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Stage 3

Marvellous Microorganisms

RIVERINAEEC

Mawang Yalbilinya

**Updated 2018 to reflect new K-6 Science and Technology Syllabus outcomes

Riverina Environmental Education Centre
7161 Olympic Highway,
Wagga Wagga NSW (02) 69329134

Marvellous Microorganisms - Stage 3

BIG IDEAS:

- A Microorganism (also called microbe) is a living organism that is too small to be seen with the naked eye, but is visible under a microscope. They feed, grow and reproduce.
- Microorganisms include bacteria, viruses, algae, fungi and protozoa.
- Decomposer microorganisms cause the process of decomposition. Foodstuffs exposed to bacteria and fungi (mould) can threaten future food security.
- Pathogenic microorganisms can cause diseases.
- Microorganisms have great health benefits and can be used in the production of some food and drinks.
- Spread of harmful microorganisms can be avoided through hygienic practices and vaccinations.

Cross Curricular Outcomes - ENGLISH	1. Introduction – Microorganisms	2. Scale of microorganisms	3. Glitterbug handwashing activity (before first meal)	4. Microscope activities	5. Decomposer timeline	6. Compost pile and chicken run	7. Yeast Balloon	8. Burger "Mummy"	9. Food Security Game
EN3-1A communicates effectively for a variety of audiences and purposes using increasingly challenging topics, ideas, issues and language forms and features									
• use metalanguage to describe the effects of ideas, text structures and language features on particular audiences	✓	✓	✓	✓	✓	✓	✓	✓	✓
• participate in and contribute to discussions, clarifying and interrogating ideas, developing and supporting arguments, sharing and evaluating information, experiences and opinions	✓	✓	✓	✓	✓	✓	✓	✓	✓
EN3-3A uses an integrated range of skills, strategies and knowledge to read, view and comprehend a wide range of texts in different media and technologies									
• identify and explain how analytical images like figures, tables, diagrams, maps and graphs contribute to our understanding of verbal information in factual and persuasive texts		✓			✓				
• summarise a text and evaluate the intended message or theme		✓							
EN3-5B discusses how language is used to achieve a widening range of purposes for a widening range of audiences and contexts									
• consider and develop sustained arguments and discussions supported by evidence	✓	✓	✓		✓				✓
EN3-7C thinks imaginatively, creatively, interpretively and critically about information and ideas and identifies connections between texts when responding to and composing texts									
• think critically about aspects of texts such as ideas and events	✓	✓	✓		✓			✓	✓
EN3-8D identifies and considers how different viewpoints of their world, including aspects of culture, are represented in texts	✓								
• respond to short films, documentaries and multimedia texts that express familiar and new aspects of the broader world									
EN3-9E recognises, reflects on and assesses their strengths as a learner									
• reflect on own learning achievements against specific criteria		✓							✓
• formulate questions for specific purposes, eg to clarify and reflect		✓							✓
• discuss and reflect on the roles and responsibilities when working as a member of a group and evaluate the benefits of working collaboratively with peers to achieve a goal		✓							✓

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Cross Curricular Outcomes – MATHEMATICS	1. Introduction – Microorganisms	2. Scale of microorganisms	3. Glitterbug handwashing activity (before first meal)	4. Microscope activities	5. Decomposer timeline	6. Compost pile and chicken run	7. Yeast Balloon	8. Burger "Mummy"	9. Food Security Game
MA3-1WM describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions									
• select and use the appropriate unit and measuring device to measure lengths and distances		✓							
MA3-9MG selects and uses the appropriate unit and device to measure lengths and distances, calculates perimeters, and converts between units of length									
• Convert between common metric units of length		✓							
• convert between millimetres, centimetres and metres to compare lengths and distances		✓							
MA3-18SP uses appropriate methods to collect data and constructs, interprets and evaluates data displays, including dot plots, line graphs and two way tables									
• compare representations of the same data set in a side-by-side column graph and in a two-way table (Reasoning)		✓							
• identify and describe conclusions that can be drawn from a particular representation of data (Communicating, reasoning)		✓							
• discuss the messages that those who created a particular data representation might have wanted to convey (Communicating)		✓			✓				✓

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Cross-Curricular Outcomes – SCIENCE AND TECHNOLOGY	**1. Introduction – Microorganisms**	**2. Scale of microorganisms**	**3. Glitterbug handwashing activity (before first meal)**	**4. Microscope activities**	**5. Decomposer timeline**	**6. Compost pile and chicken run**	**7. Yeast Balloon**	**8. Burger "Mummy"**	**9. Food Security Game**
ST3-1WS-S plans and conducts scientific investigations to answer testable questions, and collects and summarises data to communicate conclusions									
• make and justify predictions about scientific investigations		✓	✓	✓	✓		✓	✓	
• select appropriate measurement methods, including formal measurements and digital technologies, to record data accurately and honestly		✓			✓		✓		
• construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data		✓			✓				
• manage investigations effectively, individually and in groups		✓	✓	✓	✓	✓	✓		✓
• employ appropriate technologies to represent data		✓							
• compare data with predictions		✓		✓	✓		✓		
• present data as evidence in developing explanations		✓	✓	✓	✓		✓	✓	
ST3-4LW-S examines how the environment affects the growth, survival and adaptation of living things									
• describe how changing physical conditions in the environment affect the growth and survival of living things, for example:	✓		✓	✓	✓	✓	✓	✓	✓
- temperature of water in aquatic environments	✓			✓		✓	✓		
• understand that scientific and technological knowledge is used to solve problems and inform personal and community decisions SciT	✓		✓	✓	✓	✓			✓
• describe adaptations as existing structures or behaviours that enable living things to survive in their environment SciT	✓		✓	✓		✓			✓

