Neumedix

The evolution of *Melaleuca Alternifolia* Leaf (Concentrate)

Developed by Professor Max Reynolds
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Griffith University - Nathan Campus, Brisbane, Australia

98 alive

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V1.4

In the Beginning…

AIM

To find an alternative anti-microbial that was safe and efficacious against major bacterial, fungal, cancer and viral human pathogens.

I turned to nature and started to examine all of the supposed anti-bacterial and anti-fungal natural products that are known to man.

Among the candidate compounds was the group known as the ***Melaleuca*** family, in particular the groups in this family that are approved Australian **TGA listed medicines** and **USA FDA approved** to be used in **food.**

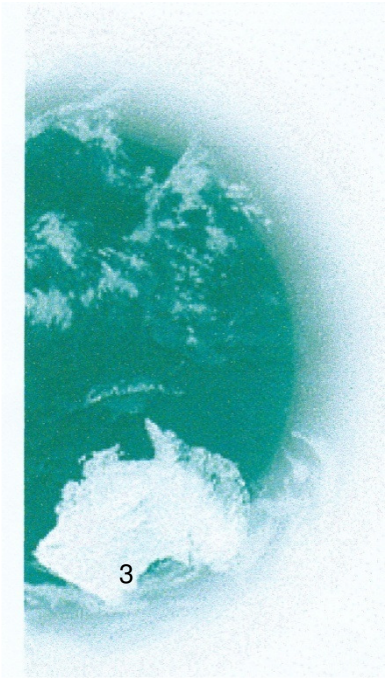
TGA

Australian Government

Department of Health and Ageing

Therapeutic Goods Administration

SUBSTANCES THAT MAY BE USED IN LISTED MEDICINES IN AUSTRALIA



Melaleuca alternifolia

Permitted for oral use , without restriction , in preparations containing 25% or less of Melaleuca oil.

(See TGA – Listed Substances & TGA Letter)

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Substances that may be used in Listed medicines in Australia

Substances that may be used in Listed medicines in Australia

The following substances are eligible for use in medicines Listed on the Australian Register of Therapeutic Goods for supply in Australia. The list includes the approved role of the substance (ie. active, excipient, and/or component), and any restrictions and conditions that apply to the substance when used in Listed medicines.

Please note substances marked as components (C) are not approved as substances for use in their own right and can only be used in conjuction with an approved source. For example, iodine is not approved as a substance in its own right but is permitted when expressed as a component of *fucus vesiculosus* (Kelp). which is known to naturally contain iodine.

Some substances are permitted as food excipients only. These substances (eg. apple, pear) refer only to ecible substances fit for human consumption as a food. Only certain preparations are permitted for most food excipients: fresh dry or powdered plant material and fresh, dried or concentrated juices. Juice preparations may only be named where the fresh plant part has a high water content. For further details, refer to the Introduction to the Herbal Substances AAN list in the TGA Approved Terminology for Medicines: http://www.tga.gov.au/docs/html/aan.htm

Please note this list does not include substances that may be used as homoeopathic preparations. The Office of Complementary Medicines is currently conducting a review of homoeopathic substance permitted in Listed medicines, and this document will be updated upon completion of the review.

A glossary of abbreviations is provided at the end of the document. For further information on Coded Warnings, refer to the following web page: https://www.tgasime.health.gov.au/SIME/DCT/webdct.nsf/PRODWARN1?OpenView

For further information on conditions related to provisional ingredients (PRVs), refer to the Australian Regulatory Guidelines for OTC Medicines: http://www.tga.gov.au/docs/html/argom.htm

This list was updated on 12 December 2007 and is subject to change from time to time as new substances are approved for use in Listed medicines. Importantly, as a result of a safety concern, substances may be subject to new restrictions or may be removed from the list.

