

*the science
behind the news...*

THE GAMMA SERIES

OF THE ROYAL SOCIETY OF NEW ZEALAND

“Yucky dirty hands”

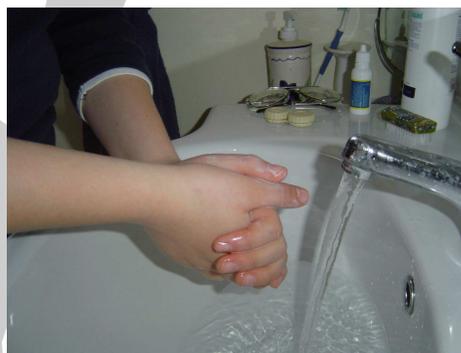
It would seem that we New Zealanders, both young and old, are not as good about washing our hands as we would like to believe. A recent survey in a primary school by the NZ Foodsafe Partnership Pilot School Hand Hygiene Campaign (Simmons et al, 2006) revealed that over a third of students did not wash their hands after visiting the toilet. Almost half of all male students did not wash their hands after visiting the toilet and of the half that did, over three quarters did not use soap.

Those who used soap when washing their hands washed for significantly longer than those who did not use soap, but this was only for about seven seconds versus around three seconds for non-soap users – a far cry from the recommended 20 seconds. Less than half of students stopped to dry their hands, and of those that did few dried their hands for the recommended twenty seconds on hand towels, and almost none for the recommended 45 seconds using air towels.



This state of affairs significantly improved after a school-wide hand hygiene campaign, but how does the rest of the country scrub up? Not well apparently. We are one of the worst countries in the first world when it comes to food-borne illnesses, many of which are caused by poor food handling by not observing the four ‘Cs’ of clean, cook, cover and chill – and yes, failure to wash

our hands adequately before and after preparing food, or even between handling raw meat and other food products.



In Christchurch, in January 2006, there was an outbreak of hepatitis A, a jaundice-causing liver disease, which affected dozens of people, mainly adults. The outbreak was traced to a childcare centre. All those affected were children who attend the centre, family members or people who have been to parties with the centre's children. Mincing no words about the outbreak, a Canterbury medical officer said the viral infection was spread through contact with faeces due to poor hand washing after using the toilet.

Christchurch is not alone, according to statistics cited by the New Zealand Food Safety Authority (ESR, 2001), five outbreaks of hepatitis A occurred in New

Zealand in 1999 and 3 in 2000. In one outbreak in Wellington, there were 36 people infected with the disease from faeces contaminated food prepared by an owner/operator.

Hepatitis A is not the only nasty disease you can get from inadequate hand-washing and contamination of food. Other micro-organisms which we can carry on our hands and pass to food include *Salmonella*, *Shigella*, *Staphylococcus*, *Streptococcus*, *Giardia*, and *E. coli*.



Eating contaminated food is not the only way you can get infected; various other bacteria and virus can be passed directly to you or by you because of unclean hands. Our lack of personal hygiene now has health officials increasingly concerned as the statistical likelihood of an influenza pandemic hangs over our heads. If such a pandemic were ever to arrive in New Zealand, how would we prevent the spread of the disease in our community when our grubby, sweaty, bacterial and viral-encrusted palms provide such willing vehicles?

According to various publications on influenza pandemic preparedness, "hand washing is the single most important measure to reduce the risks of transmitting infection from one person to

another." (MED et al, 2005). It is amazing how the simple act of washing your hands could prevent the spread of many such diseases, save millions of people from becoming ill, prevent thousands from being hospitalised or even killed, and save millions of dollars in health care and lost work and school productivity.

Wash your hands – but not too much!

Not that you should wash your hands compulsively or be like a surgeon who is required to scrub their hands for at least five minutes. It is not necessary and, in fact, undesirable to remove all bacteria from your skin. In normal quantities, the micro-organisms that are normally present on the human skin can help us in several ways. Typical organisms on our skin include *Staphylococcus aureus*, and *Staphylococcus epidermidis*. These are called 'normal flora' and they contribute to our existence in several ways. They may compete with 'transient flora' which include pathogens such as *Salmonella*; (Fix, n.d.). If we did not have our natural flora competing with harmful pathogens, then smaller levels of pathogens could make us easily sick. There have been documented accounts of the susceptibility to pathogens of animals raised in sterile environments. Normal hand washing will not upset the balance of natural flora on your skin.