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ST3-5LW-T explains how food and fibre are produced sustainably in managed environments for health and nutrition									
• explore examples of managed environments used to produce food and fibre, for example: SysT			✓					✓	✓
- cattle farms			✓					✓	✓
- fish and oyster farms			✓					✓	✓
- timber plantations			✓		✓			✓	✓
• investigate how and why food and fibre are produced in managed environments SciT			✓	✓				✓	✓
• identify and sequence the process of converting 'on-farm' food and fibre products into a product suitable for retail sale SysT								✓	✓
• explore plants and animals, tools and techniques used to prepare food to enable people to grow and be healthy								✓	
• investigate how people in design and technological occupations address considerations, including sustainability, in the design of products, services and environments for current and future use SciT				✓	✓	✓			
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Cross-Curricular Outcomes – Geography									
GE3-1 describes the diverse features and characteristics of places and environments GE3-2 explains interactions and connections between people, places and environments investigate the ways people change the natural environment in Australia and another country, for example: • examination of how people, including Aboriginal and Torres Strait Islander Peoples, have influenced each country's environmental characteristics eg land clearing									✓
investigate how the natural environment influences people and places, for example: • discussion of how climate influences the distribution of where people live M GS									✓
• comparison of how landforms influence where and how people live in Australia and another country M VR									✓
investigate the diversity in geographical characteristics within the Asia region, for example									✓
• identification of countries of the Asia region in relation to Australia M									✓

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• examination of economic, demographic and social differences between countries of the Asia region eg employment, population, lifestyle GS investigate connections between Australia and other countries of the world, for example: • description of connections Australia has with other countries eg trade, migration, tourism, aid M GS • examination of a significant event and its local, regional and global effect on people and places									✓ ✓
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Cross Curricular Outcomes – PDHPE									
SLS3-13 Describes safe practices that are appropriate to a range of situations and environments • demonstrates ways to improve unsafe environments, eg home, school, local parks • describes some of the situations where people may have allergic reactions and the signs of an allergic reaction, eg food allergies, bee stings, bluebottle stings			✓ ✓					✓ ✓	

Study Risk Management Form: Marvellous Microorganisms

Note: Risk management for the excursion is the responsibility of the visiting teachers and school. This form is just for the activities and site.

Description: Located at REEC. Students explore microorganisms with microscopes. Glitterbug hand wash kit is used in conjunction with 'black light' or UV light. Students participate in experiments using foodstuffs.

Risk Assessment Matrix	How likely is it to be serious			
How serious could the injury be?	**Very likely**	**Likely**	**Unlikely**	**Very unlikely**
Death or permanent disability	1	1	2	3
Long term illness or serious injury	1	2	3	4
Medical attention and several days	2	3	4	5
First aid needed	3	4	5	6

Task/Activity	Hazard	Risk Assess	Elimination or Control Measure
General	General		Senior First Aid qualifications are held by REEC Staff and a First Aid Kit with EpiPen, water and mobile phone is carried with REEC Staff.
Environment	Possible cold weather/High winds	5	Students must wear appropriate clothing. If weather judged too severe an alternative activity will be done or the Study postponed.
	Sun	3	Students must wear hat and apply sun screen. Water available.
	Walking over rough ground	3	Teacher at front and back of group. Teacher ratio <1:15 (guideline). Students wear enclosed footwear. Students warned of possible snake presence.
	Possible snake presence /Insect bites/stings	1	Students made aware of areas where bees, ants may be found. Teacher informed of students who may suffer anaphylactic reactions from bites/stings. REEC staff to carry first aid kit, EpiPen and mobile phone.
	Bushfire	1	REEC closed during catastrophic fire rating period. Student induction in regards to evacuation procedures at the beginning of the program.

People	Allergic reactions (anaphylaxis) – Insect stings or environmental triggers, food allergies asthma, diabetes Glitterbug hand washing kit – skin contact	1	Schools give prior advice to REEC staff of student and staff medical conditions. REEC staff to carry First Aid kit with Ventolin/spacer, EpiPen and mobile phone. Student and/or teachers carry personal medication. Students with anaphylactic reactions to bring EpiPen and Personal Health Care Plan. Medical training kit used to track hygienic handwashing techniques. Avoid contact with students with known skin allergies. Students with poor behaviour do not participate.

SUGGESTED ACTIVITIES TO EXPLORE PRIOR TO YOUR VISIT:

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Suggested Learning Experiences

1. ***Introduction – What do we already know about microorganisms?***

What we **Think** we know	What we **Want** to learn	What we **Learned**	**Questions** for further research

Prepare a large four-column chart for the class with the following headings. Introduce the first column on the **TWLQ** chart ('What we think we know'). Invite students to suggest any fact they may know before the unit starts. Let them know that these will all be recorded, but as the unit progresses, their facts will be verified (or not) as facts come to hand.

Introduce the second column of the chart ('What we want to learn') and ask students to suggest questions they can investigate later in the unit. Record all of these questions.

