



Examples of Diseases Associated with Waterborne Transmission in the Pacific Island Region

**Second Seminar on Water Management
in Islands Coastal and Isolated Areas
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Outbreaks of communicable diseases with water playing a potential or major role in the transmission

Cholera

Typhoid fever

Leptospirosis

The background of the slide features several concentric, light blue circular ripples, resembling water droplets or raindrops, scattered across the lower half of the image.

Ministers of Health Commitment

➤ Yanuca (1995):

Concept of “*healthy islands*” = *ecological model of health promotion.*

“*Healthy islands should be places where:*

- *Children are nurtured in body and mind*
- *Environments invite learning and leisure*
- *People work and age with dignity*
- *Ecological balance is source of pride”*

What is the PPHSN?



- PPHSN is a voluntary network of countries/territories and institutions/organisations
- Dedicated to the promotion of public health surveillance & response
- Current focus on CDs: epidemic ones first
- PPHSN Goal is to improve public health surveillance in the Pacific Islands, in a sustainable way

Cholera



Vibrio cholerae

CHOLERA OUTBREAKS

In the last 10 years, the following countries were affected by cholera .

Country	Year of Outbreak	Comments
Pohnpei, Federated States of Micronesia (*)	2000	Serotype: Ogawa Cases: 3500 Deaths: 20
Marshall Islands	2000	Serotype: Ogawa Cases: > 300 Deaths: 6

(*) Environmental Protection Agency monitoring data between March 1999 and May 2000 showed that

- Only 36 (40%) of 90 samples from community water supplies were free of faecal coliforms—a traditional indicator of faecal pollution.
- Only 12 (42%) of 29 samples collected from individual household supplies were free from faecal coliforms
- None of the 65 samples from Kolonia water supply contained any faecal coliforms, and over 64% of samples contained a residual of chlorine disinfectant



Cholera



What is cholera ?

- Acute painless watery diarrhoea (+/- vomiting)
Severe cases : deadly dehydration in a couple of hours
- Caused by *Vibrio Cholera* serogroup 01 or 0139
Vibrio Cholera 01 has
 - two biotypes: classical and **El Tor**
 - two serotypes: Inaba and Ogawa
- Faecal-oral transmission through food or water
highlights places with hygiene & sanitation problems
- Incubation: a few hours to 5 days (aver.2-3 days)
- Highly infectious ~ many asymptomatic infections with El Tor
- Transmitted by humans to humans

Cholera

What are the control measures ?

Aggressive measures for control:

- early treatment with ORS & IV fluids (+ antibiotics)
*decentralised, with
active case-searching*
- health education
*disease, hygiene (personal, water, food),
sewage disposal, early treatment*
- ensure safe water supply
- ensure safe sewage disposal

Cholera

Potential risks for cholera spread in the Pacific:

- Cholera endemic in many of the countries surrounding/having links with the Pacific Islands
- Travel ++: extensive air travel
 transport of personal food items
 ships and fishing boats
- Many receptive environments in the Pacific Islands, with water, sanitation and hygiene problems, as well as some receptive cultural practices (e.g. feasts, funerals, kava)

Typhoid fever



Salmonella typhi

TYPHOID FEVER OUTBREAKS:1999-2008

Country	Year of Outbreak	Comments
PNG	1999-2008	Endemoepidemic 10/1000 cases per year includes many small outbreaks It is among the 10 top causes of death in PNG Outbreaks in a school & prison
	2004	
Nauru	1999 (March)	50 cases
Tonga	1999 (April)	14 cases
Samoa	2000 (July)	122 cases 1 death
Vanuatu	2000 (Dec)	Small outbreak: 26 cases
Tuvalu	2001 (May)	~ 22 cases 6 hospitalised.
Fiji	2005-on-going	~100-200 cases per year since 2005 Now endemoepidemic, especially in Vanua Levu

Typhoid Fever



What is typhoid fever?

- infectious disease caused by bacteria (*Salmonella Typhi*).
- very serious disease that leads to death in 10% to 20% of untreated patients. If patients are treated promptly with the right antibiotics, less than 1% die.

How do people get typhoid fever?