A history of hand washing

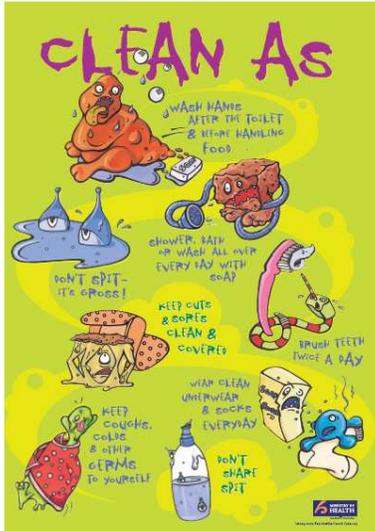
It is only recently in human history that we have realised the benefits of washing our hands. The medical profession were particularly lax when it came to the practice. Throughout history thousands of people have died, including one US president ("*20th President of the United*

States", n.d), because physicians did not realise the importance of removing bacteria from their hands with hand washing.

Childbearing in the nineteenth century was a particularly hazardous experience

for women, with thousands dying in hospitals throughout Europe and the United States from puerperal fever. One sixth of women died of this fever (*Puerperal fever*, n.d.)

In 1843, Dr Oliver Wendell Holmes noted the high number of deaths in American hospitals, and suggested that hand washing could prevent the spread of puerperal fever and wrote an essay on the subject. However, the medical community dismissed the claim. In 1847, Dr Ignaz Semmelweis was working in the maternity wards of a Vienna hospital. There he observed that the mortality rate from puerperal fever in a delivery room staffed by medical students was 13 percent compared to two percent in another delivery room staffed by midwives (*Ignaz Semmelweis* n.d.). Without knowledge of Holmes's theory on hand washing, Dr Semmelweis postulated that the medical students might be carrying the puerperal infection in putrid particles on their hands and soiled instruments from the autopsy room to birthing mothers.



MINISTRY OF HEALTH

Dr Semmelweis directed the medical students to wash their hands with a solution of chlorinated lime after performing autopsies and before examining child-bearing women. The mortality rate in the maternity ward

dropped to just over two percent, comparable to that staffed by the midwives. In 1848, Dr Semmelweis added all medical instruments used on child-bearing women to the washing directive. This further decreased the mortality rate.

However, he was dismissed from his post at Vienna in 1849, but Vienna's loss was Hungary's gain. There he operated a maternity ward with a less than one percent mortality rate.

Following this success, Dr Semmelweis's hand washing method was soon adopted by hospitals throughout Hungary.

However, when he published his findings in 1861, like Holmes, he too was ridiculed by the rest of the scientific community. Hospitals in other countries still did not believe that hand washing was necessary or relevant to the spread of disease.

Dr Semmelweis died in 1865 with his theories on hand washing still not widely practiced or accepted. In 1879, at a seminar at the Academy of Medicine in Paris, a speaker again dismissed the idea that disease could be spread by unwashed hands. A member of the audience, compelled to protest, stood and shouted at the speaker that the thing that kills women with puerperal fever is doctors that carry deadly microbes from sick women to healthy ones. That man was Louis Pasteur (Case, 1996). Pasteur, along with Italian scientist, Agostino Bassi, contributed to the germ theory of disease.

In that same year, Pasteur was able to show that *Streptococcus* was present in the blood of women with puerperal fever. However, the mechanism of spread was still not generally believed until the start of the 20th century (*Puerperal fever*, n.d.). In all it took around 60 years to convince the medical and scientific community to wash their hands to prevent the spread of disease. Let's hope the proposed campaign for New Zealand schools has better success!

How to wash your hands correctly

1. Remove jewellery (rings, bracelets) and watches.
2. Rinse hands and wrists under running water; (avoid using hot water).
3. Create a lather with soap or liquid soap perform vigorous rotational hand rubbing on both palms, and interlace fingers to cover all surfaces for 20 seconds. If hands are visibly soiled more time may be required..
4. Rinse hands under running water removing all the soap.
5. Dry your hands thoroughly with a single use towel.
6. Use the towel to turn off the tap.
7. or, dry your hands using an airtowel drier for at least 45 seconds – turning your hands frequently beneath the stream of hot air until hands are completely dry.
8. Try not to touch any bathroom surfaces particularly the door handle with your hands as you leave the bathroom – use the paper towel you used to dry your hands to touch the door handle if necessary.

PROTECT YOUR
LOVED ONES



REMEMBER ...
WASH AND DRY
YOUR HANDS

When Should You Wash Your Hands?

Wash your hands before you:

1. prepare or eat food; and
2. tend to someone who is sick or injured.

Wash your hands after you:

1. use the toilet;
2. change a nappy;
3. handle uncooked foods, particularly raw meat, poultry, or fish;
4. blow your nose, cough, or sneeze;
5. play with or touch a pet, particularly turtles and lizards as it is not unusual for them to carry *salmonella*;
6. handle rubbish; and
7. tend to someone who is sick or injured.

