programme (S&T II), through the ACP Group of States. This was in collaboration with the 10th EDF Project titled "Support to the Forum of Caribbean States in the implementation of the commitments undertaken under the Economic Partnership Agreement (EPA): Sanitary and Phytosanitary (SPS) Measures". Implemented by the Inter-American Institute for Cooperation on Agriculture (IICA).

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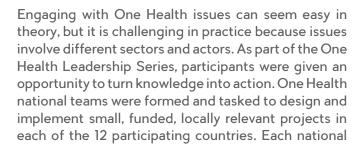








Learning by Doing -One Health National Projects



team was supported by a mentor. Participants gained insights and experience in facilitating change, building and negotiating relationships and empowering and engaging others across scales and sectors. During workshops, participants shared their successes and challenges, lessons learned and best practices from around the region.

National One Health Projects of the One Health One Caribbean One Love Project

National One Health projects included



Heavy metal testing of shark meat in Trinidad and Tobago



Construction of a mobile aquaponics demonstration system to reduce the risk of mercury exposure from eating fresh water fish in **Suriname**



Antimicrobial resistance and residues testing in **Barbados**



Raising risk awareness for pesticide use in **Haiti.**



Reducing ecosystem effects of invasive lionfish by increasing seafood access in **St Vincent and the Grenadines**



Promoting collaborative action against the African Giant snail **Antigua and Barbuda**



Creative messaging to reduce childhood obesity in **Grenada**



Addressing iron deficiency anaemia through improved nutrition in **Dominica**



Reducing the incidence of vectorborne diseases and improving childhood nutrition through backyard gardening in **St Lucia**



Promoting crosssectoral rabies outreach in **Belize**



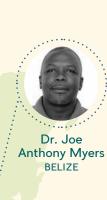
Creative re-use and recycling of solid waste in **Guyana**



Sustainable watershed management in **Jamaica**









Dr. Julio Javier Sabido BELIZE



Mr. John Bodden BELIZE



Mr. Marc Donald Simeus HAITI



Dr. Rolain Cadet HAITI

HAITI





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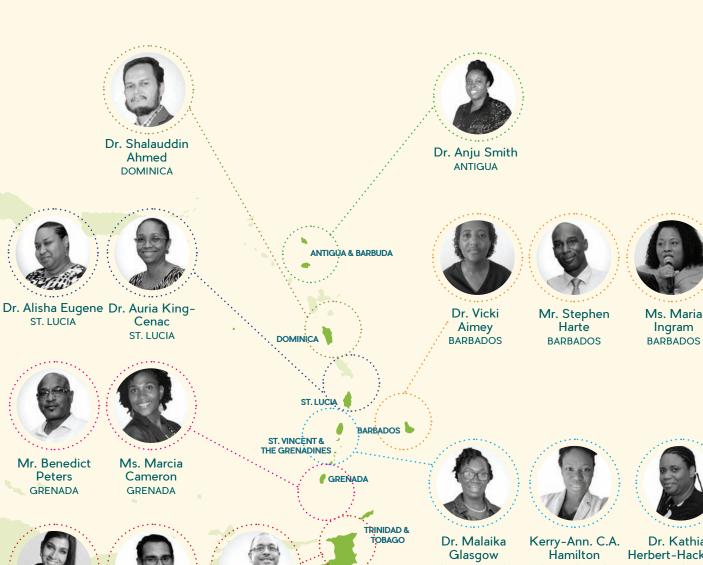
Dr. Paul Cadogan JAMAICA



Dr. Chandra Degia JAMAICA

One Health Leaders who successfully completed the One Health Leadership series in the CARIFORUM region







Seetahal TRINIDAD & TOBAGO



Dr. Maxine Parris-Aaron **GUYANA**



Dr. Paul Crooks TRINIDAD & TOBAGO



Dr. Rennard Overton **GUYANA**



Mr. Chris Saith TRINIDAD & TOBAGO



Dr. Dane Hartley **GUYANA**

ST. VINCENT & THE GRENADINES

ST. VINCENT & THE GRENADINES



Dr. Kathian Herbert-Hackshaw ST. VINCENT & THE GRENADINES



Dr. Anand Raj Chotkan SURINAME



Ms. Gaitrie Usha Satnarain SURINAME

A Priority for Many

An International, Regional & Local Priority

One Health is promoted and endorsed by international, regional and local institutions as an efficient and effective platform for multi-sectoral, multi-stakeholder action to address the most significant threats to sustainable development and health in the world today. International and Caribbean experts from academia, government, non-governmental organisations, United Nations organisations, and the private sector are all endorsing and applying the One Health approach. The WHO, the FAO and the OIE endorse the One Health approach to address animal, environmental and public health threats as a new and fundamental paradigm at the national

and international levels. The Caribbean Cooperation in Health's Regional Health Framework, CARICOM Regional Policy for Food and Nutrition Security, Caribbean Strategy and Action Plan for Invasive Alien Species in the Caribbean and CARICOM's strategic approach for coping with climate change all require inter-sectoral collaboration. The recently endorsed One Health Caribbean Policy builds on these needs and provides a new perspective and ability to develop and support synergies between many regional initiatives.



The WHO, OIE, and FAO prepared a global strategy for using One Health approaches to reduce health risks at animal-human-environment interfaces. The World Bank continues to work with these partners and with countries to develop tools for assessing country systems in the veterinary and human public health areas, and the bridges between them.

http://www.worldbank.org/en/topic/health/brief/pandemic-risk-one-health



THE ONE HEALTH, ONE CARIBBEAN, ONE LOVE PROJECT

is a microcosm of the global level of interest in One Health



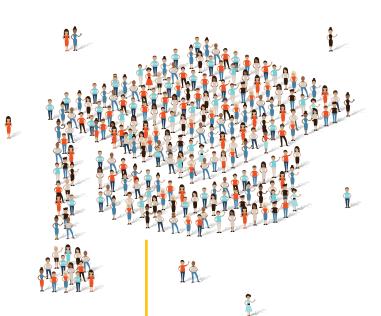
This ACP-EU funded project was led by the UWI, St. Augustine. It involved international, regional and national organisations including PAHO/WHO, IICA, FAO, CIRAD/CaribVET, Ministries of Agriculture of Guyana, Grenada and St. Kitts and Nevis.



Global governance, regional and national priorities, and international donor funding are all making One Health a priority for action.

Research & Training

Caribbean universities and research institutes strongly promote One Health in their educational, research and service programmes. There are many training opportunities available to the next generation of Caribbean One Health leaders, including free online courses in One Health offered by St Georges University, Grenada, an online Master of Science degree available through Ross University School of Veterinary Medicine, St Kitts and Nevis and training material available on the *One Health One Caribbean One Love* and CaribVET websites.



Online courses

ST GEORGES UNIVERSITY

GRENADA

Online Master of Science degree
ROSS UNIVERSITY SCHOOL
OF VETERINARY MEDICINE

ST KITTS & NEVIS

Training Material

One Health One Caribbean One
Love and CaribVET

WEBSITES



A One Health vision for the CaribVET network

CaribVET is a regional network of researchers, decisionmakers, managers and surveillance stakeholders. With linkages to more than 45 veterinary services and agricultural health/research organisations and universities, CaribVET is ideally placed to support collaborative and multidisciplinary approaches. CaribVET recognizes that the "one pathogen, one disease" paradigm is no longer applicable in a globally connected world. Vector-borne diseases, antimicrobial resistance and food safety issues require multidisciplinary approaches and cross-sectoral collaborations at both scientific and institutional levels. Recent projects involving highly pathogenic avian influenza, leptospirosis, rabies, salmonellosis, and disaster management have been carried out by members of the network. CaribVET network members also contributed to the One Health, One Caribbean, One Love project (coordinated by the UWI) and the 7th FP/ Regpot/Epigenesis project (coordinated by CIRAD). The success and impact of these initiatives demonstrate the need for the CaribVET network to play a central role within a broader Caribbean One Heath network, which will play a vital role in guiding research and policy across multiple sectors within the Caribbean for years to come.

Established in 1948, the UWI is the largest and longest standing higher education provider in the Englishspeaking Caribbean. The UWI has four campuses in Barbados, Jamaica, Trinidad and Tobago, and an Open Campus with centres on 16 Caribbean islands. The Faculty of Medical Sciences at the UWI in Trinidad was founded on the One Medicine concept, housing the schools of human medicine, veterinary medicine, pharmacy, dentistry and advanced nursing on the same site. The proximity of the schools facilitates cross-disciplinary, integrated teaching and research across the faculty. One Health and Community Engagement have been integrated into the curricula of all schools at the Faculty of Medical Sciences, with the intent to extend this to other faculties, including Social Sciences. The UWI School of Veterinary Medicine is playing a leading role in promoting the One Health concept across the region, through its leadership role in the One Health One Caribbean One Love project.



THE UNIVERSITY OF THE WEST INDIES





One Health at Ross University School of Veterinary Medicine (RUSVM)

RUSVM was established in 1982 on the island of St Kitts and Nevis and is accredited by the American Veterinary Medical Association. Its veterinary curriculum emphasises the One Health transdisciplinary approach in all courses. RUSVM runs MSc and PhD programmes, including an online Master of Science in One Health geared towards One Health practitioners, including those working in public service. Ongoing research at RUSVM focuses on key issues relevant to One Health in the Caribbean and other regions of the tropics including zoonotic and vector-borne diseases, food safety and security, antimicrobial resistance, environmental health and conservation medicine, animal models of human diseases, comparative medicine, the animal-human bond and innovation in veterinary and medical education. RUSVM also has a One Health student club and the university regularly holds community One Health symposia on relevant topics such as food safety, leptospirosis, rabies and animal bites, toxoplasmosis, antimicrobial resistance and ocean health.

One Health at St George's University

St. George's University's co-located Schools of Medicine, Veterinary Medicine, Arts and Sciences, and Graduate Studies in Grenada allows for a One Health approach to its education, research and service. Dual degree programmes enable medical, veterinary and public health students to engage in courses that explore the inextricable links between the health of humans, animals and the environment. Massive open online courses on One Health are delivered annually. These courses engage an international audience on current One Health topics. Research priorities aligned to local and regional needs are conducted as collaborations between faculty and students, government and community partners in the areas of vector-borne, zoonotic and food-borne diseases. One Health conferences are held biannually and community health fairs are regularly conducted. With over 145 countries represented among students, faculty and alumni at St. George's University, the One Health approach to its education, research and service has assumed a One World perspective.





One Health at the National Center for Animal and Plant Health (CENSA) Cuba

The Mission of CENSA is "To preserve animal, plant and human health". To this end, the staff at CENSA are comprised of people from multiple professions and disciplines that provide a broad vision of the links between these three domains. The One Health approach is central in CENSA's scientific research, technical advice and postgraduate education, as well as in the CEDESAP-REDesastres activities. CENSA is an OIE Collaborating Centre for Disaster Reduction in Animal Health and it routinely performs diagnostic and epidemiological studies. It houses a food safety laboratory with 21 quality accredited assays. It also conducts research focused on zoonotic and vectorborne diseases and antimicrobial resistance. CENSA is playing a leading role in promoting the One Health concept in Cuba, through hosting national and international conferences and workshops attended by multiple sectors and ministries from the country.

One Health at CIRAD in Guadeloupe, French West Indies

CIRAD is using a One Health approach to integrate research on vector-borne diseases, from the characterization of emergence mechanisms to the development of innovative approaches for preparedness and disease surveillance and control. Research priorities at CIRAD focus on interactions between pathogens and their vector, microbiological and host environments and on epidemiology and preparedness, to better understand epidemiological cycles and develop innovative tools for more efficient health monitoring.

Next generation technologies for high throughput detection of pathogens in various ecosystems/ matrices will revolutionize communicable disease surveillance in the Caribbean. CIRAD's state of the art facilities and equipment allows for the organisation of regional training workshops. It welcomes students, partners and researchers from across the Caribbean region. The socio-economic approach followed by CIRAD allows for a better understanding of the impact of diseases on Caribbean communities, and enables better communication of science outcomes to regional health managers, resulting in cost-effective and sustainable responses.