2. ***Set up Word Wall***

This is a crucial part of the comprehension process. Topic words are introduced during the sequence of lessons, and these are added to a

Suggested Website Links for Learning

What are Microbes?
https://www.youtube.com/watch?v=_Vj0cIgwpQI

What is a Microbe?
https://www.youtube.com/watch?v=qi1MgmaQM0Q

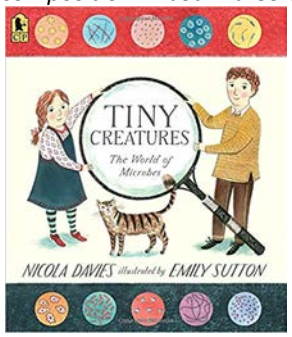
Microorganisms – An introduction (lesson plans)
http://www.e-bug.eu/lang_eng/primary_pack/downloads/itm/Introduction%20to%20Microbes%20Complete%20Pack.pdf

Language focus

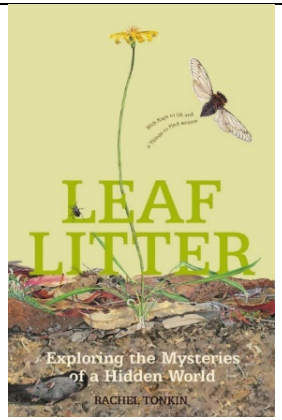
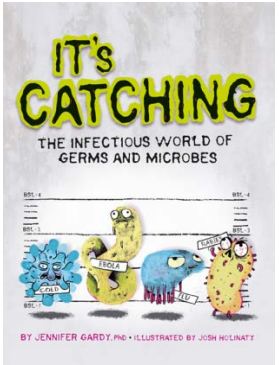
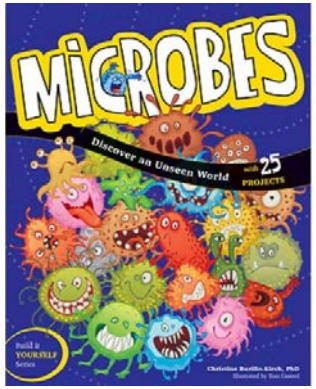
microorganism, microbe, microscope, mould, yeast, gas, sugar, growth, reproduction, antibiotic, probiotic, penicillin, warm, texture, dough, bacteria, ingredients, temperature, carbon dioxide, virus, fungus, fungi, protozoa, algae, bacteria, culture, decomposition, spores, moisture, organic, preservatives, yeast, compost, disease, pathogens, cell, host, digestion, contaminate, medicine, hygiene, fair test, variables, infection, infectious, poisoning, vaccine, culture, infect, habitat, classify, colonise, resistance, ferment, permaculture, compost fauna, multiply, sterilise, Anton van Leeuwenhoek, epidemic, pandemic, immune system,

Suggested Teacher Resources

"The Magic School Bus Meets the Rot Squad – A Book about Decomposition" – Joanna Cole



'Tiny Creatures – The World of Microbes' – Nicola Davies

'Word Wall' in the classroom. Allocate a space in the classroom and only place each word on the word wall as it is introduced. When writing, students can use the word wall as a reference to look up words they are learning about and spell them correctly. Alphabetise words for ease of access. Explain to the students that there will also be a visual or image next to each word to help struggling spellers to identify words. ***3. <u>Meaning of 'Microorganism'*** Place a list of words on the board that start with the prefix 'micro'. Eg, *microscope, microsurgery, microwave, microchip* etc. Have students describe or define each word. What connection might these words have? What might 'micro' mean? Once students have found the meaning of **micro=small,** write the word 'organism' on the board. If students have not heard of this term before, ask them to use a dictionary to find the meaning of the word. **Organism**=life form. **Microorganism**=small life form. What might be a small life form? Record all answers in the 'What we think we know' column of the class chart. ***Introduce word – **'microbe'** as synonym for 'microorganism'. The terms will be used interchangeably throughout the unit. ***4. <u>What is a microorganism and where are they found?</u>*** To gain an understanding of the main forms of microorganisms, watch the RMIT production 'What are Microbes?' https://www.youtube.com/watch?v=_Vj0cIgwpQI **Make a new class chart** – using 5 columns, headed *'Bacteria', 'Virus', 'Fungus', 'Algae'*and '*Protozoa'.* Divide into two rows – and label one row 'Beneficial' (or helpful) and the other 'Harmful'. Watch the video again and see if microorganisms mentioned can be placed according to the type of microorganism they are, and whether they are helpful or harmful. *Eg table below*	***Cell Size and Scale*** http://learn.genetics.utah.edu/content/cells/scale/ ***'Microbes – The Good, The Bad and The Ugly' online comic*** https://askabiologist.asu.edu/microbes-page-1 ***'Microbes – The Good, The Bad and the Ugly'* – pdf comic printable** https://askabiologist.asu.edu/sites/default/files/resources/coloring_pages/pdf/microbes-comic-coloring-book.pdf ***'Viral Attack'* –pdf comic printable**	**iPad/ Android Tablet App**  Bacteria Interactive educational VR 3D Mozaik Education Apple Store https://itunes.apple.com/us/app/bacteria-3d/id1168927717?mt=8 Google Play https://play.google.com/store/apps/details?id=com.rendernet.bacteria	 *"Leaf Litter"* – Rachel Tonkin  *'It's Catching'* – Jennifer Gardy  *"Microbes –Discover an Unseen World"* Christine Burillo-Kirch

	Bacteria	Virus	Fungi	Algae	Protozoa
Helpful					
Harmful					

https://askabiologist.asu.edu/sites/default/files/resources/coloring_pages/pdf/aab_viral_attack_coloring_packet.pdf

5. How 'Micro' are microorganisms?

This is a great interactive activity. Using the website: 'Cells: Size and Scale', http://learn.genetics.utah.edu/content/cells/scale/

Move the sliding scale bar across to the right. Observe the comparisons between microorganisms and everyday objects as the scale changes from metres down to the smallest units – picometers.