References

Compliance Control Inc (n.d) *20th President of the United States Died due to Poor Hand-Washing*. USA: Author. Retrieved 14 June 2006 from <http://www.hygenius.com/pres.htm>.

Case, C. L. (1996). *Handwashing*. USA: National Health Museum. Retrieved 14 June 2006 from http://www.accessexcellence.org/AE/AEC/CC/hand_background.html.

ESR. (2001). *Hepatitis A Virus*, Wellington: Ministry of Health. Cited on the New Zealand Food Standards website. Retrieved 14 June 2006 from <http://www.nzfsa.govt.nz/science/data-sheets/hepatitis-a-virus.pdf>.

Fix, D. (n.d). *Normal Flora*. Illinois: Southern Illinois University at Carbondale, the Center for Environmental Health and Safety. Retrieved 14 June 2006 from <http://www.cehs.siu.edu/fix/medmicro/normal.htm>

Ignaz Semmelweis (n.d.). From Wikipedia, the free encyclopedia. Retrieved 15 June 2006 from http://en.wikipedia.org/wiki/Ignaz_Semmelweis

Ministry of Economic Development, Ministry of Health, and Ministry of Transport. (2005). *3.4.2 Personal Hygiene*. In "3. Pandemic Contingency Planning for Infrastructure Providers". Wellington: Author. Retrieved 14 June 2006 from http://www.med.govt.nz/templates/MultipageDocumentPage____14474.aspx

Puerperal fever (n.d.). From Wikipedia, the free encyclopedia. Retrieved 15 June 2006 from http://en.wikipedia.org/wiki/Puerperal_fever.

Simmons, G., Townsend, Y., & Gao, W. (2006). *Evaluation of a primary school hand hygiene campaign*. New Zealand Science Teacher, No 112 pp 33-38

Of further interest

<http://www.microbeworld.org/know/wash.aspx>

Blong Life internet-based project; An interactive, classroom activity where students learn about global water and sanitation issues through a creative process.

<http://www.megabright.co.nz/WaraBlongLife/home.htm>

Acknowledgements

Written by: Louise Thomas, Wordwise Science Communication, Lower Hutt
Photos by: Louise Thomas
Illustrations: Ministry of Health
Edited by: Jessie McKenzie, RSNZ
Reviewed by: Dr Greg Simmons, Auckland District Health Board; Ailsa Jacobson, Ministry of Health; Gillian Bohm Ministry of Health
Layout and design by: Jessie McKenzie, RSNZ

Produced with the support of the New Zealand Government

01/07

THE SCIENCE BEHIND THE NEWS; the **GAMMA** series of **The Royal Society of New Zealand** is produced to bring you accurate, up-to-the-minute information on science issues in the news. Future issues are obtainable on subscription which will bring you such information as soon as possible after news items appear. Annual subscription is **\$25**, payable to The Royal Society of New Zealand, P O Box 598, Wellington. Fax (04) 473 1841. Email: sales@rsnz.org Other issues in the **GAMMA** series are:

- Pb or not Pb – Lead in Petrol
- Genetically Modified Food
- Mad Cow Bites Man
- Rabbit Calicivirus
- The Invasion of the Moths
- Hello Dolly - Unforgettable Ewe
- Superbugs
- Cell Phone Towers and Health
- Vaccinations
- El Niño
- Mercury Fillings
- Sun, Skin and Cancer
- Cosmic Collisions
- Asian Tiger Mosquito
- Water, Water Everywhere
- Asthma
- Tattoos and Body Piercing
- Diabetes
- Arthritis - Move it or Lose it!
- Drugs in Sport
- Genetically Modified Food 2
- Genetic Technology in Health
- Environmental Aspects of Genetic Engineering
- Genetic Engineering off the Field
- Genetic Engineering and Ethics
- Foot and Mouth Disease
- The Promise of Stem Cell Research
- How Now Mad Cow
- Food Labelling
- Organic Food
- Anthrax
- Weight of the World - Obesity
- Eating Disorders
- 1080 - Who's Taking the Bait?
- Meningococcal Disease -
- It's a Killer
- Smallpox
- SARS - the Early Days
- Life After Dolly
- Biological Weapons
- Malaria
- The Business of Drinking Water
- Asian Bird Flu Pandemic
- Osteoporosis
- Tsunamis
- Xenotransplantation
- Global Warming
- Scientific War on Terror
- Coal-New Zealand's Black Gold
- In the Blood: New Born Screening
- Energy
- Electric Cars

Promoting Excellence in Science and Technology