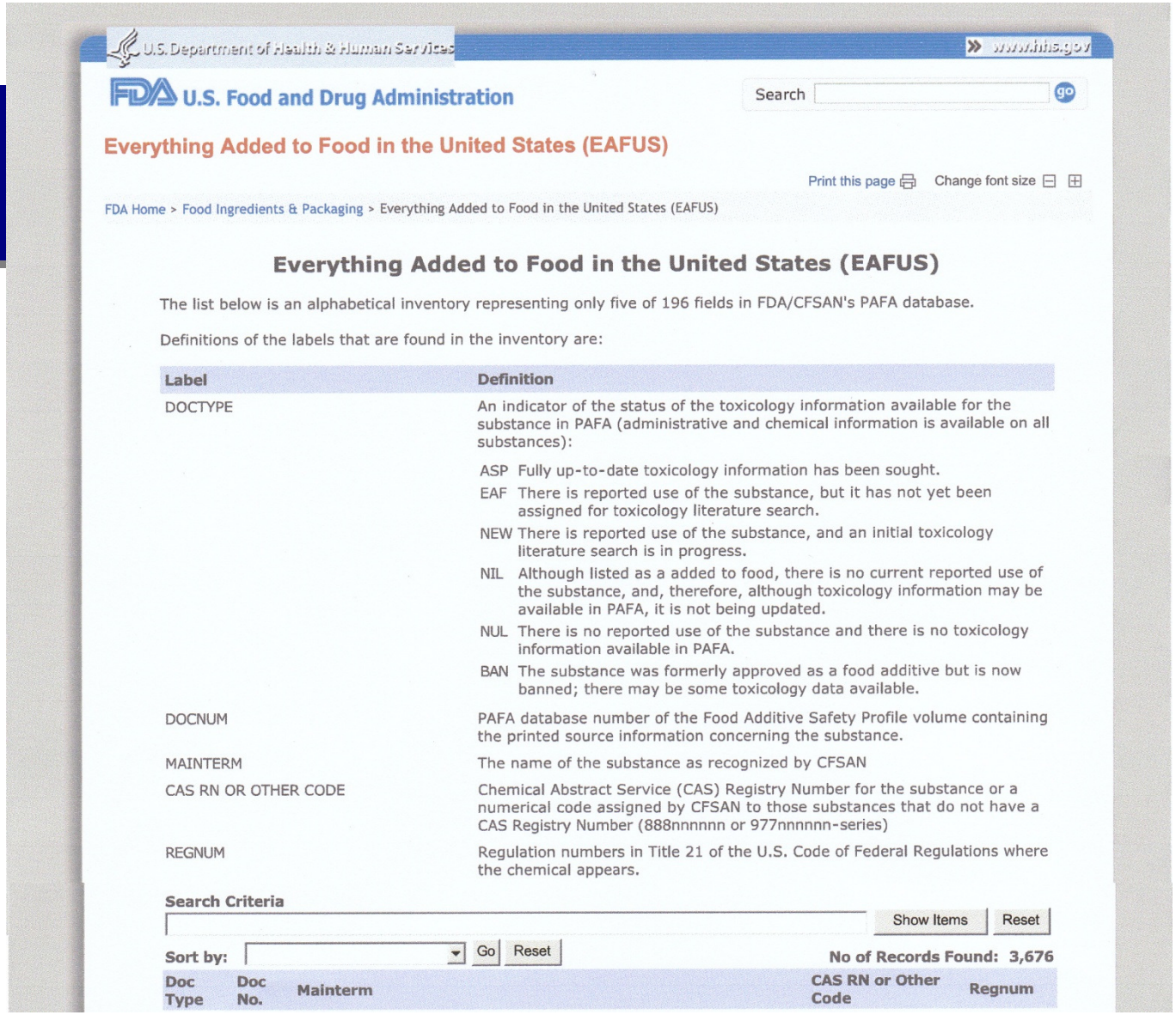
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Substances that may be used in Listed medicines in Australia