Note that the smallest microorganisms have only been identified with extremely powerful electron microscopes used scientific laboratories. The smallest objects that the unaided human eye can see are about 0.1 mm long. That means that under the right conditions, you might be able to see an ameoba proteus, a human egg, and a paramecium without using magnification. A magnifying glass can help you to see them more clearly, but they will still look tiny.

***'You are Your Microbes'* – Youtube animation**

https://ed.ted.com/lessons/you-are-your-microbes-jessica-green-and-karen-guillemin#watch

6. Anton van Leeuwenhoek – Microscope Maker – Reading

(Activities from this lesson come from ''Primary Connections" – Session 3 p20-23)

To find out about the history of microorganisms and the first observation of microorganisms, students should first read the fact sheet provided (resource sheet 2).

Watch ***Seeing the Invisible: van Leeuwenhoek's first glimpses of the microbial world***

https://www.youtube.com/watch?v=ePnbkNVdPio

to gain a greater insight into van Leeuwenhoek's discoveries. After watching, add more of the facts learned to the 3rd column of our class chart – *What we Learned.*

Seeing the Invisible: van Leeuwenhoek's first glimpses of the microbial world

https://www.youtube.com/watch?v=ePnbkNVdPio

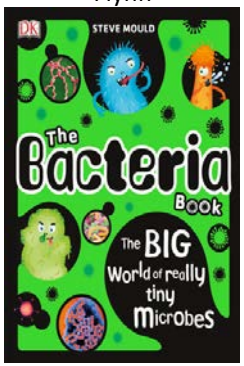
7. Microorganism Artwork

Visit Nikon's 2017 Photomicrography Competition. These images were taken by people with an interest in microscopy and photography. Visit the gallery winners and attempt to guess what the subject matter could possibly be before checking the details.

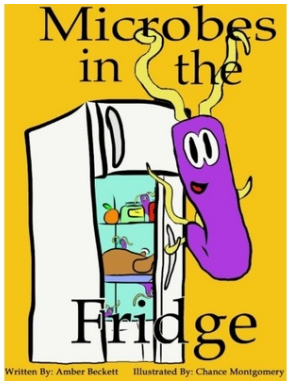
Nikon Small World Photomicrography Competition site

https://www.nikonsmallworld.com/galleries/photo/2017-photomicrography-competition

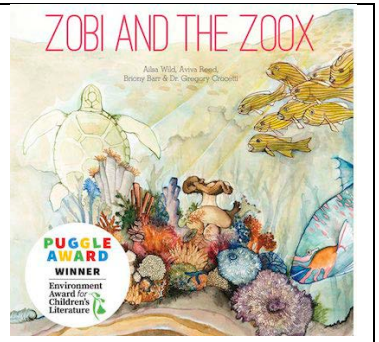
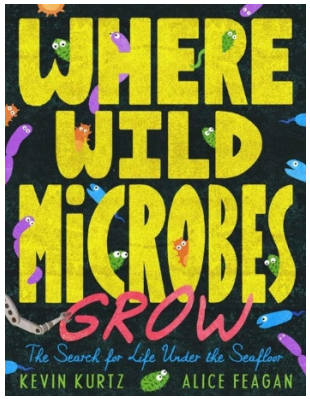
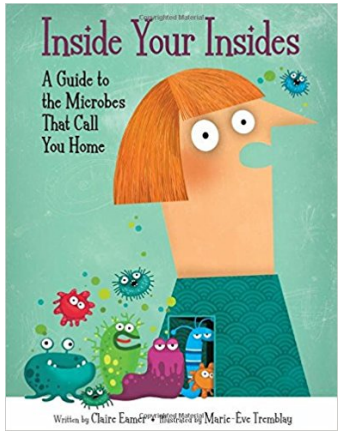
"This Book Stinks!" (National Geographic) – Sarah Wassner-Flynn

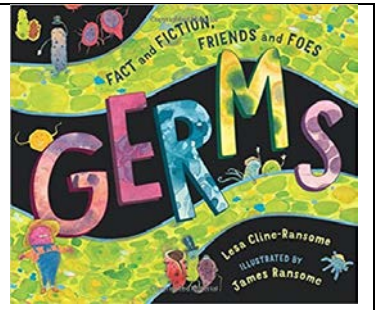
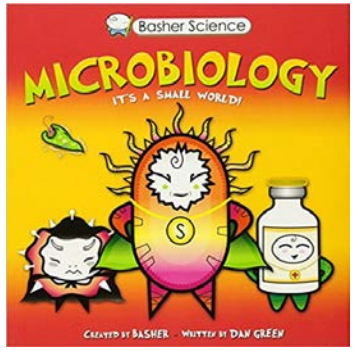