More Aware

Connecting specialised pools of information and sharing interpretations from different perspectives makes us more aware and better prepared. Sharing accurate and actionable information between government agencies, practitioners, policymakers, and other stakeholders marks a shift from creating pockets of information to fostering collective situational awareness. One Health helps information flow between sectors, making it easier to share. This requires people with One Health skills that make them open to exploring plausible but unusual scenarios. They can let questions guide their approach, rather than tradition, experts or schools of thought.



It is hard to avoid a problem on your left if you only look to your right. There are many examples of actions made with the best of intentions in one sector causing harm in another. For instance, antibiotics can make livestock healthier, more productive and more profitable, but also add to the antimicrobial resistance emergency facing public health. Industrial chemicals like pesticides have tremendous economic benefits, but can make children and wildlife sick. Crossdisciplinary collaborations and trusted relationships between people in different agencies and sectors can help us to see more clearly the possible unexpected outcomes of our decisions.

Less Vulnerable

Vulnerability is driven by exposure to something harmful plus sensitivity to that harm. Because of the interdependencies of human, animal and environmental health, sources and signals of exposure and sensitivities in one group may be found in another. Tracking the ebbs and flows of viruses in animals may, for example, help public health identify people more likely to be exposed to new disease risks. Degraded watersheds not only increase exposure to waterborne germs but also make communities downstream more susceptible to flash floods and droughts. One Health can reduce exposures and susceptibilities in one sector by managing risk factors in another sector.









More Resilient

Community, economic and ecological resilience all require an all-of-government approach. However, the spread of programmes, legislation, expertise and authority across multiple and separated programmes often result in efforts to build resilience in one sector exacerbating vulnerability in another. One Health aims to sustain the positive interdependencies of human, animal and environmental health. It broadens participation in problem solving and promotes an all-of-government approach to solutions. One Health bridges programmes and perspectives to ensure that actions to build resilience in one sector links to the consequences for other areas.

Inspiring Timely Action

Recognising a need for change before health is negatively impacted is a key to inspiring preventive actions. Signals of risk in animals or the environment can help society identify new risks to people. These signals provide information to motivate changes in personal risk behaviours, and yield insights into new and unanticipated threats.

More Efficient

Rarely does any one agency or programme have access to all the expertise and resources needed to deal with the multiple dimensions of a One Health problem or effect change in those fundamental drivers of risk that reside in human behaviours, ecological functions, and other social and ecological factors. By working at the interface, One Health borrows, augments and supports the capacities necessary to effect change without having to duplicate effort and resources.









Motivating Action

One Health is action oriented. It motivates people to make the changes needed to protect health and to reduce risk. One Health generates and communicates information that helps people recognise the need to act, showing them that they have the tools and the skills to effectively act and to experience the benefits of collaborative action. Linking across expertise and perspectives can expand world views, change routines and lead to more enjoyable working situations, motivating people to continue to work together.



One Health innovation crosses boundaries—from one discipline to another, from knowledge to solutions, from researcher to community, and from policy to practice. One Health collaborations create opportunities to bring together differing perspectives and knowledge to create something new. Transferring information and technology across sectors can result in innovative solutions. One Health collaborations are conduits for ideas to flow and innovation to emerge.



A One Health approach will see the implementation of creative strategies, sharing of experiences and a wider variety of solutions being available to confront threats in a cost-effective manner.

Dr. Dwight Waldrond -Deputy Chief Executive Officer, Guyana Livestock Development Agency, Guyana







Better Outcomes Through One Health

One Health builds capacities and solutions to improve preparedness and response by producing 8 key outcomes.







Case Studies The Benefits of One Health



Mining in Suriname can pollute watersheds with mercury, which in turn contaminates wild fish. Aquaponics grows fish and plants together in backyard tanks, enabling communities to produce their own fish to eat, reducing exposure to mercury, as well as having fresh vegetables and herbs to eat. A pilot One Health project developed and demonstrated affordable aquaponics technology as an innovative tool to reduce family exposure to mercury poisoning.





Better Prepared - Grenada's community clinics

Sometimes, the best way to respond to a disease outbreak is to get in front of the expanding epidemic by vaccinating susceptible people and animals. But organizing and getting compliance with these programmes can be a challenge. St Georges University in Grenada regularly interacts with atrisk communities by conducting community clinics. Fostering ongoing relationships with communities has built trust which is critical for ensuring community cooperation in an emergency. This ensures that Grenada is better prepared if a mass vaccination campaign, for example, is needed.

Better Response - Trinidad fish kills

When two large fish kill events happened in areas of Trinidad and Tobago where oil spills had occurred in the past, people became worried about food safety. They stopped buying fish, resulting in financial hardship for fisher folk and vendors. The government formed a multi-disciplinary, multi-agency team that quickly ran tests and found that the fish were safe to eat and communicated the results to the public. This cooperative approach showed how an effective process is as important as a written plan when it comes to responding to environmental emergencies.



Better Solutions - Innovative, low cost diagnostic technology

Cheap and easy. These are the attractive features of innovative diagnostic technology that has been introduced into veterinary diagnostic labs in Trinidad, Guyana and Suriname through the UWI's ACP-EU funded *One Health One Caribbean One Love* project. This molecular (PCR) technology is designed to be used in low resource settings, using reagents which do not need refrigeration during transport. The technology does not require any associated lab equipment and is cheap and easy to use in any setting, including out in the field.











It is a sunny Saturday morning in the parish of St. David on the island of Grenada. Volunteers are putting up colourful tents in the playing field in front of the small primary school building. Outside, dogs are milling around. Then a man with three goats, all being reluctantly led on leashes, appears along with hordes of children accompanied by their parents or older siblings. This is the scene at the One Health One Medicine community clinic conducted by students and faculty of St. George's University (SGU). Since 2007, the SGU medical school, veterinary school, and public health programme have co-delivered community health clinics for the people and animals of Grenada.

The community clinics provide diabetes and high blood pressure screening, breast examinations and nutrition education, among other services. For animals, there are physical exams, dewormings, wound treatment, rabies vaccinations and owner education, especially about zoonotic diseases. By offering services to people and animals within the same setting there are many opportunities to focus on human and animal interactions and prevention of such things as zoonotic parasites, animal bites and rabies. This model has led to increased access to health services for more people and animals. The community clinic approach has provided a setting in which future healthcare professionals gain a better understanding of what each discipline can contribute. The theme of "One Health" is now firmly etched in the minds of the residents of Grenada and, maybe more importantly, in the minds of medical, veterinary and public health students and faculty.

Climate Connections – Rivers, Climate & Health

Dr. Chandra Degia¹ & Dr. Roderick K. King²

1 - Lecturer, Centre for the Environment, The University of the West Indies, Mona Campus, Kingston 7, Jamaica

2 - Chief Executive Officer, Florida Institute for Health Innovation,
Assistant Dean of Public Health Education, Associate Professor - Department of Public Health Sciences, Director of MD/MPH Program, University of Miami Miller School of Medicine

Seated on a makeshift wooden bench across from a rum shop on an unpaved road, Eric "Worries" McCurbin points across Jamaica's Rio Grande Valley and explains, "Once upon a time in the 1980s, Millbank used to be in the top ten places in the world for highest rainfall. Now? Not again! The place so dry and when the rain come, it come hard. Last year people's house get flood out. The river come down so hard and fast on we. We never see nothing like that up this side before."

Millbank is in the Upper Rio Grande Valley of Jamaica. It is a remote Maroon farming community sitting on the edge of the Blue and John Crow Mountains National Park, a UNESCO World Heritage site. Aside from the poor road conditions, which people in the community view as the biggest obstacle to the area's growth and development, residents are seriously concerned about "river poisoning."

River poisoning happens when people from outside the community slip in undetected and put Gramoxone (a weedicide), Sevin dust (an insecticide) and other toxic chemicals into rivers and streams to catch crayfish. These poisoned crayfish are often sold in the town of Port Antonio, often to school children, who can get sick from eating the poisoned shellfish, sold as "peppered shrimp" – a well-loved Jamaican snack.

Children miles away from the lush Rio Grande Valley are not the only ones who get sick from these illegal river poisonings. Communities, in the Rio Grande Valley, like Millbank, are also gravely affected. These

remote areas do not get their domestic water supply from the National Water Commission. Instead, residents work together to run their own pipes from pristine springs emerging from the rocks in the mountains to community standpipes and to a few homes. When outsiders poison springheads teeming with large crayfish, they often poison an entire community, leaving many people deathly ill.

Humans are not the only ones affected. In a single case of river poisoning, a farmer lost his entire herd of cows because an outsider poisoned the river to catch a few "janga" - the Jamaican word for crayfish - for sale.

"This problem of river poisoning in the Valley is going to get worse because of climate change," explains Fitz King. "It's one thing to get sick from river poisoning when there is lots of rainfall to flush the poison out the streams, springs and the Rio Grande, but with climate change the rain is coming less and less. This means that the poison will be less diluted. People will start to get more violent illness. Some will die because the poison will not be as diluted as it was before. And it's not just we up here in the Valley that going to be affected but further down the Rio Grande, all the districts and towns that depend on this river are going to see more river poisoning sickness and death with this thing called climate change."

Climate change is the change of weather patterns over a 30-year period. In the Caribbean, rain and temperature are the main components of weather that affect us. Rainfall, water availability, and accessibility



POISONS ARE PUT INTO RIVERS AND STREAMS TO CATCH CRAYFISH Climate change compounds the problem of river poisoning



Other toxic chemicals

Sevin Dust (an insecticide)





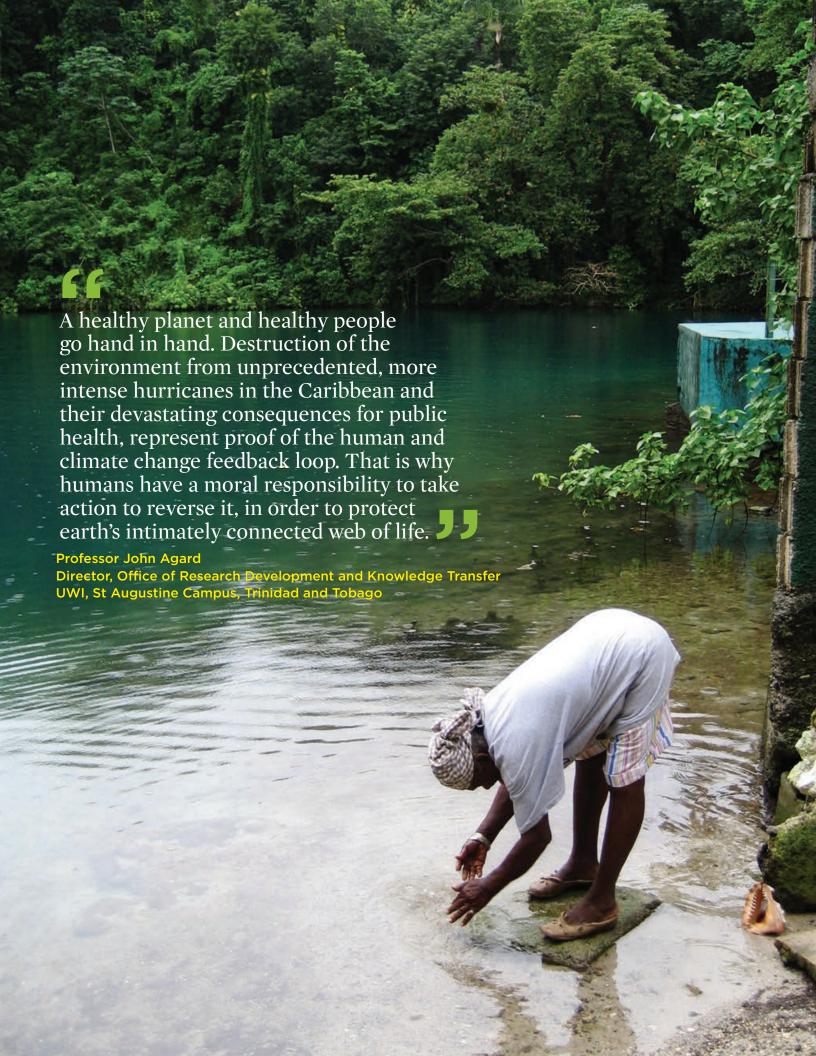




SOLD TO SCHOOL CHILDREN AS "PEPPERED SHRIMP"

SCHOOL CHILDREN GET SICK FROM EATING POISONED SHRIMP







Fitz King

have become the most critical issues related to livelihood, rural community conflict, health and the environment. In the global north, countries like the USA, the UK and Canada fear that climate change will bring more tropical diseases, like Zika, Chikungunya and Mayaro. Some of these diseases are entering the Caribbean for the first time, causing increased health costs and lowered productivity. As the late Professor Dave "Mosquito Man" Chadee explained, with climate change, mosquitoes are now reproducing and spreading faster, causing unprecedented disease epidemics throughout the Caribbean. However, as much as these vector illnesses and communicable diseases can debilitate populations and wreak havoc on already stressed Caribbean economies, many health issues related to climate change in the Caribbean are more complex.