Ingredient	Use[1]	Restrictions
Mannitol	E	When the quantity of sugar alcohols per RDD exceeds 2 g, the quantity of the sugar alcohols must be declared on the label in addition to the label statement SUGOLS.
Maranta arundinacea	A, E	
Marjoram oil spanish	A, E	Permitted without restriction in preparations containing 50% or less. When the concentration is greater than 50%, the nominal capacity of the container must be 50mL or less, a RFI must be fitted on the container and the product label must include the statement CHILD.
Marjoram oil sweet	A, E	Permitted without restriction in preparations containing 50% or less. When the concentration is greater than 50%, the nominal capacity of the container must be 50mL or less, a RFI must be fitted on the container and the product label must include the statement CHILD.
Marrubiin	C	
Marrubium vulgare	A, E	
Marsdenia reichenbaachii	A, E	
Marshmallow root dry	A, E	
Marshmallow root powder	A, E	
Martynia parviflora	A, E	
Mastic	A, E	
Matricaria flower dry	A, E	
Matricaria recutita	A, E	
Meadowsweet herb dry	A, E	
Meadowsweet herb powder	A, E	
Medicago sativa	A, E	When the ingredient is a fresh leaf extract and the extraction ratio is between 34:1 and 46:1 then the quantity of l-canavanine in the extract must not be more than that in the fresh leaf. When the ingredient is a herbal extract, the quantity of l-canavanine in the extract must not be more than that in the dry herbal material.
Medium chain triglycerides	E	
Melaleuca alternifolia	A, E	Permitted without restriction in preparations containing 25% or less of melaleuca oil. When the concentration of melaleuca oil is greater than 25% and the nominal capacity of the container is 15 mL or less, a RFI must be fitted on the container and the product label must include the statements CHILD and NTAKEN. When the concentration of melaleuca oil is greater than 25% and the nominal capacity of the container is greater than 15 mL but less than or equal to 25 mL, a CRC and RFI must be fitted on the container and the product label must include the statements CHILD and NTAKEN. Melaleuca oil, Cajuput oil and Cineole are mandatory components of this ingredient (see separate entries). Native species – If exporting this product (excluding oil) please contact the DEH.

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FDA



U.S. Department of Health & Human Services — www.hhs.gov

FDA U.S. Food and Drug Administration — Search

Everything Added to Food in the United States (EAFUS)

Print this page | Change font size

FDA Home > Food Ingredients & Packaging > Everything Added to Food in the United States (EAFUS)

Everything Added to Food in the United States (EAFUS)

The list below is an alphabetical inventory representing only five of 196 fields in FDA/CFSAN's PAFA database.

Definitions of the labels that are found in the inventory are:

Label	Definition
DOCTYPE	An indicator of the status of the toxicology information available for the substance in PAFA (administrative and chemical information is available on all substances): ASP Fully up-to-date toxicology information has been sought. EAF There is reported use of the substance, but it has not yet been assigned for toxicology literature search. NEW There is reported use of the substance, and an initial toxicology literature search is in progress. NIL Although listed as a added to food, there is no current reported use of the substance, and, therefore, although toxicology information may be available in PAFA, it is not being updated. NUL There is no reported use of the substance and there is no toxicology information available in PAFA. BAN The substance was formerly approved as a food additive but is now banned; there may be some toxicology data available.
DOCNUM	PAFA database number of the Food Additive Safety Profile volume containing the printed source information concerning the substance.
MAINTERM	The name of the substance as recognized by CFSAN
CAS RN OR OTHER CODE	Chemical Abstract Service (CAS) Registry Number for the substance or a numerical code assigned by CFSAN to those substances that do not have a CAS Registry Number (888nnnnnn or 977nnnnnn-series)
REGNUM	Regulation numbers in Title 21 of the U.S. Code of Federal Regulations where the chemical appears.

Search Criteria [Show Items] [Reset]

Sort by: [Go] [Reset] No of Records Found: 3,676

Doc Type	Doc No.	Mainterm	CAS RN or Other Code	Regnum
ASP	2844	TEA TREE OIL (MELALEUCA ALTERNIFOLIA)	068647-73-4	

(See FDA – Food Additive Database)

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Raw Material for Concentrate

The aerial leaves of the plant are harvested from the plantations and steam distilled to produce the raw material - '*Melaleuca* Oil'.