"The Bacteria Book" – Steve Mould



'Microbes in the Fridge"- Amber Beckett

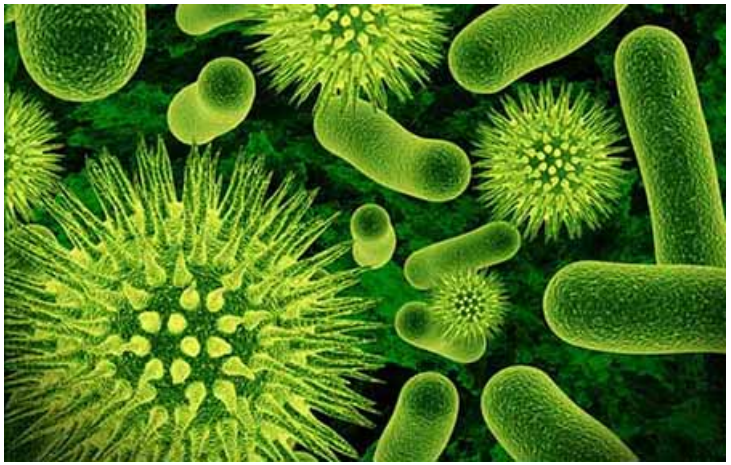
Inspired by the beauty of the photographs, have students create their own photomicrography artwork using a choice of mixed media. Display in the classroom. ***8. <u>Exploring Bread</u>*** This first activity comes from '*Primary Connections – Marvellous Microorganisms'*, Session 1 – 'Exploring Bread', page 12. You will need to reproduce the recording sheet for each group needed for this experiment in A3 – (resource sheet 1) Follow the instructions for this experiment. Discuss findings between yeast-free and yeast additive breads. Collect assessment – '*Observation record: Exploring Bread'*. At this point in time, teachers may explore all bread and yeast activities as outlined in 'Primary Connections – Marvellous Microorganisms' – pp18-40. ***9. <u>A Nightmare in My Lunchbox –(Session 1 p43)</u>*** What do you know about mould? Where have you seen it grow? Add suggestions to chart (What we think we know). Does mould only grow on food? What about other places – eg shower, on damp clothing, windows etc. What conditions might link these mould 'biomes?' – Students may suggest warmth or damp conditions. The lessons related to moulds in Primary Connections – 'Marvellous Microorganisms' (pp43-51) should be investigated with caution. Where moulds have been grown, be sure to adhere to advise given about 'double bagging' and sealing of food samples with mould grown. ***10. <u>The Rise of Cleanliness</u>*** In the nineteenth century, cholera killed millions, but it also sparked one of the history's greatest innovations – sanitation. • Research some of history's pandemics caused by poor sanitation: - eg. 'Black Death'/Plague, Typhoid fever (or enteric fever), Cholera, Smallpox etc. ***11. <u>Medical Microorganisms</u>*** Complete lesson 7 – Marvellous Microorganisms pp52-57.	***Magic School Bus – Make a Yeast Feast Worksheet – printable*** http://www.scholastic.com/browse/subarticle.jsp?id=2849 ***Magic School Bus Meets the Rod Squad*** https://www.youtube.com/watch?v=KkjhZBmS9QM ***<u>Growing Mould on bread – Wash Your Hands!</u>*** https://www.youtube.com/watch?v=8jxRmvF1Ecc (This is a great idea to try in the classroom – be sure to 'double bag' and seal with tape.)		 *"Zobi and the Zoox"* – Ailsa Wild  *"Where the Wild Microbes Grow"* – Kevin Kurtz  *"Inside Your Insides- A Guide to the Microbes that Call You Home"* – Claire Eamer

			 *"Germs: Fact and Fiction, Friends and Foes"* – Lesa Cline-Ransome  *"Microbiology – It's a Small World"* – Dan Green

RIVERINA EEC
Mawang Yalbilinya

Stage Three– Marvellous Microorganisms
Riverina Environmental Education Centre

Introduction to Microorganisms

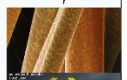
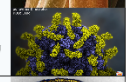
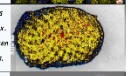
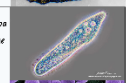
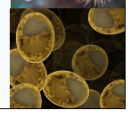


Students will be given an induction to the Centre.

- Gauging previous learning – what do students already know about microorganisms? What do they want to find out about microorganisms? What IS a microorganism?
- Discussion about where microorganisms are found. What are the differences between helpful and harmful microorganisms?
- Preview the day's activities for the day.

Scale of Microorganisms

Microorganism Scale Activity

Organism	Model size	Actual size	Effect on body	Shape
Human Hair	10m	0.1mm wide		
Poliovirus	2mm	0.00002mm	Diseases of the digestive tract, brain and spinal cord.	
Vaccina Virus	2cm	0.0002mm	Cowpox virus. Is similar to smallpox. Transferable between cows and humans.	
Paramecium	20m	0.2mm (You can almost see it!)	Common protozoa important in the food chain.	
Staphylococcus	5cm	0.0005mm	Causes food poisoning.	
Escherichia Coli (E.Coli)	20cm	0.002mm	Most strains are harmless but some cause food poisoning.	
Baker's Yeast	0.5m	0.05mm	Used in the production of some foodstuffs	

RIVERINA EEC
Mawang Yalbilinya

An activity to help us to get a better idea of how small microorganisms are:

- Groups of 4 take a card and some chalk
- In the carpark draw two lines drawn 10 metres apart. This represents the width of a STRAND OF HUMAN HAIR.
- Using the measurements from your card, draw each microorganism to scale using rulers, trundle wheels and tape measures.
- Using the movie function on your iPad, discuss each microorganism and its size, as though you were presenting the information in a documentary. Take turns being a camera person or presenter.
- These documentaries will be saved and viewed back at school.