- By eating food or drinking water contaminated by stool or urine from other infected persons.
- Only humans can carry the bacteria; animals do not play a role.
- People can become **chronic carriers**: these people shed the bacteria but are not ill themselves.

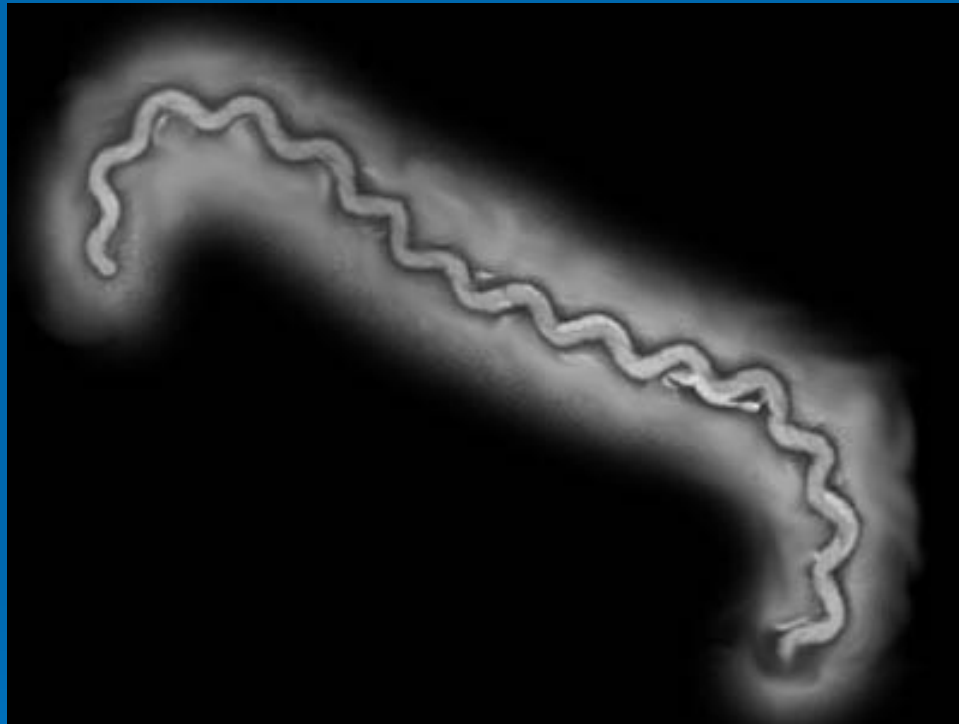
Typhoid Fever



How can typhoid fever be prevented?

- Good personal hygiene, use of safe water, and good sanitation:
- People must always wash their hands with soap and water after each toilet visit and before each meal.
- Food should be prepared hygienically: wash hands before handling food, eat food while it's still hot, cover food to protect from flies, and don't use unsafe water. Known *Salmonella Typhi* carriers should not be allowed to prepare food for others.
- People should be very careful to keep feces and urine away from water and food. Never use a river as a toilet! Instead, people should only use latrines or toilets.
- Unsafe water (e.g. from rivers, creeks, or unsafe wells) should be boiled or treated with chlorine before drinking. Rainwater and ground water can be safe, provided it is collected correctly.
- Mothers should breastfeed their babies and not use powdered baby formula.