"What we need in rural communities is alternative livelihoods," Mr King proposes "We need to find things that young people can make money from so that people can stop poison the river to catch janga. The tourism people need to show the youth how to develop ecotourism. The government need to fix the road so tourists will come up here. The agriculture guys need to show the ones who want to sell pepper shrimp how to raise shrimp in a pond, rather than poison them in the river.

We need do more organic products but when we plant organic, the market vendor say them too expensive. We need somebody to show us who are the people who want to buy organic so we know if any gramoxone is found in the community, is not we bring it here.".

"Is true what Mr King is saying," Worries agrees. "But in the meantime, we need to start back educating the youths on the dangers of river poisoning. We also need to train the police how to look at evidence, cause we the Maroons can look and see the difference between a janga that poison and a janga that a Maroon catch in a basket. Police and judges have to be trained in what evidence to look for because a lot of these guys that the community catch doing river poisoning, the judge give them license to poison cause they say not enough evidence and set them free. The environmental people and the Maroons have to help the doctors, police and judges to find new ways to collect the data to prosecute these criminals cause they are killing people children."

In the Caribbean, health issues are inextricably linked to our changing climate. A One Health approach that utilises local knowledge, in conjunction with the medical, environmental, and agricultural fraternities, as well as a myriad of other disciplines, is needed to address these wicked environmental problems. Caribbean professionals will have to check their egos at the door and learn to work with colleagues across disciplinary and national boundaries to craft culturally sensitive solutions at the regional, national and community levels. With a One Health approach to problem solving, the Caribbean can be proactive in designing innovative health strategies that help the region adapt to and mitigate climate change.





Early Warning

Urbanisation, global movement of people and products, climate change, and other large-scale socio-ecological changes are causing new health risks to arise at unexpected times and places. Early warning systems need to look beyond traditional surveillance outcomes to a wider array of warning signals found in the world around us. One Health early warning signals strive to provide insight into the event in question, to prepare in time to prevent harm or reduce serious impacts. For example, biomarkers in wildlife can provide early clues that a pollutant is a risk to people. Changes in rainfall and vegetation can show a place is more likely to be the site of a disease outbreak. Knowing where mosquitoes and ticks are surging can forewarn us which communities are at greater risk for vector-borne diseases.

The steady growth of disease risks points to the need to strengthen disease preparedness and response, including multi-hazard early warning systems. One Health early warning increases the sensitivity of detection, quality of assessment, and identification of response options. This helps us act faster and be more effective in avoiding or minimising harm. Our capacity to anticipate problems in time to inspire action can be improved when early warning signals are shared across sectors and interpreted as an integrated whole.







Winning the Rat Race - Leptospirosis

Climate-sensitive diseases are on the rise in the Caribbean. One of those diseases is leptospirosis. People can get this bacterial disease by direct or indirect contact with infected urine from rodents, or through contaminated food or water. Domestic animals, wildlife and pets also get this disease. Leptospirosis outbreaks around the world, including in the Caribbean, have been linked to flooding and heavy rainfall. Climate change is expected to result in more extreme weather and floods in the Caribbean. The region needs to be prepared to combat an upsurge in the frequency and severity of leptospirosis outbreaks.

To meet this challenge, the CaribVET Veterinary Public Health Working Group is developing regional guidelines, policies and best practices to promote an integrated approach to leptospirosis. The foundation of these guidelines is recommendations to increase awareness of physicians, veterinarians, farmers and the general public on recognising the disease, as well as to highlight efforts that can be undertaken to reduce the risk of contracting the disease. Early recognition

through improved diagnostics and collaborative surveillance of human and animal cases can allow for a rapid response and early action to reduce the size and prevent the spread of an outbreak. Early recognition of high risk areas in advance of human cases (such as may be seen by detecting animal cases first or identifying areas at risk for flooding) can prompt alerts to people to boil their water or take other measures to reduce their risk of exposure to this disease.

Close collaboration between public health, animal health, agriculture, food production and environmental management sectors is required to identify local environmental drivers and reservoirs of leptospirosis risk and to develop sustainable programmes to manage risks in the community. Cooperation and information sharing between these sectors is needed to make effective use of scarce resources, and to develop plans and programmes to prevent this disease before large outbreaks occur. Diseases like leptospirosis do not respect boundaries; neither should the programmes that help prevent them.





Case Study

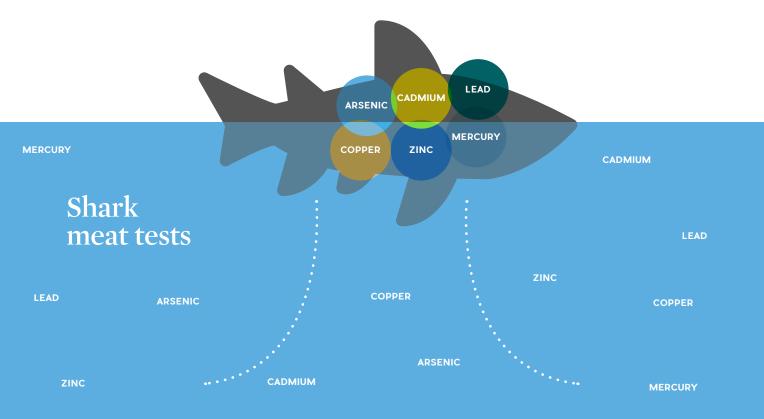
Sharks and Heavy Metals – Trinidad & Tobago



Fish is a good source of protein, and 'bake and shark' in Trinidad and Tobago has long been on the list of favourite local foods. However, sharks are apex predators and are more likely to have unsafe levels of heavy metals like mercury and arsenic. Increasing pollution in our oceans is increasing the risk of high levels of heavy metal accumulation in the fish we eat. Consumers may not be aware of these health risks, nor well-informed about the extinction and conservation risks for many of the world's sharks.

Local data are lacking with respect to heavy metal accumulation in sharks. The One Health leadership team in Trinidad and Tobago embarked on a project to investigate this issue. The team tested shark meat for mercury, lead, arsenic, cadmium, zinc and copper, providing baseline information for species of shark eaten locally. They also assessed consumer and fisherfolk awareness of the risks associated with eating shark meat.

Such studies help people make informed food choices. By telling us about the past and present state of pollution and its footprint in our foods, environments and wild fish, cross-sectoral baseline studies provide a benchmark for measuring success or failure in attempts to protect the health connections among oceans, sharks and people.







Purposeful Networking for Disaster Preparedness -Cuba

Preparedness comes from access to the right information fast enough to make decisions that will protect populations. The Caribbean is experiencing extreme weather events and can anticipate more as the effects of climate change become more pronounced. People and animals will suffer the effects of extreme weather, such as interruptions of safe and secure water supplies and the frequency and severity of infectious disease outbreaks. The Training Center for Sanitary Disaster Risk Reduction in Animal and Plant Health in Cuba is building an information network to reduce risks of animal and plant diseases arising from climate change. The REDesastres is a national agricultural sector network, which includes researchers, teachers, specialists and officials at different levels from government and universities. It promotes timely sharing of the readily accessible, up-to-date information onto the desks of decision-makers, scientists and industry. One Health



networks like the REDesastres link skills, knowledge and capacities for faster response, quicker recovery and better anticipation. Relationships developed in One Health teams build links and trust between people in organisations and communities who must work together to improve preparedness and response to emerging diseases, emergencies and disasters.





Case Study Remembering Hippocrates

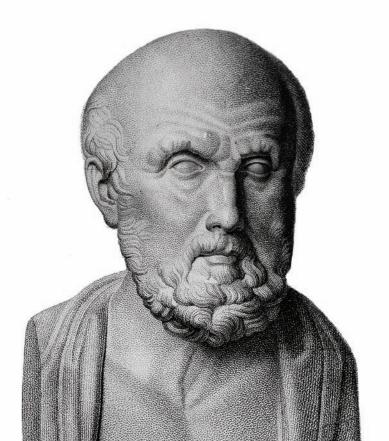


It was July in Trinidad and the rains were very heavy that year, resulting in flooding. A teenage boy suffering from fever, rash and aching joints went to the doctor and, as can happen when doctors see these symptoms, he was diagnosed with dengue, and told to go home and rest. When the boy went to a doctor a second time, he got the same diagnosis and advice. He went home and, a few days later, he was dead.

Hippocrates, who is considered the founder of Western medicine, is thought to have said, "It is better to know what sort of person has a disease than what sort of disease a person has." He taught aspiring physicians that, to understand why people fall ill, it is important to know how they relate to the world around them. Hippocrates might be said to be the first advocate for

a One Health medical history. It is not surprising that many people presenting themselves to their doctor in the Caribbean with fever, rash and aching joints are diagnosed with either ChikV, Dengue or possibly Zika and are told to go home and rest.

But it turned out that the boy lived in a very poor community in East Trinidad, was off from school for the July-August break, and was regularly playing with his friends in and around flood water. Solid waste management was a problem around his house, resulting in a build-up of food waste which attracted rats into the area. The boy was later confirmed to have died of leptospirosis. Leptospirosis is a highly treatable disease when diagnosed in a timely manner. Risks of contracting leptospirosis increase dramatically at times of flooding in areas with high levels of rat infestations, as the leptospira bacteria is transmitted though the urine of rats. This case illustrates the value of a One Health history knowing how the boy 'related to the world around him' could have helped the doctor come to a correct diagnosis in time.



It is better to know what sort of person has a disease than what sort of disease a person has.

Hippocrates

Antimicrobial Resistance – A Clear One Health Issue

Dr. Alexandra Vokaty, Advisor on Veterinary Public Health for the Caribbean, PAHO/WHO Office in Trinidad and Tobago

According to the World Health Organisation, antimicrobial resistance (AMR) is an emerging global threat to public health. Antimicrobial resistance is the ability of bacteria or other pathogens such as viruses, parasites or fungi, to resist the effects of an antimicrobial (antibiotic, antiviral, antiparasitic or antifungal medication). Antibiotic resistance occurs when bacteria change in a way that reduces or eliminates the effectiveness of drugs, chemicals, or other agents designed to cure or prevent infections. The bacteria survive and continue to multiply, causing more harm. Antibiotic resistance can cause significant danger and suffering for animals, children and adults who have common infections that used to be easy to treat with antibiotics. Other antimicrobials, including antivirals, antiparasitic agents and antifungals are also becoming increasingly ineffective.

Repeated and improper uses of antibiotics in people and food animals are primary causes of the global increase in drug-resistant bacteria. Antimicrobials are often used for treatment and prevention of diseases in livestock and crop production, including aquaculture. Antibiotics can be used at less than therapeutic levels to promote growth in livestock production. These actions are often associated with the potential risk of emergence and spread of resistant micro-organisms.

If bacteria are resistant to many drugs, treating the infections it causes can become difficult or even impossible. Resistant infections can be transferred directly between people or between animals. People can become infected with resistant bacteria through improper or inappropriate use of antibiotics, in hospitals and health care facilities, through direct contact with infected animals or by consuming animal products that are contaminated with resistant bacteria. Drug resistance can circulate between humans, animals, food, water and the environment. Transmission is



influenced by trade, travel and migration (both human and animal).

Because the root causes of antimicrobial resistance can emerge in health care settings, in communities, in animals and in the environment, coordinated efforts are required on all these various fronts in order to design effective interventions to monitor, prevent and manage the problem. In other words, AMR is a quintessential One Health problem that requires disparate sectors to collaborate to design and implement effective solutions.