Glitterbug handwashing activity 	• **GlitterBug Potion** is used in conjunction with a UV torch. • Students will squirt some onto their hands, rub it in and try to wash it off. Any residue will glow under a UV light. • Most people will have successfully cleaned their palms and maybe parts of their fingers. Many however, will miss the wrist, side of the hand, finger nails and rings. • The glowing GlitterBug Potion will instantly show students where they have not washed their hands well enough to avoid microorganisms possibly moving from their hands to their food – making themselves susceptible to pathogens entering their digestive tracts. • When the UV light shows presence of the GlitterBug Potion, students are given a second chance to wash their hands again before consuming their first meal at REEC.
Microscope Work 	Students will be inducted to correctly focus and use a microscope in the classroom. Different samples of microorganisms will be viewed under the microscope. These include: • *Human hair (width – recalling the 'scale' activity, the human hair can be used to compare the sizes of other microorganisms.)* • *chicken drinking water* • *dog drinking water* • *dam water* • *commercially prepared algae, fungus, protozoa, bacteria and virus slides* Students will produce a scientific drawing what is seen on a prepared worksheet.

Chicken Run and Compost Pile 	• Students will 'visit' the compost pile and 'permaculture chicken run'. 'Permaculture' – defined as agriculture systems that are maintained self-sustainably to mimic the diversity and stability of natural animal and plant ecosystems. Students are made aware that the nitrogen cycle is working here. Microorganisms like plant life. The microbes in the soil are working to build the soil. The soil grows food to feed the chickens, who in turn return their waste to the soil. The fertilised soil assists food production. The chickens enjoy protection form aerial predators, shade and protection from lower trees and plants. • Students investigate the compost heap, to find evidence of decomposition here. There may also be sightings of macroinvertebrates who live here and also help to break down the food matter. A compost identification chart can be used to assist in naming compost fauna present in the soil.
Decomposer Timeline  	• Students will be challenged with the following inquiry questions for a group task: - *'How long does it take for organic and inorganic items to decompose?'* - *'Do some items take longer to decompose than others? Why?'* - *'What is an acceptable "timeframe" for decomposition?'* • 4 equal groups are given a 'timeline pack'. They are introduced to all components of the pack – these being a series of pictures of organic and inorganic items (total 16 items) , and a set of cards with a specific number of days, weeks, months and years labelled on them. The challenge is to place the pictures in a sequential line from those items that would decompose fastest, to the items that would take the greatest amount of time to decay. • Students place items sequentially and match time cards to show elapsed time for decomposition. • A chosen recorder from each group records answers onto a whiteboard to bring back to the group. The kit is packed away. • At the end of the activity, students clarify HOW they arrived at their answers. • Students evaluate the level of difficulty for this activity – *how did they make a consensus on their chosen sequence? Did everyone have the chance to participate?* • Answer cards are given to clarify the decomposition rates for the items given. Students discuss answers. It is noted that those 'times' in green are items that could have decomposed within the time the student has been alive. Orange times represent those items that could decompose in a human lifetime. Red times will show which items will 'outlive' up to another 5+ generations of their family to come. • *Were there any surprising figures here? How can we solve some of these problems?*

Yeast Balloon

- Yeast is a fungus and is therefore a living microorganism. Like us, yeasts must get their food from their surrounding environment to grow and reproduce—that is, to make more yeast. What do they eat? Yeasts feed on sugars and starches. They turn this food into energy and release carbon dioxide gas as a result. This process is known as fermentation. The carbon dioxide gas made during fermentation is what makes a slice of bread so soft and spongy. The pockets of gas are produced by yeasts when the dough is allowed to rise before baking. The following experiment will demonstrate fermentation and carbon dioxide release.

- Bottle A – warm water and yeast only
- Bottle B – warm water and sugar only
- Bottle C – warm water, yeast and sugar added.

- All bottles are labelled as above. Remove each lid and stretch a balloon completely over the opening of the bottle (over all of the ridges). *Why do you think it is important to form a tight seal with the balloon on the bottle's opening?*
- Leave the bottles to rest in a warm location for 45 minutes. Keep the balloons out of direct sunlight. *How do the balloons change over time?*
- After 45 minutes, examine the bottles and the balloons. *Which balloons have become inflated? How big are they compared to each other? Do you notice any differences in the contents of the bottles?*
- *In which environment did the yeast make the most carbon dioxide? What does this tell you about the conditions needed for yeast fermentation to take place?*

Burger 'Mummy'

- The main function of preservation is thus to delay the spoiling of foodstuffs and to prevent any alterations in their taste or, in some cases, their appearance. This can be done in different ways, through processing methods including canning, dehydration (drying), smoking and freezing; the use of packaging; and the use of food additives such as antioxidants or other preservatives.

  The primary reason for using preservatives is to make foods safer by eliminating the influence of biological factors. The greatest threat to consumers is that of food being spoiled, or from becoming toxic by the effect of micro-organisms (e.g. bacteria, yeast, moulds) occurring in them.

- This activity compares the decomposition process between a commercially bought hamburger and fries, and a similar meal made with no preservatives.

- Students exposed to some information about food preservatives, their use in particular foodstuffs and possible side effects for users.