Currently there are 500 tons of this raw material available in Australia and around a further 200 tons in other countries.



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Melaleuca plantation



Melaleuca alternifolia – 9 months before Harvest

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Melaleuca plantation (cont.)

Below: Transferring from harvester to transport /distillation bin





Above: Delivery to distillery

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Manufacturing Unit for Concentrate



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Biotechnology Pty Ltd

The creation of Concentrate

The *Melaleuca* oil undergoes a proprietary process which removes, at low boiling point, unstable and potentially toxic monoterpene components and concentrates the heavier bioactive components within the oil.

The system operates at low temperature, using inert gas purging under high vacuum extraction and in an enclosed system, to remove the bulk of the unwanted compounds.

The process can be controlled precisely and the end product can be made to within a 3% range from batch to batch.

The creation of Concentrate

Several name changes have occurred over the years.

* MegaBac™
* M.A.C. – (*Melaleuca alternifolia* concentrate).
* 98 Alive™ is the current commercial name of the product

The advantages of this process are:

Increased Bioactive & Efficacy (in some cases over 200X)
Toxicity decreased by 30% (when compared to the raw *Melaleuca* oil)

How Safe is M.A.C?

From a toxicology point of view M.A.C has been shown to be safe for humans both as a topical application and oral ingestion.

We have undertaken acute, sub-acute, 30 day & 90 day oral ingestion studies (*up to 30mg/kg body weight = to 1800mg / 60kg body weight person*). (***See Acute and Sub-acute Toxicity Studies of MAC and photos of rat organs at this dose level***)

We have also completed the Phase 1 Clinical trial of M.A.C with 40 healthy volunteers. This trial was to assess any changes to normal body functions with varying dose regimes. Blood and urine analysis was carried out and all were found to be within normal standard levels. Even at elevated dosing (*up to 900mg/day*). Included with this work is a complete pharmacokinetic study. ***(See Phase 1 – Clinical Trial of M.A.C)***

How Safe is M.A.C(cont.)

Three studies in 2005 concluded:

1) *Melaleuca alternifolia* oil is non-clastogenic (not mutagenic) in the mouse micronucleus test at dose levels of between 1000mg/kg & 1750mg/kg. ***(See Micronucleus test of Tea tree)***

2) *Melaleuca alternifolia* oil and its major constituent terpinen-4-ol were found not to be mutagens nor carcinogens using the *Salmonella* reverse mutation assay technique.
(See Mutagenic Potential of Tea tree)

3) M.A.C. was tested at concentrations of between 5-25% for acute dermal toxicity in guinea pigs. There were no ill effects.
(See Dermal Acute Toxicity)

List of Products

Currently Listed and approved by TGA:

* MAC Immune Health Boost – Aust L 179798
* Pain Relief Oil – Aust L 179684

In Development / In TGA listing process:

* Lung Health
* Nasal Spray
* Throat Spray
* Fungal (feet)
* ACNE treatment
* Oral – Gum Diseases, Teeth
* Herpes – Both 1 and 2 including cold sores
* Hair scalp treatment
* Ear drops
* Sunburn treatment
* Pessaries (vaginal and anal infections)
* Wound Treatment
* Cold and Flu infections

Immune System Response to M.A.C

The results of a 2009/2010 study series on the effects of M.A.C on selective cytokine induction and activation of immune cell populations in mice were:

1) M.A.C helps promote immune response when administered in doses 200mg- 800mg/(kg body weight).

2) M.A.C increases production of selective acute immune phase response cytokines IL-1, IL-3 & IL-6 but not TNF alpha (inflammatory response).

3) M.A.C promotes significant increases in activation of immune "T" cells particularly CD3+, CD4+ (helper cells), CD8+ (killer cells), CD11b, CD40+, and CD80+ lymphocytes.

(See Murine Immune Response)

Immune System Response to M.A.C (cont.)

4) Even the smallest dose of M.A.C (200mg/kilo) in mouse trials promoted increased levels of F4/80 (up to 5 fold) and CD11b+ monocyte/macrophages in peripheral blood.