Multi-sectoral collaboration and cooperation are necessary at both the international and national levels since action is needed in all countries and sectors simultaneously. Sustainable coalitions are needed within countries to bring different sectors and stakeholders together, for integrated surveillance between the health and agriculture sectors, and for sustained prevention and elimination programmes.





In recognition that a multi-sectoral One Health approach is necessary to identify, prevent and reduce antimicrobial resistance, the World Health Organisation (WHO), Food and Agriculture Organisation of the UN (FAO) and World Organisation for Animal Health (OIE) have signed a tripartite agreement to collaborate on antimicrobial resistance.

In May 2015, the World Health Assembly (WHA) endorsed the Global Action Plan to combat AMR (GAP-AMR), providing guidance for countries to use in the development of national action plans (NAPs). GAP-AMR sets out five strategic objectives: (1) to improve awareness and understanding of AMR; (2) to strengthen knowledge through surveillance and research; (3) to reduce the incidence of infection; (4) to optimize the use of antimicrobial agents; and (5) to ensure sustainable investment in countering AMR. The 2015 WHA resolution urged each Member State to develop a NAP by May 2017 to guide management and implementation of locally appropriate AMR prevention and control activities. In order to promote concerted efforts between countries to achieve gradual progress, the objectives in the national action plans are closely aligned to the global action plan.

Global leaders met at the United Nations General Assembly in New York in September 2016 to commit to fighting antimicrobial resistance together. This was only the fourth time in the history of the UN that a health topic was discussed at the General Assembly. Heads of State and Heads of Delegations addressed the seriousness and scope of the situation and agreed on sustainable, multi-sectoral approaches to addressing antimicrobial resistance.

In the Caribbean, PAHO/WHO has been conducting workshops to train the relevant national authorities on how to develop national action plans that are aligned with GAP-AMR. Countries have formed national multi-sectoral coordinating groups to design and implement these national action plans. The coordinating groups include epidemiologists, microbiologists, infection control personnel in hospitals, pharmacists, veterinarians, food safety authorities and environmental health authorities. They are working together to conduct AMR situation analyses in their countries, and to identify objectives and activities that will address their AMR situations. For some countries, this is their first experience in working in a One Health context between Ministries of Health and Agriculture. But most report that they find the exchange of information and experiences, as well as focussing on common objectives, to be stimulating and productive.

PAHO/WHO has also been training epidemiologists and microbiologists from Ministries of Health and veterinary services in Ministries of Agriculture on integrated surveillance for AMR, with data from food animals, foods of animal origin and people being integrated into central databases, to facilitate trace back. This is a prime example of an integrated multisectoral or One Health surveillance system that can trace AMR in people back to the source, whether in animals, foods of animal origin, communities or health care facilities.

In conclusion, because people can acquire resistant bacterial infections from other people in their communities or hospitals, from consuming meat, milk or eggs or directly from animals or the environment, antimicrobial resistance is a fundamental One Health problem. Reducing antimicrobial resistance will require surveillance in people, hospitals, communities, food and animals in order to determine the source and prevent the spread. Cooperation between the relevant health, agriculture and environmental authorities is necessary in order to combat this emerging public health threat.



Case Study Piloting Antimicrobial Resistance Surveillance



The Inter-American Institute for Cooperation on Agriculture (IICA) under the 10th European Development Fund (EDF) Sanitary and Phytosanitary (SPS) measures project launched a pilot programme, The Caribbean Integrated Surveillance System on AMR in Agriculture. This was initated in seven countries as a One Health approach to addressing antimicrobial resistance in the Caribbean region. This multi-country pilot programme represented a first step in contributing to the establishment of an antimicrobial resistance surveillance system in the

Caribbean region. The Programme was organised and monitored through collaboration with the Ohio State University and started in June 2016 with Belize, Jamaica, Dominican Republic, Barbados, Trinidad and Tobago, Guyana and Suriname. The project encouraged knowledge and resource sharing, established an AMR baseline and assisted in building laboratory capabilities. In addition, over 230 public health and agriculture professionals from the seven countries were trained and sensitised in AMR surveillance.









Partnerships for Safe Food - Barbados

Are antibiotics present in the most popular meat in the Caribbean? The One Health Leadership team in Barbados set out to investigate if antibiotic residues were present in locally produced chicken meat and whether multidrug resistant bacteria, Salmonella, was present.

This pilot project not only detected possible drug residues and multi-drug resistant Salmonella but also informed the design of longer term AMR surveillance programmes and built long lasting relationships. The collaborations built between the Ministries of Agriculture, Health and with other stakeholders ensures an integrated, One Health perspective to the critical issue of AMR in Barbados.



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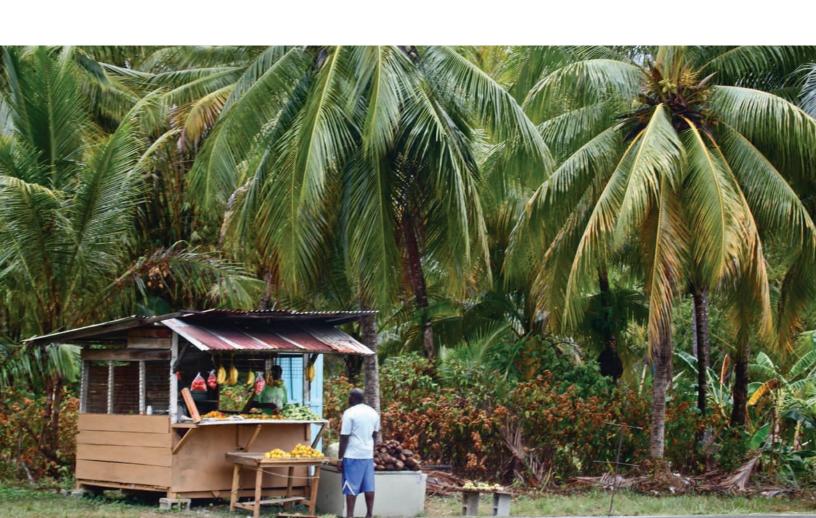
Economic Argument for One Health





Too often, economic development, health and environmental management are not integrated. One Health can protect and produce economic benefits by linking plans, priorities and actions that overlap in the same communities and ecosystems. In some cases, the One Health approach can help prevent losses. For example, diseases of crops and livestock threaten trade and reduce locally produced food availability. One Health also reduces the economic burden of infectious diseases – diseases that fall disproportionately on poorer people – by preventing them at their source. Many international stakeholders

rely on One Health for more effective protection of the global community against pandemic threats. In other cases, One Health protects economic opportunities. Ensuring and protecting healthy reefs, for example, produces safe and abundant seafood and excellent snorkelling – both of which attract tourists. One Health aims to avoid the typical siloed approaches between sectors that can result in unanticipated and unwanted consequences. Good health is a major resource for economic well-being – for us, for animals, and for our shared environment.







On The Fly in Northern Rupununi -Guyana

Arapaima is a very large species of fish that is a main attraction for anglers. In Guyana, the species is protected. Northern Rupununi is one of the few areas where the Arapaima is found.

However, gainful employment is an overwhelming concern for the people living in this area. In this case, the rich biodiversity of the region was used to create jobs in a way that is sustainable and which keeps families together. Ecotourism is a fast-growing alternative to mining and forestry for local jobs. The One Health challenge was how to extract the community benefits from this potential money-earning resource without destroying the fish population.



Sustain the fishery

Sustain the Arapaima

Produce valued local iobs

Arapaima catch and release fly fishing did not exist as a sport fishing opportunity anywhere in the world. The Guyanese government provided special permits to test whether the Arapaima could be caught on the fly in Rupununi. Investment from the private sector, government and international agencies supported research that showed the Arapaima were worth more to the community if used in a catch and release sport fishery than a one-time benefit for poaching. Three eco-lodges worked together to develop standards of practice that would sustain the fishery, sustain the



Arapaima and produce valued local jobs. Training in hospitality services, as well as in medical care, was given to community members to prepare them to provide excellent service to workers and guests. The project employed local Amerindian communities and reduced gender inequities by creating new jobs for local women. Positive environmental impacts came through investment in solar energy and planting new fruit and vegetable crops for guests.

The new capacity being built through this expanding eco-tourism opportunity is being used as a foundation to attract new resources that can serve as outposts to monitor the health of fish, domestic animals, wildlife, people and ecosystems around the eco-lodges. Northern Rupununi is under pressure from logging, gold mining, oil prospecting, bauxite mining, wildlife trade, burning, grazing for agriculture, and expansion of towns and villages. Understanding how these activities are affecting human, animal and ecosystem health will inform development policies that ensure safe, sustainable and healthy use of natural resources.



Case Study

Ecotourism & Sea Turtles: Slow and Steady - Trinidad



Nature Seekers is a leading, non-profit organisation based in the Matura community on the east coast of Trinidad. Over more than 25 years, Nature Seekers has pursued a range of innovative initiatives that continue to empower communities and support sustainable ecosystems. Among other programmes they provide a range of guided conservation ecotours, conservation training and outreach programmes, and produce a successful line of hand-crafted jewellery made from recycled materials. Their journey began with an innovation. Beaches near their community host large and active nesting populations of the globally vulnerable leatherback sea turtle. Nesting leatherbacks have long been harvested in Trinidad despite regulatory restrictions. In 1990, the national government made the Matura beach a Prohibited Area to protect nesting sea turtles. Although the

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designation met with resistance in the community, some community members embraced the change. They formed Nature Seekers which soon had responsibility and some funding to patrol the beach during sea turtle nesting season and to provide a tour guide service to visitors who wished to see nesting sea turtles. Over the following years, at times with no or limited funding, the group continued to reliably deliver both sea turtle conservation and an exceptional ecotourism experience. Their persistence demonstrated to their community the viability of an alternative use for sea turtles. As their website states "During this time, the activities of Nature Seekers attracted and transformed eight poachers and children of poachers into conservationists and they are the strongest members of the team." Today, as they have grown and diversified, Nature Seekers is an inspiration and model for other rural communities around the Caribbean region to find sustainable ways to benefit from their natural heritage.

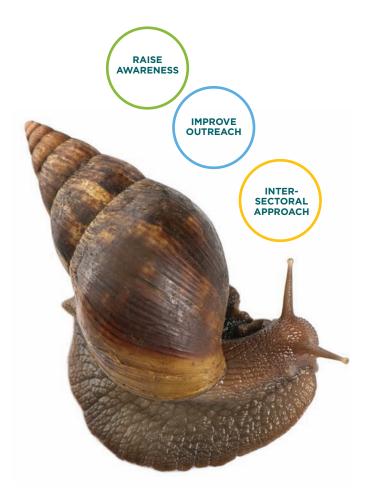






No Snail's Pace for Food Security & Health -Antigua

Invasive species are a major cause of crop loss around the world. The Giant African snail, originating from East Africa, is invading the Caribbean. This snail can negatively impact agriculture, tourism and health care costs. It can eat over 500 species of plants, destroying crops, medicinal plants and native ecosystems. It is a threat to agriculture profitability, directly impacting farmers' livelihoods and income generation in Barbados, Antigua and Trinidad. The snail serves as an intermediate host of the rat lung worm that causes meningitis in people. It has even been cited as a cause of road accidents due to sheer numbers of snails on the roads.





Approaching this challenge of economic stability, food security and health, a physician in the Ministry of Health in Antigua began collaborating across the various sectors that deal with the snail. She established working relationships with Ministry officials from Health and Agriculture and affected change for farmers from the Jolly Hill District / Bolans New Extension area of Antigua. This One Health team worked with the community to improve outreach and awareness of issues related to the snail, stressing the need for an inter-sectoral approach. The team held field school training for farmers which focused on practical methods for the prevention and control of the snail.

One Health & Food Security in the Caribbean

Dr. Cedric Lazarus - Livestock Development Officer, FAO Sub-Regional Offices for Meso-America

Food security has been defined as a state where "people at all times have physical, social and economic access to sufficient, safe and nutritious food, which meets their dietary needs and food preferences for an active and healthy life". One Health is "the collaborative effort of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals and the environment". So, it does not take a stretch of the imagination to recognize that a One Health approach to achieving food security has merit.