Food Security Game

- Students explore global inequalities in food production and consumption through participating in a brief simulation game. Whilst the world produces enough food to feed everyone, the distribution of food is not equal. Roles are allocated to all students. They will represent around 4% of the world's population, and will be grouped accordingly:

  1. Those who live on less than approximately $1.25 per day and do not get enough food to be healthy and lead an active life.
  2. Those who live on about $2 per day and are frequently hungry.
  3. Those who are not extremely poor, but don't live in a country with a very high level of development and are therefore vulnerable to changes in status caused by natural disasters, serious illness or rapid increases in the price of food.
  4. Those who live in countries with a very high level of development who can afford a nutritious daily diet. A high caloric diet means you face health problems such as heart disease and diabetes.

- The goal for this game is survival.
- Allocations of 'food' (balls to drop in bins) will be given according to the 'group' a student belongs to. One ball=one meal (3 per day needed).
- Balls are dropped into bins at stations around the course.
- Throughout the game there will be a number of varying scenarios added which may change the food security future of the participants. Some participants may be forced out of the game when they do not have enough food to continue. This equals death.
- At the conclusion of the game, students will analyse the results and discuss the outcomes for each of the groups who participated.

Discussion points for critical thinking:

- *Why is it that some of the population is starving and others throwing out excess food waste, if the world produces enough food?*
- *What percentage of Australian society struggle with food insecurity?*
- *What was the role of microorganisms in food spoilage?*
- *What is being done at a national and global level to address food insecurity?*
- *What other measures do you believe could assist those struggling with food security issues?*

	<u>At school (to further explore food waste), find out:</u> ➢ *What happens to food with a daily shelf life that is not bought that day?* ➢ *What 'cosmetic standards' are placed on farmers when producing food for large chain supermarkets? And what is done with the edible products that 'fail' this standard?* ➢ Consider the fate of the following food items: - Bread crusts at a café (ie Have YOU ever been served a crust instead of bread slices?), -Fruit and vegetables that did not sell within the 'best before' date? -'less desired' cuts of meat at the butchers.

SUGGESTED POST - VISIT ACTIVITIES and RESOURCES

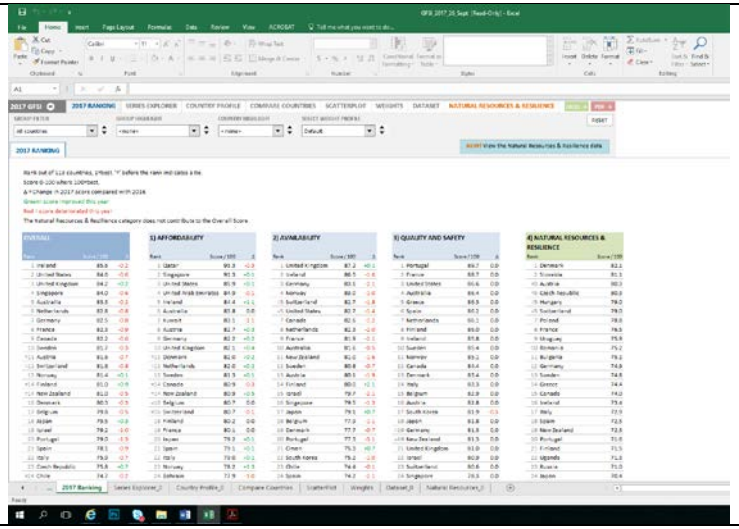
To further explore activities relating to microorganisms and global food security issues

Teaching/learning guiding inquiry questions

- ***What do we need to do to avoid global food wastage?***
- ***How are food safety and food security linked?***
- ***What food hygiene practices should we use when storing food?***
- ***How can fermentation practices help us avoid food poisoning? Which foods use bacteria in their processing?***
- ***What does our immune system do to stop bacterial and viral infection?***

Lesson Sequence	***Resources***
Food Waste Footprint  	*https://www.youtube.com/watch?v=IoCVrkcaH6Q* • *Watch this video and create a poster to show how food producers, retailers and consumers can take measures to reduce food waste at their level.* • *As a class, paint large pyramids to show preferred food recovery hierarchy. Place these around areas at school where* • *bins are located. Eg* 

Third World Farmer 	***To highlight global food waste in a very visual way – see 'Food Clock'*** ***http://worldfoodclock.com/*** ***Third World Farmer*** *is an interactive online game, whereby students are expected to put themselves in the shoes of a third world farmer, with limited money and resources. They must make decisions relating to the direction of the game; when unforeseeable drops in market prices, droughts, wars etc, may arrive at any time. Students make decisions relating to the purchase of basic necessities, tools and seeds for crops; when to plant, etc. This is a thought provoking simulation and will provide the springboard for critical thinking and deep discussion at the completion of the game. Who will survive?*
Global Food Security Index  	This website is extremely useful. It includes an interactive map of the world and users are able to explore the food security profile of any country in regards to their world ranking for food affordability, availability, quality and safety, natural resources and resilience categories. This site also houses a resource library whereby users can access information, data and reports related to a number of global food securities issues. Another great feature of the site is the ability to download the index into a spreadsheet format. This allows users to compare and contrast countries based on their world rankings in the categories mentioned above. Main page – http://foodsecurityindex.eiu.com/ Download the index - http://foodsecurityindex.eiu.com/Downloads <u>This website would service a number of possible lessons/ student projects:</u> 1. Where are Australia's challenges to food security? In most of our rankings for affordability, availability, quality and safety, Australia fares well. Check out our world ranking (out of 113 countries) for natural resources and resilience. Use the tabs to explore category scores for - exposure (rising temps, drought, flood, storm severity, rising sea levels), - Water (water quality and quantity for agriculture), - Land (soil erosion, organic matter present and forest change), - Oceans (richness of nutrients present and oxygen depletion, marine biodiversity, marine protected areas),