5) M.A.C does not inhibit LPS-induced immune response *in vivo,* but rather is able to promote these responses.

6) M.A.C shows a greater capacity to promote established antigenic immune responses and hence, its mode of action is different from LPS/endotoxin.

M.A.C does not appear to act as a non-specific immune stimulant/adjuvant.

(See Murine Immune Response & Dose Response to Oral MAC reports)

Gold Coast Griffith University - Medical Centre Department

Virus

To establish the fact that M.A.C had antiviral activity we have studied the following encapsulated strains:

Corona Virus (SARS group) ***(See Coronavirus - Viricidal Study)***

Herpes Simplex 1 and 2 ***(See HS2 - Viricidal Study)***

Avian A type **H1N1** (*swine flu – Sun Yat-sen Medical University*)

Avian A type **H1N1** (*so called Spanish flu that killed 50 million people*)

Avian A type **H5N1** (*current Bird flu Vietnam Strain*)

Dengue Fever Virus (all 4 strains) – University of Indonesia Jakarta

In all cases we killed these strains "in vitro" and for Dengue patients "in vivo".

Sun Yat-sen University in Southern China is working with us on "in vitro" and "in vivo" studies against H1N1 and H2N3 Avian strains.

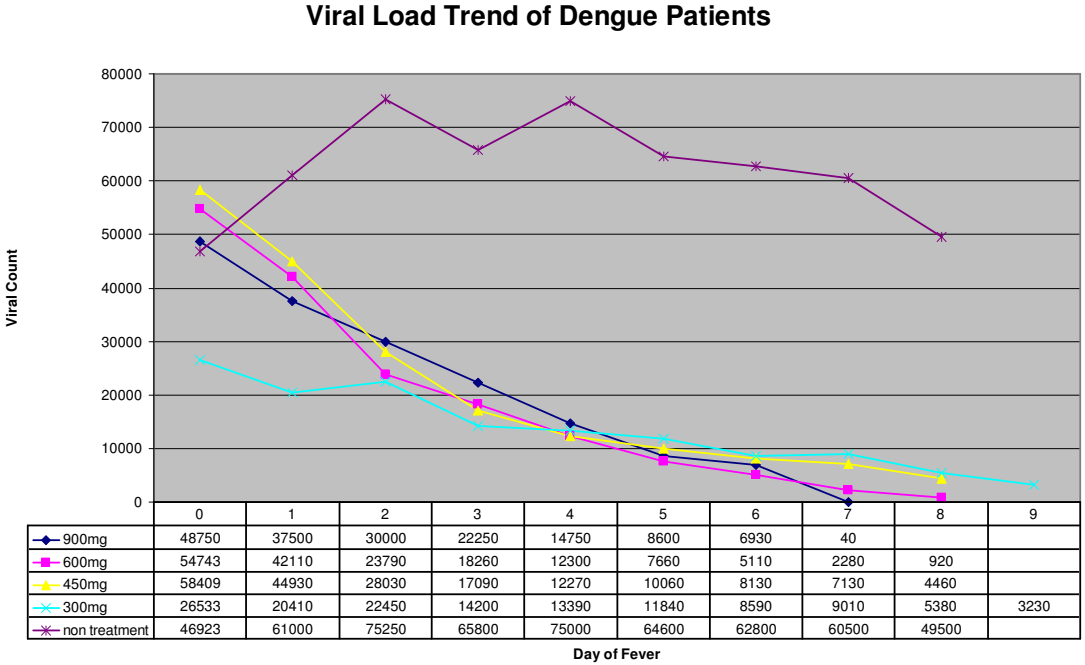
Dengue Fever

In early 2008 a small scale hospital human trial (Indonesia Professor Umar Achmadi – Indonesian University Jakarta)was carried out in Indonesia in which 5 patients were diagnosed with Dengue (*using the NS1 and Elisa early testing regime*).