In the Caribbean most, if not all, countries are food insecure, which simply means that they do not produce enough food to feed their growing populations and therefore have to rely on imported foods - a situation which might not be sustainable. In fact, due to the relatively small land mass of most Caribbean states, plus their vulnerability to natural disasters and the impact of climate change, many of our countries are especially at risk from food insecurity. Efforts to produce more food and reduce the regional food import bill (which surpassed the US\$4 billion mark in 2011) should incorporate the One Health concept and approach whereby all the various actors and stakeholders, both in the private and public sectors, work together and collaborate on strategies and plans to reduce the problem of regional food insecurity.

To feed our growing population, farmers in all Caribbean countries need to produce and make available to consumers more food, and not just more food but healthy food with the recommended nutritional value that we all need for a healthy lifestyle. Incorporating the One Health approach means that all stakeholders in food production have to change their traditional way of working, which is not something that comes easily or naturally to many. Some of the obvious stakeholders are crop and

livestock farmers and fisherfolk, extension officers, agricultural scientists such as entomologists and agronomists, veterinarians, public health and food safety officials, food scientists, and environmentalists. Other important stakeholders include sociologists, economists, food marketing experts and politicians who make policy decisions that influence areas directly related to food security, such as management of natural resources, decisions on domestic food production, food trade and commerce.

As we seek to increase food production in the Caribbean, greater emphasis has to be placed on reducing food losses due to pests, diseases and poor management practices by food producers on farms. In one Caribbean country, for example, it was recently reported by officials in the Ministry of Agriculture that in many communities livestock farmers lose, on average, over fifty percent of all lambs and baby goats born annually due to a combination of preventable diseases and poor management practices. If 50 out of every 100 lambs and goats born alive on a farm die, it means that farm productivity is very low indeed and farmers are losing a considerable amount of money. This in turn will lead to a scarcity of lamb and goat meats for consumers, higher prices for the scarce local product and eventually more imports to satisfy demand. This situation can be turned around by initiating a One Health approach whereby environmentalists, animal health officials, extension officers, agricultural researchers, veterinarians and others get together with the affected goat and sheep farmers in the communities to analyze the problem and come up with workable solutions to overcome it. This must be accomplished with the appropriate leadership and the required collaboration, since the problem is likely to have multiple factors, some of which may be environmental, while others may be related to nutrition and management factors, such as the availability of adequate housing for the animals.





Every country in the Caribbean aspires to become food secure. The attainment of this goal requires a collaborative, multi-disciplinary and inter-sectoral approach to policy development, farming practices, food production, nutrition and food safety. The 'One Health' approach is the vehicle that will drive the process toward food security in the Caribbean.

Mr. Gregg C. E Rawlins
IICA Representative in Trinidad and Tobago and Coordinator, Regional Integration,
Caribbean Region
IICA Delegation in Trinidad and Tobago



The level of food insecurity in many countries can be significantly reduced when consumers have more access to good quality locally produced foods, rather than having to rely on imports, the prices of which keep on rising.

Across the Caribbean region in crop production, losses due to plant pests and diseases are considerable and these losses impact negatively on food security. Only by fostering an integrated approach along the ideals of One Health, whereby all stakeholders are engaged and work closely together (rather than in silos) can these pests and diseases that threaten food security be controlled or even eradicated. If this is accomplished, the level of food insecurity in many countries can be significantly reduced as consumers would have more access to good quality locally produced foods, rather than having to rely on imports, the prices of which keep on rising. Some of the diseases that threaten regional crop production and could benefit from a One Heath approach to their management are Black Sigatoka, beet army worm and citrus greening.

Efforts to reduce the risk of entry into our countries of zoonotic diseases (diseases transferrable from animals to man and vice versa), such as highly pathogenic avian influenza, are meant to protect and safeguard both animal and human health. A One Health approach should therefore be considered not only in developing, but also in implementing, the appropriate risk reduction strategies. Important stakeholders in this area include Ministries of Agricultures, Ministries of Health, farmer organisations, Customs and Commerce Departments

and risk communication experts. Bearing in mind that poultry meat is the most widely consumed meat in the Caribbean, the impact on regional food security of a disease like highly pathogenic avian influenza would be tremendous, which is why a collaborative One Health effort is needed.

Increasing the dialogue, collaboration and interaction between public health officials and officials in agriculture within the context of One Health, and taking into consideration farm practices, is important to decrease food losses along the value chain. The sharing of information and data among these groups is not routinely done, yet it is only by collaboration that certain food safety problems and issues, such as reducing slaughterhouse losses due to condemnation, can be solved. The farmer, his/her animal health professional and the food safety personnel play a key role here, but they must communicate with one another routinely and on a regular basis to solve problems which are observed in the slaughterhouse, but that begin on the farm. Policy makers and senior managers in government have a key role to play in ensuring that such inter-agency collaboration is promoted and takes place. The outcomes would be beneficial not only to the farmers, but also to consumers.

Food security in the Caribbean is such an important issue that it cannot be left to any one group of stakeholders. It cannot be solved by individuals or groups working independently. It requires, among other things, a collaborative One Health approach.

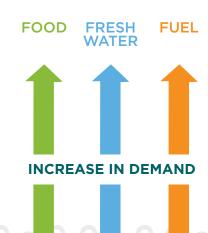
Protecting Ecosystem Goods & Services

The Millennium Ecosystem Assessment made it very clear that "everyone in the world depends completely on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfilment, and aesthetic enjoyment". People have changed ecosystems more rapidly and extensively over the past 50 years than in any other periods of human history to meet the rapidly growing demands for food, fresh water and fuel. Adverse impacts on our health can occur when ecosystem services cannot meet our needs. The choices we make can speed up, stop or even reverse the degradation of ecosystem services and goods. In order for One Health in the Caribbean to be relevant

to the pressing problems in the region, the protection of ecosystems services must necessarily be part of its scope of practice. The Caribbean benefits tremendously from its natural resources. The global trends discussed throughout this book, like climate change and habitat loss, coupled with increased pressures on natural systems, are driving emerging diseases, new ebbs and flows of pollutants and other environmental threats. Protecting environmental services and goods not only helps sustain current community benefits, but also helps build resilience against unknown future risks.

People have changed ecosystems more rapidly and extensively over the past

50
YEARS





Case Study Protecting Watersheds - Jamaica



The Blue and John Crow Mountains National Park (BJCMNP) is a UNESCO World Heritage site, of global significance. It provides goods and services that are essential to Jamaica's health and economic prosperity. For instance, the national park provides the micro-climate responsible for the world-famous Jamaican Blue Mountain Coffee. The rivers in the park provide drinking water and water for agriculture and industry for over 40% of Jamaica's population. The national park is of historical and cultural importance to the Windward Maroons. The health and prosperity of several communities are tied to the National Park. Communities living in areas close to the park are usually low-income and are dependent on farming and ecotourism. Certain farming practices, such as the improper disposal of animal waste, threaten the ecological health of the watershed. Working with the Scotts Hall Maroon community, the One Health Team in Jamaica, the Jamaica Conservation and Development Trust and the One Health celebrity





patron, international dancehall artiste, Roshaun "Bay-C" Clarke, provided training in sustainable farming practices to reduce pollution of the tributary of the Wag Water River as a step to protecting ecosystem goods and services.

One of the key innovations that inspired youth participation and interest was a national River Health Song Competition championed by Bay-C and held in the remote Scotts Hall community. Participants were asked to compose dancehall lyrics on the importance of maintaining healthy rivers in their communities. The enthusiasm from the song competition rekindled efforts within the community to put more emphasis on ecotourism, a potential source of major revenue for the community. On their upgraded eco-heritage tour, visitors are now met by the winner of the song competition, Goldie Notch. Notch sings his song, "Clean and sweet", which highlights the importance of nature's goods and services, especially the local watershed.





Case Study

A Gastronomic Solution to Lionfish – St. Vincent and the Grenadines

Coral reefs support more species per area than any other marine environment. They provide food for millions of people, protect communities from storms and support tourism and fisheries. Tourism is an important economic activity for St. Vincent and the Grenadines and a healthy environment is a critical selling point for local and international visitors.

But the lionfish is now threatening the health of Caribbean reefs. Native to the Pacific and Indian Oceans, lionfish have invaded Caribbean waters. These voracious predators pose a major food security risk to the region, feeding on many of the juvenile, commercially important fish such as snappers, groupers and hinds. Caribbean reefs are already stressed and fragile. The lionfish negatively impacts reef health and ecology by decreasing ecologically important species, including parrot fish and other herbivores who keep algae from overgrowing coral.

Usually seen as a problem addressed by the fisheries division, the St. Vincent and the Grenadines One Health team spearheaded the coordination of several

key agencies to develop the "eat them to beat them" campaign. The project carried out a gap analysis on current knowledge of lionfish among affected groups and focused efforts to promote lionfish as an alternative, safe source of protein. The team carried out school cooking competitions, poster competitions, produced a lionfish jingle, conducted a lionfish derby during Fisherman's Day and carried out several outreach presentations in local schools. Success required a large collaborative team that included the Ministries of Agriculture, Fisheries Division, Health and Wellness, Education, Tourism, National Parks and Gardens, as well as fisher folk organisations, NGOs (SusGren, Mayreau Regatta, Bequia Dive), and St. Vincent and the Grenadines' Hotel and Tourism Association, to implement a coordinated mitigation strategy that leveraged the expertise and resources of the groups involved. Promoting the fishing and eating of lionfish provided a local, safe food source while at the same time protecting the reefs by removing a significant invasive species.







Case Study

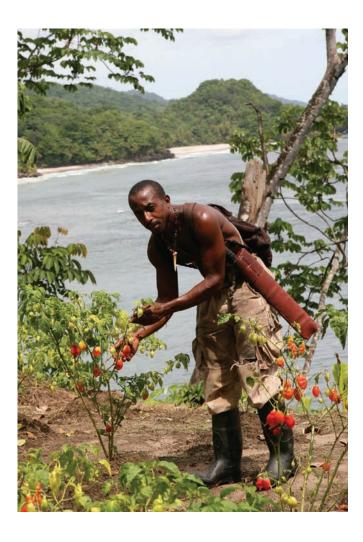
Pollination: Connecting Plants, Animals and People - Trinidad and Tobago



Healthy bats, bees and other insects are good for us. As crop pollinators, they are key to food production and security. Trinidad and Tobago was one of four countries that implemented the Project for Ecosystem Services (ProEcoServ), a global UNEP flagship project that built upon the Millennium Ecosystem Assessment. As one of the project activities, Dr. L. Dempewolf investigated the contribution of pollinators in crop production in the Nariva Swamp. In the absence of pollinators, crops such as cucumbers would experience losses of between 75%-100%. Approximately 75% of the yield of hot peppers grown in the Nariva Swamp, for example, depend heavily on pollination by insects. The industry is worth approximately US\$8 million a year. Without pollination services, pepper production would drop to approximately a quarter of

its current production, which would be a significant loss of income for farmers and the country. The Caribbean, like much of the globe, is facing a decline in the health and abundance of pollinators. The consequences of these declines will be lower yields and higher costs of producing fruits and vegetables, leading to increasingly unbalanced diets. Ensuring healthy, abundant pollinators requires collaboration between conservation, agriculture and food security programmes.

About
75
%
of the
yield of
HOT
PEPPERS
grown in the
Nariva depends
on pollination by
insects



The Importance of Ocean Health to the Caribbean

Dr. Carla Phillips, Lecturer, Marine Mammal and Animal Health, School of Veterinary Medicine,
The University of the West Indies, St. Augustine. Trinidad & Tobago

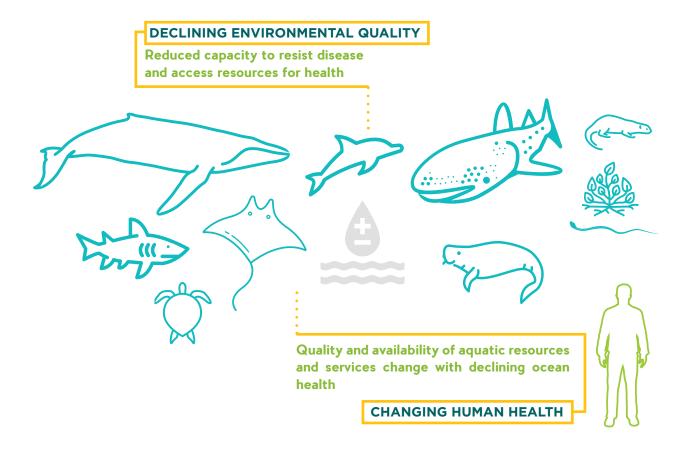
Is there a connection between large whales in the ocean and the quality of air we breathe? I assure you, an important link exists.