Leptospirosis



Leptospira

LEPTOSPIROSIS CASES & OUTBREAKS: 1995-2008

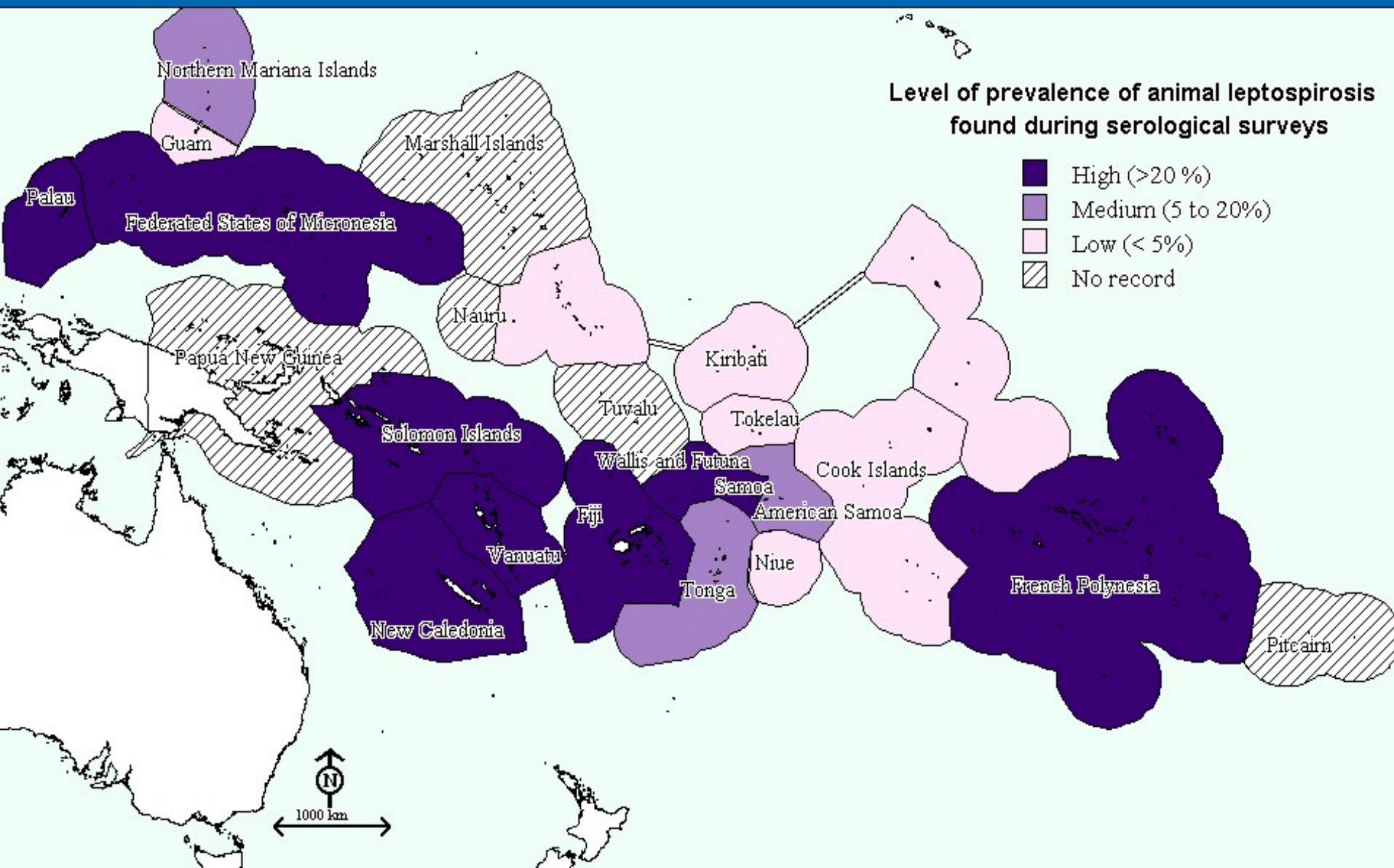
Country	Year of Outbreak	Comments
Vanuatu	1997	Small OB- 8 confirmed cases
New Caledonia	Sporadic cases all over the year with annual seasonal outbreaks in February-March-April, and a geographical concentration in Bourail commune.	
	1995	92 notified cases
	1996	139 notified cases, with 6 deaths
	1997	207 notified cases, with 3 deaths
	1998	132 notified cases, with 3 deaths
	1999	200 notified cases, with 19 deaths
	2000	82 notified cases, with 1 death
	2001	129 notified cases, no death
	2002	50 notified cases, with 2 deaths
	2003	13 notified cases, with 1 death
	2004	13 notified cases, no death
	2005	40 notified cases, with 1 death
	2006	65 notified cases, with 2 deaths
	2007	53 notified cases, with 1 death
	2008 (until May)	105 notified cases, with 3 deaths

LEPTOSPIROSIS CASES & OUTBREAKS: 1995-2008 (ctd)

Country	Year of Outbreak	Comments
Fiji	1998-99-2000 2003 2006 (April) 2007	Large outbreak with 141 cases, 42 deaths Endemoepidemic: small outbreaks with deaths, often linked to flooding
FSM-Kosrae	2000 (April-May)	Small OB , 10 cases
Palau	2000 (April)	3 confirmed cases
CNMI	2000-2001	Outbreak, with 10 cases confirmed.
Guam	2002	21 cases through recreational sport
Wallis & Futuna	2004 – on-going 2008 (until March)	Endemoepidemic in Futuna (around 20-60 cases per year) 33 cases

Distribution of Animal Leptospirosis

[SPC Animal Health & Production Service: www.spc.int/rahs]



Leptospirosis



What is Leptospirosis ?