Patients were treated with M.A.C and were found to be free of all clinical symptom after 3-4 days (*follow up tests confirmed patients were free of the virus*). By comparison, the normal recovery time after hospitalization is 11 – 14 days. ***(See Dengue Fever Case Studies)***

Phase 1 and Phase 2 studies are now completed which have confirmed the initial results. ***(See Phase 1 & 2 – Clinical Trial of M.A.C.)***

Dengue Fever (cont.)



	0	1	2	3	4	5	6	7	8	9
900mg	48750	37500	30000	22250	14750	8600	6930	40		
600mg	54743	42110	23790	18260	12300	7660	5110	2280	920	
450mg	58409	44930	28030	17090	12270	10060	8130	7130	4460	
300mg	26533	20410	22450	14200	13390	11840	8590	9010	5380	3230
non treatment	46923	61000	75250	65800	75000	64600	62800	60500	49500	

Viral Load verses Dosage – Phase II Trial

Note: Significant decrease in viral load regardless of the dosage.

All 4 types of Dengue virus were present in the patients.

Starting viral load for patients varied. Hence treatment reaction time was affected by the initial viral data.

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Dengue Fever (cont.)

Phase II Trial Conclusions – Key Results

•M.A.C reduces the viral load of Dengue infected patients.

•M.A.C was well-tolerated on Dengue infected patients.

•M.A.C's reducing ability was dose-related.

• The most effective dose for a reduction effect was 600 mg/patient.

•The 600 mg M.A.C dose can also reduce body temperature earlier.

• Thrombocytopenia on control is lower than M.A.C-treated group.

• M.A.C decreases plasma leakage of Dengue infection.

Dengue Fever (cont.)

Indonesia suffers approximately 360,000 cases a year with around 2 % deaths.

India reports 800,000 cases annually with a much higher fatality rate.

There is currently *no cure* or *vaccine* against dengue fever and it affects around 100 million people a year (WHO figures) with up to 500,000 life threatening infections.

This will increase with global warming as habitat for mosquitoes expands. Since 1960 to 2010 the infection rate has increased 30 fold. This geographical distribution is around the equator with 70% of the 2.5 billion people living in endemic areas from Asia and the Pacific.

Dengue Phase III

Results from Phase III carried out by The University of Airlungga in Indonesia by Professor Nasronuddin and his team.

- Viral Load reduction by 97.6%
- MAC may have Immunomodulatory Effects
- MAC can maintain Endothelial Homeostatis which can prevent plasma leakage
- MAC is well tolerated in the body, which can be concluded it did not have Hepatotoxic and Nephrotoxic effects
- Treatment with MAC does not give any other significant side effects
- The positive results of this study certainly has policy implications. It suggests that treatment with MAC should be adopted as the National Standard for Dengue Hemorraghic Fever patients in Indonesia.is will increase with global warming as habitat for mosquitoes expands.

- Professor Nasronuddin MD Internist Infectious.

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HIV - AIDS

In 2009 Southern Research , USA carried out an "*in vitro*" study on HIV showing that M.A.C. is as effective as Aldrithiol (*an anti-viral compound unsuitable for humans*) and has no negative side effects and no immune system destruction compared to current HIV drugs.

A small scale study of 11 patients with full blow AIDS was commenced in November of 2008 at the Joshi Institute in Mumbai, India.

After 13 months of treatment all patients had experienced a dramatic decrease in clinical signs & symptoms and have returned to a normal lifestyle while still being HIV positive. ***(See HIV Trial Report)***.

HIV – AIDS (Cont.)