Intricate and complex interconnections exist in global aquatic ecosystems. The aquatic ecosystems that define the Caribbean region are no exception. The factors that influence and determine the health of these systems are equally multifaceted, and therefore require a similarly multifaceted approach to developing, implementing and enforcing effective intervention strategies, if we are to strengthen our regional conservation efforts.

Fisher folk, tourists and islanders Caribbean-wide, all depend on the health and sustainability of aquatic ecosystems for food, income and leisure. The availability of an abundant and consistent supply of marine fish serves as the foundation of the household income for residents of many coastal villages across the region; however, poor fishing practices and environmental degradation have severely threatened this commodity, in terms of gross numbers and the capacity of species to rebound. Our warm waters, and the reef-life that lies beneath, provide a significant source of revenue derived from the thousands of tourists that visit our shores annually, seeking to experience the brochure beauty that our tropical isles offer. The beauty and health of our oceans are threatened, however, by petrochemical spills, pesticide contamination, dumping of plastics and other waste materials, including raw sewage, and a host of other threats derived from irresponsible civic and industry management practices. Poor environmental health and/or loss of biodiversity have ill effects on all who depend on these ecosystems. Many sources contribute to degradation and it will take the collective, coordinated efforts of many to rectify these issues.







Caribbean aquatic ecosystems in general house an enviable collection of sea, shore and swamp birds, colourful reef and ornamental fishes, endangered marine life including whales, dolphins, manatees, sea turtles, sharks, whale sharks and rays, as well as snakes, neotropical river otters, aquatic vegetation and many others. Poor water quality results in compromised immune systems of these creatures, increasing susceptibility to disease and leading to deterioration of the health of aquatic species. Poor health of the water, animals and plants within aquatic ecosystems serve as a warning of impending threats to human health, as people physically interact with, handle and consume many of these aquatic products and by-products. Environmental, animal and human health are therefore intricately linked.

The Caribbean is not only home to a vast array of marine fisheries, vibrant coral reefs and pristine beaches, but also to ecologically rich swamp land, mangrove habitats and protected rain forests which sustain hundreds of unique plant and animal species. Human activities severely threaten these habitats and their biodiversity. Garbage and other pollutants deposited in inland and coastal aquatic and semi-aquatic habitats, all ultimately make their way to the ocean. These, coupled with the effects of climate change, threaten the health of not only

the ocean, but terrestrial and aquatic environments. This deserves urgent attention, especially when we consider that the ocean is ultimately the source of our water and our oxygen, and is a critical site for environmental carbon regulation. Given the wideranging deleterious effects, it is clear that no single profession would likely have all the answers if we were to attempt to find resolutions for these critical problems.

Let's return to my opening question: Can you find any possible connection between large whales in the ocean and the air that we breathe? Here's how Killer Whales may influence the quality of air:

When there are changes in the population of predators at the top of the food chain, this results in sequential changes in the population of both predator and prey species at the other levels in the food chain or food web, creating a 'cascade'. One classic example is that of the apex predator, the Orca or Killer Whale. Orcas are at the top of the predator list in the ocean, with some populations being known to hunt other large whales. With the loss of large whales, some killer whale populations shifted to hunting sea otters. But for sea otters, sea urchins represent a significant percentage of their diet. As the killer whales shifted their focus to hunting sea otters, the sea otter population declined,

Value of healthy reefs for local income:

66

I keep fighting to conserve something that I depend on to have money in my pocket and food on my table. I would go out to fish today and make \$400.00 but if I take four people snorkelling for half hour, I could do the same thing and obtain a livelihood in less time.

Mr. Welldon Mapp, Community Field Technician, Environmental Research Institute Charlotteville, Tobago, W.I

causing the sea urchin population to increase. Sea urchins graze on kelp. With the increase in sea urchins, the kelp forests have dramatically declined. Kelp forests not only provide refuge for many fish, sea turtles, invertebrates, and marine mammals, but also serve an important role in regulating carbon dioxide concentrations in the atmosphere, the very atmosphere that we utilise for respiration.

Shifts in aquatic animal populations, regardless of the underlying cause, alter natural 'checks and balances' in aquatic ecosystems and may ultimately result in far reaching deleterious environmental and human impacts. Again, environmental and animal and human health are intricately linked.

With an understanding of this intricate linkage, it is important to elucidate the many threats to ocean health and biodiversity so that we can devise strategies to mitigate the risks that are ultimately also posed to humans and animals. Some of the major threats include environmental changes and habitat loss due

to climate change; loss of reef diversity due to coral bleaching; death of aquatic vertebrates (including aquatic birds) and invertebrates (including coral) due to the ingestion of plastics and microplastics. Other major threats include wildlife entanglement in fishing gear and in other garbage that accumulates in the ocean in the multiple oceanic garbage patches; the acute and chronic effects of oil spills; eutrophication and its possible link to harmful algal blooms (HABs) and toxic HAB syndromes in man and animals. Zoonotic diseases also pose a threat. Agents have been isolated from and may present in many of our aquatic animals and their environments. Examples include mycobacteriosis, *Streptococcus iniae* infection and brucellosis.

Intervention and prevention of health problems in any of the three sectors positively changes the overall outcome, but because of the interconnectedness of these spheres and the highly complex nature of these problems, it is vital that we bring together people and processes and link the information, expertise and perspectives needed to promote the health benefits of interactions between humans, animals and our shared environment, and prevent or reduce risks that might arise from these interactions. This is the basis of One Health Conservation.



Marine Mammal connections

Marine mammals are but one example of ocean inhabitants that serve multiple important ecological roles. The abundance and distribution of these and other animals can have critical impacts on the structure and function of marine ecosystems. Marine mammals are some of the primary consumers at most feeding levels in aquatic ecosystems.

Depending on the marine mammal species, they may consume anything from aquatic vegetation, to fish, squid, shellfish, other invertebrates and even other marine mammals, thereby impacting and shaping the structure and function of aquatic communities. Some examples include:

- Following the death of large marine mammals, their decay can contribute significantly to the transfer of nutrients to communities on the ocean floor.
- ★The presence and distribution of marine mammal populations may influence life-history characteristics and community structure of different prey fish species.
- ♣ Some marine mammals are important in controlling seagrass populations, including influencing seagrass species densities in favour of more nutritious varieties, thus impacting the structure of the seagrass communities.
- + Human activities have threatened and resulted in a reduction in the numbers of large whales. Loss of these large whales may increase the availability of feed (krill, squid) to other species whose populations and relative abundance may then expand. This expansion, when coupled with environmental changes, may have the potential to upset the natural balance of the newly expanding population, which in turn may have deleterious effects on other fish species.
- → The feeding behaviour of some marine mammals has been found to have an effect on small species living on the ocean floor. As some marine mammals feed, they disturb sediments, unearthing debris that had settled, making it available to ocean floor scavengers, and redistributing the sediments which may favour colonisation by certain benthic species. The selective feeding of some marine mammals also serves to control the abundance of some invertebrates that live in sediments.

Non- Communicable Diseases

The Caribbean region has among the highest rate of non-communicable diseases (NCDs) in the Americas, including diabetes, heart disease and hypertension. Obesity among young children and adolescents is growing at an alarming rate. Poor diets and lack of physical activity are major factors behind the grim statistics on Caribbean non-communicable disease. Historically, One Health has focussed on infectious diseases. But the major challenge of non-communicable disease will only be addressed by fostering healthy interactions with our living environments. One Health actions can forewarn of non-infectious threats. There is a long history,

for example, of animals serving as bio-sentinels for threatening environmental pollutants. The world around us provides the building blocks for health. The availability of safe, affordable foods, for example, depends on healthy animals and ecosystems. Nature provides us opportunities for recreational and social interactions that reduce stress and provide exercise. Addressing NCDs requires building shared commitment and widespread collaboration involving several different institutions across disciplines and sectors - very much a One Health approach.







Ironing out Anaemia -Dominica

Anaemia is a global public health problem. It is often associated with iron deficiency, which is the most widespread nutrient deficiency in the world. The functional consequences of anaemia are serious and include an increased risk of maternal, foetal, and newborn death; poor pregnancy outcomes such as low birth weight and pre-term birth, impaired cognitive development, reduced learning capacity, diminished school performance in children and decreased productivity in adults. Children in the developing world are especially vulnerable because of high worm burdens and diets with low iron bioavailability. Healthy, iron rich foods are not easily accessible for communities and groups most at risk.

In Dominica, based on a 2010 Survey conducted by the Ministry of Health and Caribbean Food and Nutrition Institute (CFNI), the highest prevalence of anaemia was in;



To address this challenge and focus on women and children at highest risk, a local One Health project team worked with the La Plaine community and partnered with the Ministries of Health and Agriculture and community groups. Together, they created demonstration sites where they grew locally available iron rich, nutritious foods. They also developed meal plans and recipes incorporating the iron-rich products. In addition to improving health and food security, there was the added benefit of direct cost savings. The community was motivated "to do" because the team explored fun, creative and tasty ways of problem solving.







Case Study

Tuning in to Childhood Obesity - Grenada



The One Health team in Grenada worked on childhood obesity with a focus on the pre-school population. The team started by putting together an overview of ongoing efforts in Grenada to address childhood obesity, identifying gaps in the initiative. They focused their efforts on tangible improvements that could be easily implemented and sustained. They developed a culturally appropriate awareness campaign targeted to pre-school kids, with the goal of integrating it into the larger community. The team consisted of representatives from the Ministries

of Health, Agriculture and Education and popular Grenadian soca artistes. The singers composed a catchy soca tune, "Your health is your wealth", emphasizing messages on fighting obesity and lifestyle related factors. The song has been shared with national radio stations, schools and regional bodies, to be used for related obesity projects in the Caribbean.

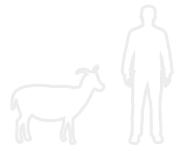




Your Health is your Wealth

"We tackling de problem, right here, right now, childhood obesity and cancer together we have to fight....
No junk food no more...
Healthy eating habits,
Eating what we grow..
Your health is your wealth, Your wealth is your health,
Get your wheels in motion,
Save the doctor fee,
Let's make a healthy Caribbean,
Healthy you, healthy me!





Promoting the Human-Animal Bond - Grenada & Tobago

The human-animal bond is a mutually beneficial and dynamic relationship between people and animals, influenced by behaviours that are essential to the health and well-being of both. This includes, but is not limited to emotional, psychological, and physical interactions of people, animals, and the environment. The human-animal bond is beneficial in child development and in care of the elderly. It has therapeutic value for mental illness, physical impairment, abuse and trauma recovery, as well as the rehabilitation of incarcerated youth and adults. St Georges University in Grenada, for example, is promoting animal companionship to enhance physical and mental health in their students, involving petting puppies prior to exams. While many studies show the benefits of animal ownership in elderly or diseased individuals, healthy college students can also benefit from animal companionship. Veterinary students share puppies, kittens, birds and other animals with their medical counterparts around exam time. It is always a welcome activity and leads to better performance in life and the classroom.

Horse-assisted therapy is another example of the value of the human-animal bond. It uses the close interactions between differently-abled children and horses to help resolve a variety of behavioural and emotional issues. Healing with Horses, for example, is a non-profit organisation situated in Tobago where

The human-animal bond is beneficial in childhood development and in care of the elderly

children from different backgrounds, with varying physical and cognitive disabilities, come together to enjoy therapy and creative play.





Case Study

Too Much Fast Fatty Food - Trinidad

Professor Chris Oura, Project Leader *One Health One Caribbean One Love* project, Faculty of Medical Sciences, The University of the West Indies, St. Augustine, Trinidad & Tobago

When I first arrived in Trinidad more than five years ago, there was one noticeable feature of the landscape along the route from airport to town and it wasn't royal palm trees or steel pans. Instead, the ubiquitous sight was Kentucky Fried Chicken restaurants!