- Most widespread zoonosis
- Long survival in fresh water, soil and mud.
- Longer survival of *leptospire*s in warm & wet environment
 - Predominant and rather seasonal in tropical settings, e.g. SE Asia, Pacific Islands (“endemo-epidemic” profile)
- Seasonal: summer and fall in temperate climates
 - rainy season under warm climate
 - flooding

Leptospirosis



How do people get leptospirosis fever?

- General susceptibility in humans, though significantly less frequent in children and more in some professional groups
- Primarily transmitted by direct contact with the urine (& kidney & bladder) of infected animals (prefers alkaline urine).
- Mode of entry:
 - ✓ Mainly: abrasions/cuts in skin & mucosa, and conjunctiva
 - ✓ Others possibilities: water-borne; inhalation of water/aerosols; animal bites; direct inter-human transmission
- Main source of infection
 - ✓ Direct: reservoirs (maintenance hosts)
 - ✓ Indirect: surface water, mud, soil (from reservoir)

Cattle, pigs, cows, ...



Leptospires



Domestic
Animals



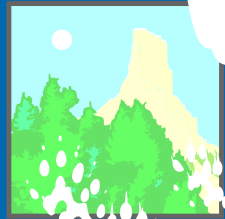
Environment
(water, mud)



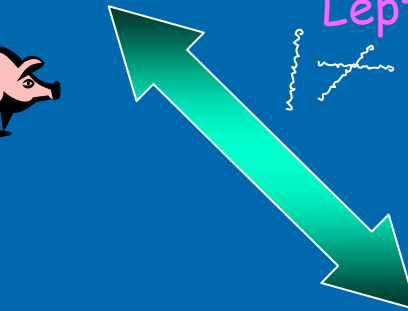
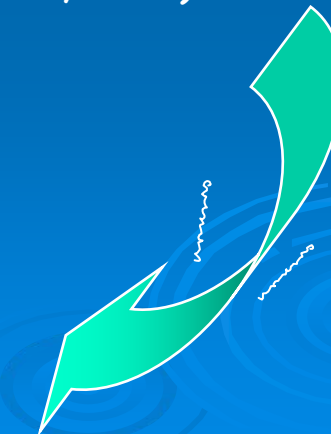
Humans



RODENTS



Wild Fauna
Toads to Primates





Leptospirosis

What are the control measures ?

- Pacific islands inhabitants may be exposed to multiples sources of potential contamination
- To improve overall hygiene and sanitation measures, esp. in town and villages (rodents control, drainage)
- To increase awareness among physicians and health personnel about leptospirosis
- To improve and expand relevant leptospirosis syndromic surveillance, diagnosis and treatment within health care services
- To improve access to timely and reliable laboratory diagnosis
- To better monitor and further assess the epidemiological situation in the Pacific islands

Summary of current situation of outbreak-prone diseases associated with waterborne transmission

- **Although susceptibility exists, no cholera outbreak since 2000, only sporadic cases:**
 - **Fiji: 1995, 1998, 1999 (Ogawa)**
 - **Guam: occasional cases, imported, with a few cases locally-acquired**
- **Typhoid fever: ongoing problem, especially in Fiji, Samoa and PNG where it's endemic.**
- **Leptospirosis outbreaks in New-Caledonia and Wallis and Futuna are occurring this year. It is an unrecognised problem, and likely significant cause of deaths in many of the PICTs.**

Managing the Risks to Safe Drinking Water

A practical approach for small communities

Dr Jan Gregor
Science Leader

Specialist Science Solutions

Outline

- The Concept
- Drinking-water Safety Planning at the Water Supply Level
- The Pacific Drinking-water Safety Planning Programme

Drinking-water Safety Planning is about ensuring consistently safe drinking water.