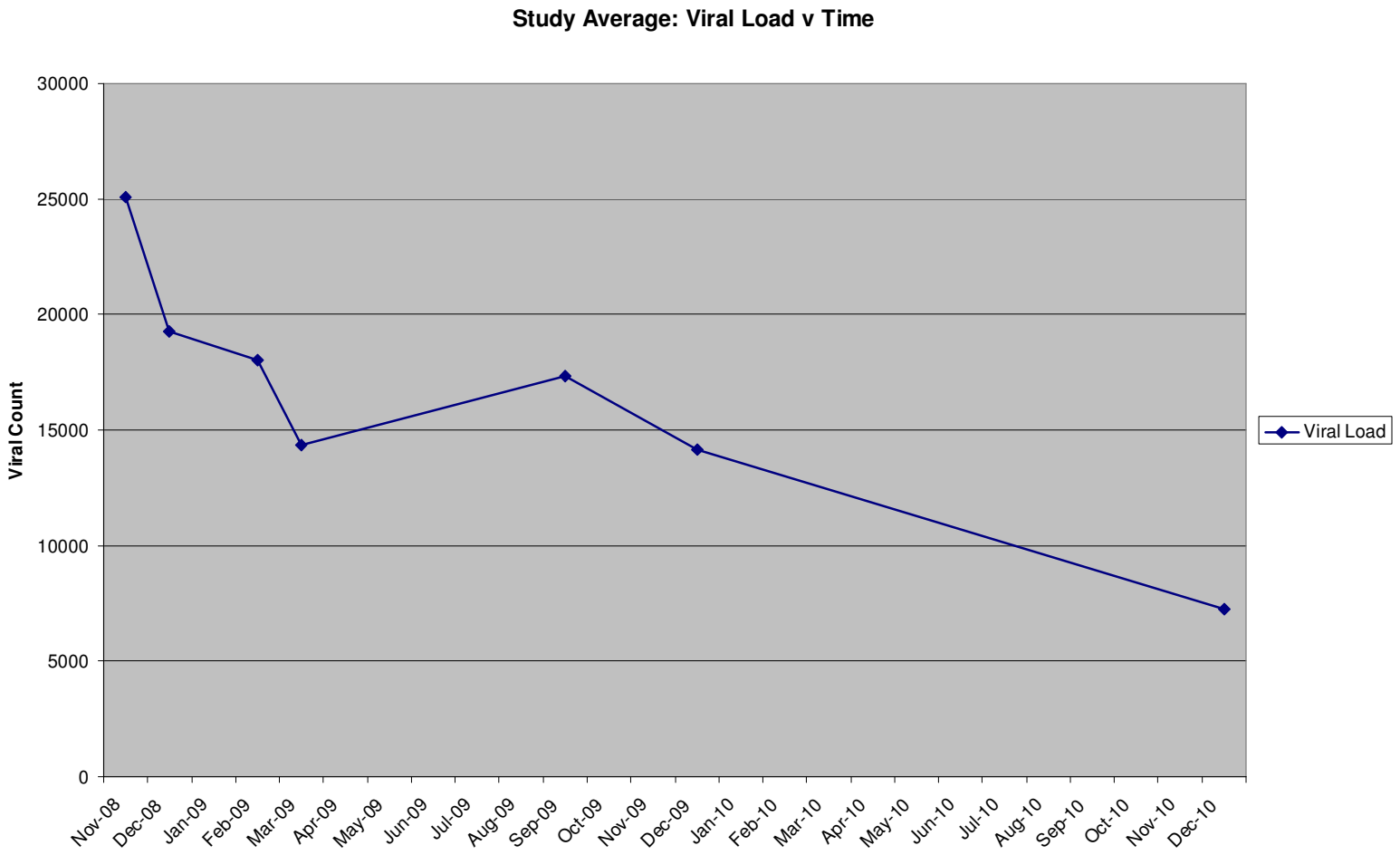
Over the course of the trial differing M.A.C dosage levels were applied from 300mg to 900mg/day.

The results show the higher the M.A.C dose level the greater the reduction in viral load.
Regardless of the M.A.C dose level (300-900mg/day) the CD4 levels increased and have stayed within a small variation range.