I commented on this to the driver who proudly informed me that Trinidad had the highest density of KFCs in the world, and the branch in the centre of the capital city of Port-of-Spain had the highest

per capita sales of any KFC outlet. Soon after this, on my first visit to the supermarket, I was shocked by the cost of locally grown fruit and vegetables, let alone imported food. It soon became very clear to me how difficult it would be for local people to choose healthy food options. Clearly, if we are going to persuade Caribbean families to eat more healthy foods, we need to make them more accessible and affordable, or people will continue to take the easy and often cheaper way out i.e. the bargain bucket.

KFC Indepence Square, Port-of Spain, Trinidad

highest per capita sales of ANY KFC outlet.



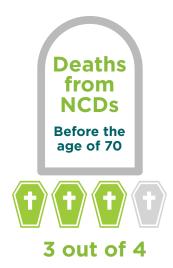
Non-Communicable Disease in the Caribbean – One Health in all Policies

Professor T. Alafia Samuels - Director, George Alleyne Chronic Disease Research Centre Caribbean Institute for Health Research, University of the West Indies, Cave Hill campus, Barbados

Most people in the world today will die from a non-communicable disease (NCDs), such as a heart attack, a stroke, diabetes or cancer. When it comes to death, our only options are NCDs, communicable diseases or injuries, so we might want to look forward to a short illness after a long and healthy life.

Unfortunately, many people in the Caribbean are not getting a long life, but instead are dying prematurely before the age of 70 years. In the Caribbean, 3 out of 4 deaths that occur before the age of 70 are from NCDs, and our premature mortality rate is double that of North America. This places a high burden of disease on wage-earners and pushes their families into poverty.

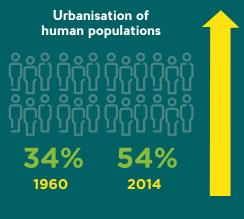




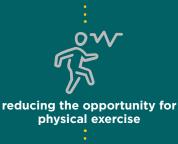
This is a relatively new phenomenon. A contributing factor for this surge in NCDs is our success in addressing communicable diseases, which used to decimate the populations at young ages, so we are now living longer. But most important is the fact that our

diets and physical activity have changed drastically in the last 50 years. Over this time, we have transitioned from getting our food from our own backyards and fields, to buying food at the market, to buying at the supermarket, and now from fast-food restaurants, prepared foods and processed and tinned foods. These risk factors, particularly physical inactivity and unhealthy diet, are causing high and increasing rates of obesity, diabetes and hypertension. Among men in particular, the epidemic is also being fuelled by binge drinking of alcohol and tobacco use.

Food and obesity are at the centre of the One Health and NCDs intersection, and what we eat has the greatest overall impact on when and how we die. Obesity is now the #1 risk factor for premature death in the Caribbean. Have you ever seen an 80-year-old who weighs 300 lbs? Not only is our obesity problem getting worse, but men are catching up with women, and children are now obese too. For example, we estimate that in Barbados, there are 7,500 children between 10-19 years who now have elevated blood









pollution increasing the risk of heart and lung diseases

pressures as a direct result of childhood obesity.

Urbanisation of human populations is continuing rapidly, increasing from 34% in 1960 to 54% in 2014. This creates" urban deserts" with little access to fresh fruits and vegetables, lack of green spaces and security concerns reducing the opportunity for physical exercise and pollution increasing the risk of heart and lung diseases. The neighbourhood environment is one of the strongest predictors of an individual's level of physical activity or lack thereof. Thus, environmental health, planning, and design professionals share the responsibility to promote environments that enhance public health.

People need access to safe, nutritious, affordable food so a "One Health food strategy" is needed. This includes a range of people, from those who produce the food to those who market it to those who consume it. Yet there has been insufficient progress in addressing unhealthy diets in the Caribbean.

People need to get out and exercise. Many recreational opportunities in the Caribbean can be found in nature - in the water, on the beach, in the forest - so a safe secure physical environment needs to be available and sustainable. The built environment and urban planning can also enhance opportunities for safe, pleasurable activities.

Sir George Alleyne and others have championed this cause, and were instrumental in the convening of the 2007 Caribbean Community (CARICOM) Heads of Government summit on Non-Communicable Diseases, the first ever such summit on NCD prevention and control in the world. The summit issued the Port-of-Spain Declaration, "Uniting to Stop the Epidemic of NCDs," which included a focus on enhanced food security; fair international trade policies in support of indigenous agricultural products and foods; increasing physical activity in the entire population by increasing public recreational spaces; and facilities to encourage physical activity. Thus, the Heads of Government were explicitly recognizing the importance of diet and the physical environment in the production of human health.

The following month, the CARICOM Ministers of Agriculture issued the "Declaration of St. Ann" in support of the Port-of-Spain NCD Declaration



which included mandates to ensure the availability and affordability of healthy foods; the production and consumption of regionally produced foods, particularly fruits and vegetables; establishment of formal planning linkages between the agriculture sector and other sectors (especially, health, tourism, trade and planning) in order to reduce obesity and public education in support of wellness and increased consumption of fruits and vegetables.

In response to the formal evaluation of the 2007 CARICOM Heads of Government Port-of-Spain NCD Summit Declaration, the communiqué from their July 2016 CARICOM Heads of Government Conference highlighted their renewed commitment to NCDs and identified four areas for intervention, three of which had to do with diet:

- · trade related measures;
- banning advertisement of potentially harmful foods which specifically target children;
- elevating taxes on foods high in sugar, salt and trans-fats.

This addresses not only the relative cost incentives of purchasing foods, but also ensuring that children are not subject to an obesogenic environment. This approach recognizes that individual level behavioural change and "will power" alone will not be enough. There are social determinants of childhood obesity marketing to children, the school environment, food systems and availability, cost and taste of alternative foods, agricultural production, fiscal measures, and the built environment. A robust response requires "all hands on deck" with collaboration between the Ministries of Health, Agriculture, Education, Finance, Trade, Transportation, Planning, Culture and Sport - a whole of government response. In addition, we need to involve all of society the private sector, civil society and the government for a One Health strategy.

Empowering and Enabling Communities to Act

It is challenging to persuade people to act to protect their health, the health of animals or environmental health, but this is essential for turning One Health knowledge into action. Health and sustainability are achieved at a local level. International and national policies provide an enabling environment, but the decisions people make at a local level determine if we will be successful in public health, food production, economic security and conservation. People are more likely to change what they do when they believe there is a problem that needs solving, when they are empowered to act, and when there are tangible steps they can take to make a change.

One Health fosters such change by developing the tools, policies, regulations and support to enable individuals and organisations to act. One Health builds bridges across institutions, agencies and communities to develop a shared perspective about what requires action and the most effective ways to act. One Health pays attention to people whose knowledge and perspectives matter, especially the change agents within communities who are being asked to act.

The desire to help communities and governments make healthy decisions is at the heart of One Health. Turning research and surveillance into action is challenging and riddled with barriers. Interventions need to be tailored to the local conditions. We need to be sure that recommendations made to protect the health in one sector does not cause harm in another. By connecting ideas, evidence and innovation from one sector to another and linking with communities and governments with the ability to act, One Health reduces the likelihood of unintended effects and increases the likelihood of more acceptable and effective actions.

The need for change is constant, but the need to act quickly seems to be growing due to unprecedented social and environmental changes. Communities need to be adaptable to these changing circumstances. One Health can provide motivators for change and share innovative solutions across sectors.





Case Study Fishing for Solutions Suriname



Suriname's mining sector contributes significantly to the country's GDP. One of the unintended negative consequences of illegal mining is the high mercury contamination of waterways and ecosystems, which then ends up in popular fish species eaten by local communities. This is a food security and safety issue that affects public health. Working primarily with the residents of Brownsweg Brokopondo, a team from the Ministry of Agriculture, Animal Husbandry and Fisheries (LVV) and the Anton de Kom University Suriname (AdeKUS), explored alternative, practical and sustainable methods to reduce mercury exposure through fish consumption by providing affected communities with a safe, alternative food supply using aquaponics. Aquaponics is a food production system that combines conventional aquaculture

(raising fish in tanks) with hydroponics (cultivating plants in water) in a shared system. Commercial aquaculture has been used previously but for small communities, the commercial systems have proven to be too expensive and problematic to maintain at times.

Using a participatory approach with the villagers, the One Health team identified fish and crop species that they preferred. The team then developed a mobile, small-scale, low-cost aquaponics system, designed to increase and diversify safe backyard food production. The model aquaponics system was an affordable, innovative tool for at risk communities to reduce exposure to mercury. It also will enable communities to produce their own fish and fresh vegetables to eat.











Case Study Biting back – the Rabies Response - Belize

Rabies is the one of oldest known zoonosis. Rabies can be prevented in people by vaccination, or when a person has already been bitten by a potentially rabid animal, by use of post-exposure prophylaxis. In Belize, rabies predominantly affects domestic animals exposed to infected wildlife. The last documented human case was in 1989. Due to recent population growth and encroachment into wildlife habitats, there is more contact between wildlife, increasing the risk of rabies transmission to people and domestic animals. This has contributed to the recent increases in the numbers of cattle rabies cases transmitted by bats in the Corozal, Orange Walk, Cayo and Toledo Districts of Belize. Although rabies is endemic, farmers have not practised routine vaccination resulting in a rise in notifications. Historically, the response to rabies outbreaks has been uncoordinated across sectors. The Belize One Health team centralised efforts and shared information and resources across the private sectors and Ministries of Health, Agriculture and Environment. Through this coordinated effort, they actively engaged the at-risk communities in the Corozal and Orange Walk Districts and responded to the specific needs of the affected communities. Using outreach and an onsite community clinic, the team provided training in the importance of administering rabies vaccines to livestock and pets and communicated risks posed by vampire bats to humans and animals using local media. They also gave training in first-aid care of bite wounds for people bitten by a potentially rabid animal or exposed otherwise. These efforts are resulting in better preparedness for a rabies outbreak. The crosssectoral approach that was implemented can result in financial and resource savings, compared to sectors working separately.







Case Study Solid solutions to Solid Waste - Guyana



Solid waste disposal and management is a recurring problem across many Caribbean countries. It can be detrimental to the environment and adversely affect human and animal health. In Guyana, different aspects of solid waste disposal from homes, farms and industries fall under the responsibility of various Ministries; Ministry of Agriculture, the Ministry of Public Health, the Ministry of Communities and the Ministry of Presidency (Natural Resources and the Environment Unit). Efforts to address issues related to solid waste disposal are usually carried out in

isolation. Guyana's One Health Leaders spearheaded collaboration across disciplinary boundaries, integrated knowledge and encouraged sharing of resources among various Ministries, international agencies and civil society groups. They formed a multi-faceted team that worked with residents of the Plaisance community in east coast Demerara to proactively address solid waste disposal issues in the community. Working with schools and community leaders in the Plaisance community, they fostered creative ways of reusing and recycling waste.

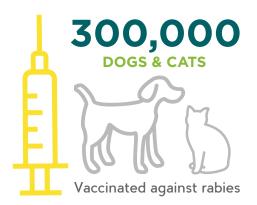






Stepping together: a One Health Approach to Rabies in Haiti

More than 100 people die from rabies every year in Haiti, which is the highest rabies death rate in the Western hemisphere. However, only about seven of those deaths are reported to health authorities each year because of inconsistencies in case detection, limitations in diagnostic capacity, and lack of awareness and understanding of rabies among the public and medical providers. Dog bites are the main cause of rabies for Haitians. A sustained approach that integrates veterinary and human medicine, public health and environmental measures for dog population management is considered essential to eliminating human deaths from rabies.





Leading up to the annual World Rabies Day in 2015, the US Naval Ship Comfort's Continuing Promise mission requested educational resources to accompany a planned rabies vaccination event in Haiti. This developed over six months into a fullscale workshop designed to reinvigorate Haiti's national rabies strategy in advance of a national rabies vaccination campaign. Workshop planners included members of the US Army's Veterinary Corps, representatives of the Haitian Ministries of Health and Agriculture, Natural Resources and Rural Development, the US CDC, the Pan American Health Organisation, the Global Alliance for Rabies Control, Christian Veterinary Mission, Humane Society International and the International Fund for Animal Welfare. Workshops were planned to address national policy for rabies prevention and control in Haiti; capacity building among veterinarians, paraveterinarians and others involved in rabies control; and prevention training in three key administrative departments.