How safe is this drinking water?

➤ **Testing the quality of tap water**

➤ **Illness in the community**

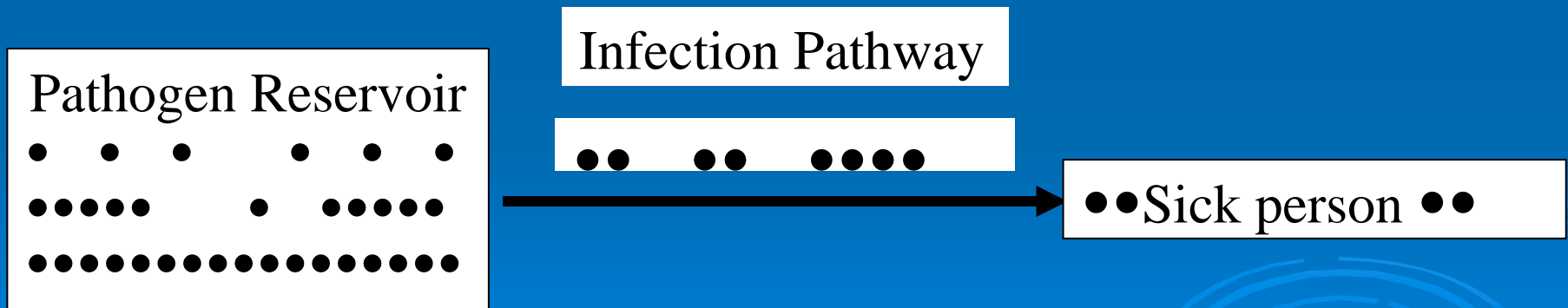


- **Weakness**
 - **After-the-event**
 - **A point in time**
 - **Reactive**
 - **Cause unknown**



Pathogens

For a pathogen to infect a human it must be transmitted from a reservoir of the pathogens to the human via an infection pathway.



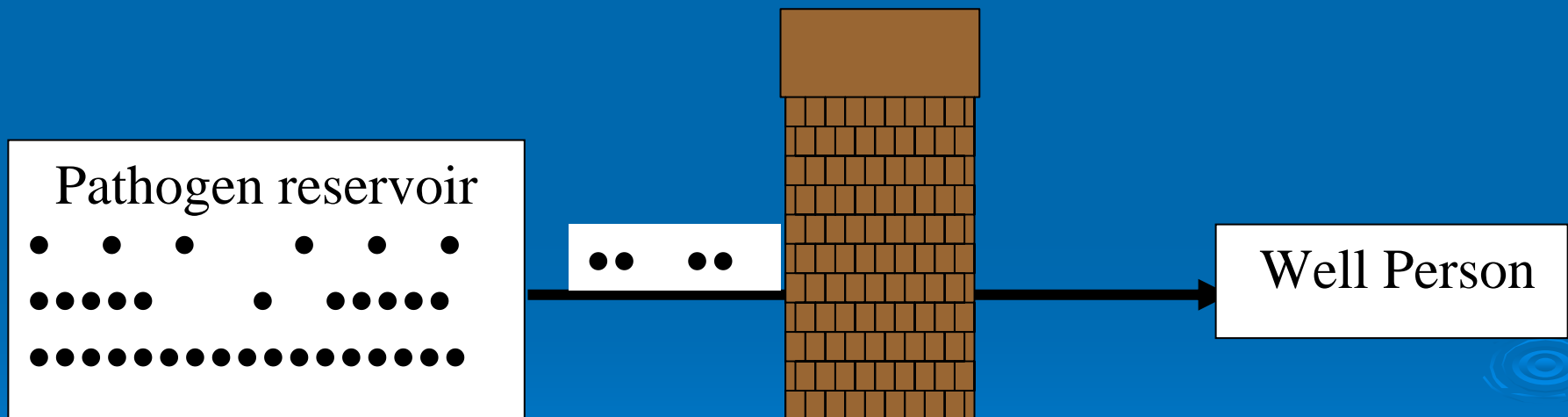
No Pathogens

If there are no pathogens in the reservoir, there is no disease transmission.



Blocked Infection Pathway

If the infection pathway is blocked there is no disease transmission.