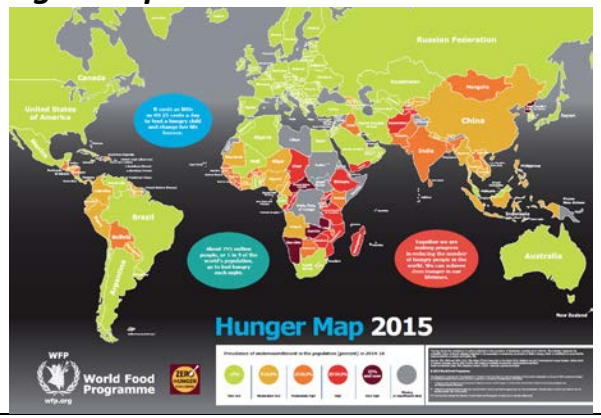


- Sensitivity (food import dependency, disaster risk management),
- adaptive capacity (early warning measures/ climate smart agriculture, national agriculture risk management systems) and
- demographic stresses (population growth, urbanisation).

Where do we 'fall down?' How can we find out what these scores mean?
http://foodsecurityindex.eiu.com/Index/AdjustmentFactorRankings

2. Choose a country and compile a factsheet relating to 'adjustment factor ratings' – those factors which are natural resource and climate-related risks mentioned above, that may pose long term threats to food systems.
http://foodsecurityindex.eiu.com/Index/AdjustmentFactorRankings

World Hunger Map Resource



Download the **2015 World Hunger Map** from the World Food Programme website. Fits to print on A3.
https://bit.ly/2I6m0DZ

Play – The Global Food Development Game. There are three levels, each with a different theme:

1. Where does the world's food come from?
2. Where are undernourishment rates highest?
3. Multiple choice picture round.

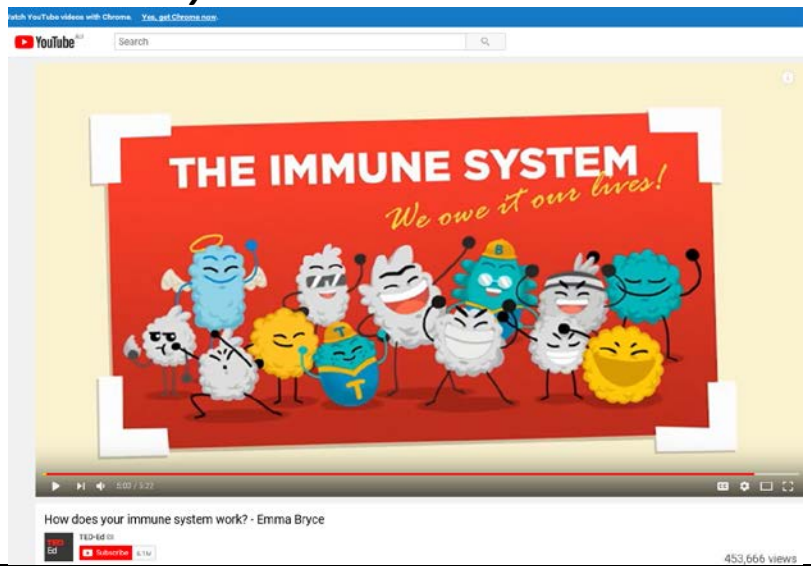
https://www.theguardian.com/global-development/interactive/2013/jun/07/food-game-what-do-you-know

Food Safety

1. **WHO – Five Keys to Safer Food** – excellent animation to show students the ways to avoid food borne illness.
https://www.youtube.com/watch?v=ONkKy68HEIM

2. **(Food) Workplace Hygiene Fliplet** – Interactive 'booklet' with information and movies. Once familiar with content, there is a quiz attached.
http://www.fliplets.net.au/fliplets/wh/WH.html

3. **Perils at the Picnic** – read the passage and identify the number of ways Tom has compromised his food safety from previous knowledge gained in these food safety lessons. Complete worksheet.
https://naitc-api.usu.edu/media/uploads/2015/08/13/perilsatthepicnic.pdf

Good Bacteria in Foods  	**<u>TedEd video –The Beneficial Bacteria that make Delicious Food</u>** This video considers the processes required to make some foodstuffs that use bacteria. https://www.youtube.com/watch?v=eksagPy5tmQ ed.ted.com will then test students' comprehension of the video with a quiz. https://ed.ted.com/lessons/why-is-bread-fluffy-vinegar-sour-and-swiss-cheese-holey-erez-garty/review_open#question-1
The Immune System  	**<u>TedEd video – How Does Your Immune System Work?</u>** This animation is a great visual to explain the roles of different cells in our immune system and how they fight bacterial and viral infection. https://www.youtube.com/watch?v=PSRJfaAYkW4 There is another linked comprehension quiz to try. https://ed.ted.com/lessons/how-does-the-immune-system-work-emma-bryce#review **Activity – Download and print the following webquest.** https://bit.ly/2G8JOKQ Students are able to work in pairs to find the answers to questions relating to the immune system. There is a rubric for marking purposes included if teachers were wishing this to be one assessment task for the unit.

Evaluation:

Pre – Visit Activities
REEC Program – Marvellous Microorganisms

Post-Visit Activities