The workshops were followed by a mass rabies vaccination and spay/neuter campaign on the outskirts of Port-Au-Prince on World Rabies Day. Because of this inter-sectoral initiative, the existing, but outdated, national control strategy for the elimination of rabies was updated using GARC's Stepwise Approach towards Rabies Elimination tool: 47 Haitian para-veterinarians and veterinary technicians completed GARC's Rabies Educator Certificate (REC) training; and 300,000 dogs and cats were vaccinated against rabies. More importantly, this initiative provided opportunities for more comprehensive and sustained rabies prevention initiatives and inter-sectoral cooperation for its prevention and control that continue today.



Case Study Raising Risk Awareness for Pesticide Use - Haiti



Two main agricultural regions in Haiti use pesticides and fertilisers to sustain crop yields. Rice is grown in the Artibonite province in the north central region of Haiti. Broccoli, carrots, cherries and grapes are grown in the western Haitian province of Kenscoff. Agricultural workers are routinely exposed to pesticides but are generally unaware of the risks that pesticides pose to human, animal and environmental health. The One Health team in Haiti built interdisciplinary relationships and developed a One Health network with representatives from the Ministry of the Environment, Ministry of Health, Ministry of

Commerce and Industry, Ministry of Agriculture and Municipal authorities. Together, they worked with farm workers, consumers, residents and managers of agricultural shops to highlight the health risks posed by the overuse and unsafe use of pesticides. They carried out outreach and consultations, conducted an inventory on pesticide use, performed a gap analysis on the knowledge and practice related to the safe use of pesticide and conducted training events within relevant communities to encourage a reduced and safe use of pesticides in these agricultural communities.







Stopping Pollution at its Source – St. Kitts

Ocean pollution is a worldwide problem. Fish and wildlife can die or become ill after they ingest waste found in the water or on the shorelines. As with other One Health problems, humans are the source of the problem but are also the source of the solution. Ross University School of Veterinary Medicine in St. Kitts is doing an environmental intervention to reduce the amount of waste it produces, particularly of disposable plastic and Styrofoam food containers.

By applying social theories of behaviour change, they are creating a new norm, in which people refuse disposable containers by replacing them with reusable food containers. This action is the start of behaviour change interventions aimed at reducing harm to wildlife from man-made sources and creating healthier, local ecosystems to improve human and animal health.







minimize use of styrofoam food containers



behaviour change causes people to refuse disposable containers



healthier, local ecosystems to improve human and animal health





Charting the Path Forward

One Health is a valued and useful approach to help address and solve the health problems facing the Caribbean now, as well in the future. This book has shown that the necessary expertise, relationships, tools and networks are in place in the region and are expanding to meet the growing expectations for collaborative approaches to address health priorities. The case studies highlighted throughout this book illustrate that a collaborative approach to gathering and applying evidence is crucial to effectively implement multi-sectoral strategies to improve the resilience and prosperity of the Caribbean.

Promoting and sustaining One Health collaborations between sectors has been recognised at international, regional and national levels as a core strategy for improved outcomes. But this will not happen on its own. Ground-breaking One Health projects are possible only because of the enthusiasm and commitment of practitioners and leaders and investment in these initiatives. This needs to be cultivated, celebrated and expanded if One Health is expected to be an ongoing contributor to a healthy Caribbean.

It is hard to work across sectors and to bridge disciplines and programmes. Job descriptions often constrain people to act only on a narrow part of a problem. The time taken to build and sustain trusted relationships with collaborators is too often not part of people's job descriptions, yet working outside formal parameters is essential if One Health is to be most effective in its initiatives. Employers in governments, universities, research institutes, the private sector and funding agencies need to develop new ways to create the time, resources and permissions that will enable Caribbean One Health leaders to create the networks that allow resources and information to move quickly across sectors to ensure action is taken before harms are realized. While it may be easy to

allow people to be part of time-limited One Health projects, it takes leadership and creativity to create the people and positions to sustain One Health programmes that are ongoing and 'ready to go' when new problems emerge.

Despite the strong intuitive sense by many agencies that One Health can be useful, there is a need to invest in efforts that build the business case that One Health is indeed a more efficient and effective approach that does not help one sector by harming another. To turn existing One Health policies and frameworks into action, decision makers need the assurance that One Health is indeed the preferred approach. This book has provided many examples of the promise of One Health. Investment by governments, funding agencies and international donors on systematic evaluations of past or ongoing One Health efforts will help to specify the types of problems and situations for which One Health is the most beneficial approach.

While much of the world's One Health efforts remain focused on diseases transferred from animals to people, this book shows how collaboration across the human, animal and environmental sectors is critical for a wider suite of problems. By mapping out how these cases included in this book addressed the 17 Sustainable Development Goals, it is easy to see the breadth of benefits that can arise from One Health. Caribbean One Health champions must build on these case studies to ensure that the technology, tools, skills and knowledge are sustained in the region to address the full spectrum of One Health, from detecting potential new diseases in environmental reservoirs to creating sustainable development systems.



A Roadmap

The Caribbean region is ready to take on the One Health approach. A regional One Health policy has been endorsed by the Caribbean Chief Medical and Veterinary Officers, the Caribbean Animal Health Network, as well the CARICOM councils for human, agricultural and environmental health. A six-year strategic One Health framework (2017-2022), mapping the way forward for One Health in the Caribbean region, has been developed and published. From a 'top-down' perspective, the next





ANIMAL HEALTH

step is to ensure that the strategic framework has buy-in from all the relevant stakeholders who are being tasked to implement it. From a 'bottom-up' perspective, we need to ensure that the teams of One Health leaders and advocates working at ground level across the Caribbean continue to develop and conduct community-based projects following a One Health approach.

ENVIRONMENTAL HEALTH



CARICOM support

The One Health approach and the Caribbean One Health Policy was supported at several CARICOM meetings:

1. Meeting of the Council for Trade and Economic Development (COTED) - Agriculture, Georgetown, Guyana, 2013

Member States were encouraged to consider the adoption of the One Health approach and to form national inter-sectoral One Health Working Groups

2. Meeting of the Council for Human and Social Development (COHSOD) **Health**, Washington, D.C, 2014

Member States were requested to implement multi-disciplinary teams working collaboratively to improve human, agricultural and environmental health. The composition of the teams should include agricultural scientists, anthropologists, economists, educators, engineers, entomologists, environmental scientists, epidemiologists, food and environmental health inspectors, hydrologists, microbiologists, nutritionists, physicians, public health professionals, sociologists and veterinarians; a Regional Coordinating Mechanism to support the implementation of a One Health Policy Framework

2. Meeting of the Council for Trade and Economic Development (COTED) - Environment), 2015

Endorsed the implementation of multidisciplinary teams working collaboratively to improve human, agricultural and environmental health and recognised the need to create regional and national coordinating groups populated with professionals who are experienced in multidisciplinary collaboration

One Health Leaders Speak



Dr. Anju Smith Antigua

66

One Health is needed in the region to change the approach with which we address public health issues. It goes one step further from being multi-sectoral, to being action and relationship oriented.



One Health helps to create a channel for information sharing, one that is necessary for peaceful and harmonious habitation in this Global Village.



Dr. S. Ahmed Dominica



Dr. Chandra Degia Jamaica

66

Addressing these complex socio-political health issues, within the context of history, finance and culture, will require a bottom-up approach, working effectively with communities, and utilising systemic thinking and planning.

66

One Health is needed in the region because the magnitude of the issues currently placed at the focal point cannot be dealt with by a single entity or organisation, but requires a concerted effort by all stakeholders who are currently affected and are likely to be affected.



Ms. Dahlia Punkett Jamaica



Ms. Gaitrie Usha Satnarain Suriname

66

The One Health priority for Suriname is to work towards the well-being of the nation by utilizing the available natural resources. It is intended to achieve this by extracting these natural resources in a sustainable way to safeguard the ecosystem services which are critical for food safety and food security in the first place, but also for other important needs.

66

With limited resources, it is critical to merge existing assets and avoid duplication, misuse or overuse in an attempt to preserve the region's scarce resources, and to achieve a healthy symbiotic, triadic (human, animals and the environment) relationship.



Ms. Marcia Cameron Grenada



Dr. Maxine Parris-Aaron Guyana



Guyana's focus on One Health is to strengthen technical and institutional relationships between the Ministries of Public Health, Agriculture and the Environment.

66

Complex societal problems require multiple perspectives and collaboration for suitable and successful mitigation.



Dr. Paul Crooks
Trinidad & Tobago



Mr. Benedict Peters Grenada

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Everything that grows needs a conducive environment to do so and it is my belief that a better understanding of the ecosystems relation that exist in the environment and with animals and humans can help in finding the causes of some of the problems that affect us as humans and our animals.



21st century problems urgently require 21st solutions. With One Health in the Caribbean we are moving past the buzz words to empower people to secure a sustainable, healthy future.



Dr. Adana Mahase-Gibson Trinidad & Tobago



Dr. Kathian
Herbert-Hackshaw
St Vincent & the
Grenadines

66

One Health is needed in the region to remove the silos of thought processes of national health planners and practitioners.



One Health provides creative strategies and sharing of experiences to confront these regional threats in a cost-effective manner.



Dr. Dane Hartley Guyana

Caribbean One Health and the Sustainable Development Goals

One Health is at the root of solutions to many of the challenges set out in the Sustainable Development Goals.

The cases highlighted through this book show onthe-ground actions of Caribbean One Health teams to help unite us together to make a positive change for people, prosperity and the planet.







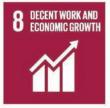






















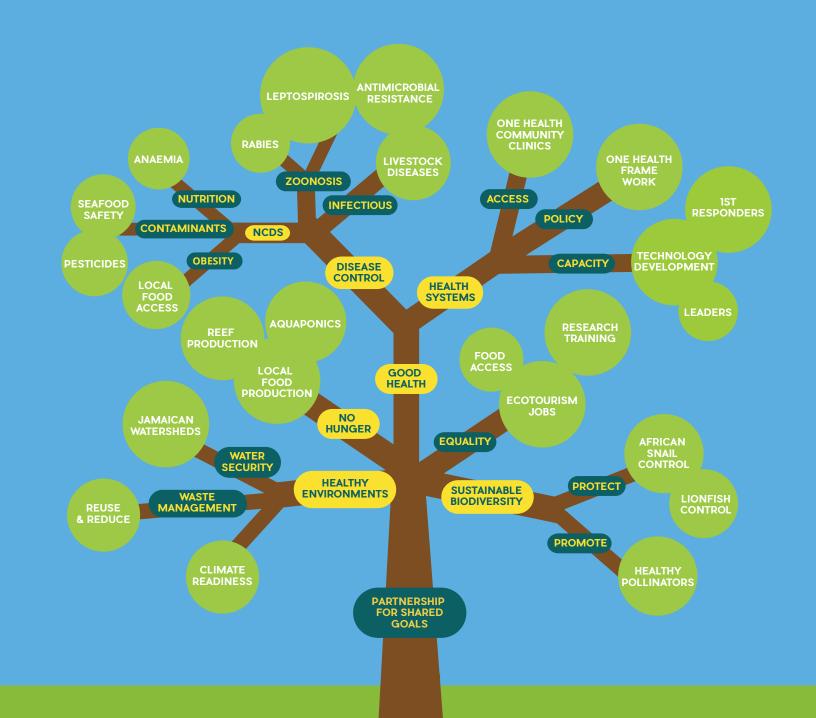














This book shows how a One Health approach can help overcome major challenges to health and prosperity in the Caribbean. Many of these problems, like climate change, food security, ocean health, and emerging diseases arise from the interactions of people, animals and our shared environment. One Health is about working together to improve the health of all species and places. It links people, capacity and expertise in human health, veterinary medicine and environmental health. This approach helps to achieve efficiencies in programme delivery, find early clues to support actions for prevention, and cultivate social settings and environments to keep us all healthy. This book draws on the ACP-EU funded UWI project, One Health, One Caribbean, One Love, plus other individuals and institutions in the region. It showcases Caribbean experience and people who are able to develop One Health solutions to some of the most pressing Caribbean problems.