Infection Pathway blocked

Blocking the Pathways

- Minimize contamination of source water
- Reduce or remove contamination through treatment process
- Prevent contamination during storage and distribution



Drinking-water Safety Planning

“A conscious and systematic assessment of every aspect of providing safe drinking water to identify events that could cause the water to become unsafe to drink, and to identify ways to manage these events.”

- ✓ What could go wrong?
- ✓ What needs to be checked?
- ✓ What can be done to prevent it?
- ✓ What needs to be fixed?
- ✓ Write it all down
- ✓ Now do it



Barriers to Contaminants



Removing particles from the water (where many of the germs hide)

Preventing contaminants entering the source water



Killing germs



Barriers to Contamination



**Removing chemical
contaminants
(where necessary)**



**Preventing recontamination
in storage and distribution**

Key Steps in Drinking-water Safety Planning

- Involving people who know about the water supply and who can make changes happen
- Describing the supply, and identifying, ranking and planning to manage the risks to provision of safe drinking water – the plan
- Implementing the plan
- Checking the plan is working, and changing plans and practice as indicated





PACIFIC DRINKING-WATER SAFETY PLANNING PROGRAMME



Objectives

- Promote drinking water safety plans as a tool for effective management of drinking water safety;
- Build capacity within selected PICs to develop and implement drinking water safety plans;
- Strengthen drinking water quality monitoring through a drinking water safety plan;
- Develop an appropriate strategy for replication of DWSPs in other PICs



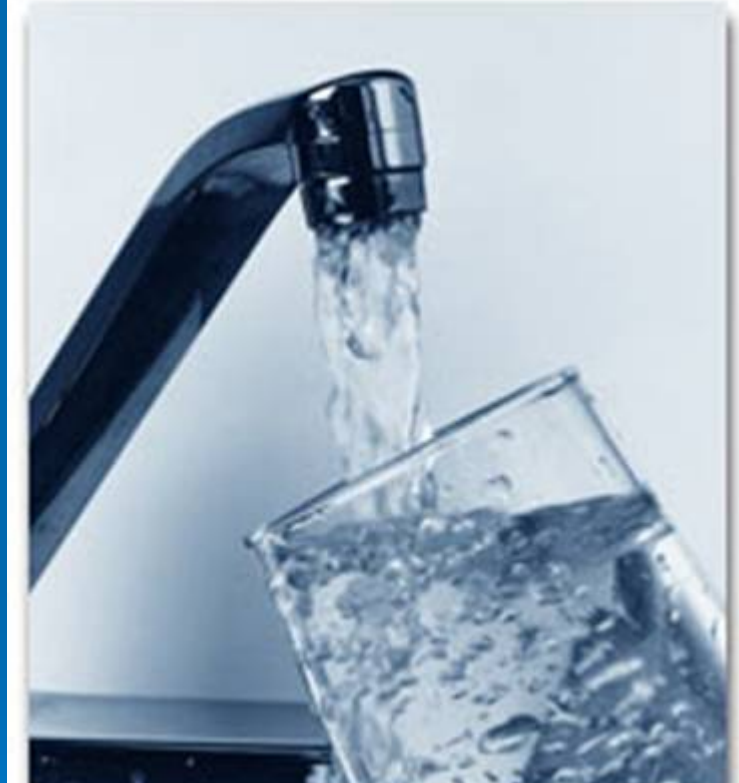
Status of Water Safety Planning in Pacific Island Countries

- Support received from AusAID for Pacific region
- Water Safety Plan pilots in Tonga, Palau, Vanuatu, Cook Islands
- Replication started in Samoa, Fiji, Niue, Marshall Islands
- Participation in training and exchange lessons learned within Pacific region
- Experience & technical input available from NZ MOH
- Resulting WSP and Improvement Plans scoped, funded and implemented
- WSP Guidelines under development for further replication

Benefits of Water Safety Planning

- A practical approach to ensuring continuously safe drinking water
- Guides day-to-day actions and long-term planning for improvements and expenditure
- Supports applications for funding
- Brings people together in communities to share the responsibility of ensuring safe drinking water
- Brings agencies together – *water is everyone's business*

The End Result



Thank you for your attention