All patients have:
- Increased CD4 levels (average 168%)
- Decreased viral levels (average 83%*)

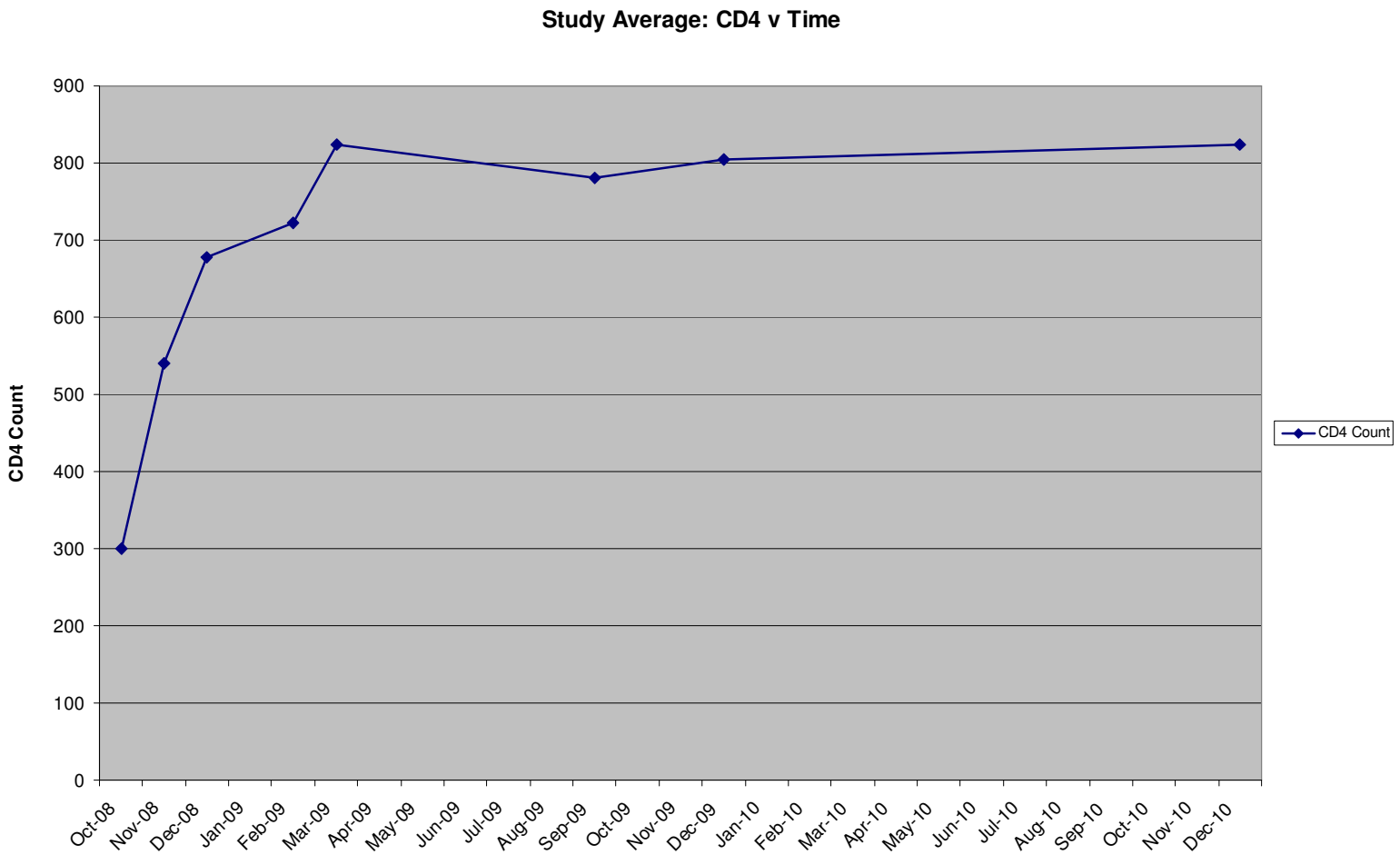
* There were **no before treatment viral load levels** taken. Southern Research, USA states that the **normal viral load level** for **AIDS patients** averages **70,000**. Using this figure the **actual viral load decrease would be closer to 80%**

HIV – Average Viral Load (Cont.)



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HIV – Average CD4 (Cont.)



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CSIRO - Avian Bird Flu Study

INFLUENZA - VIRAL

In 2005 CSIRO completed "*in vitro*" trials on live fertile chicken eggs against Avian H5N1 influenza Vietnamese strain (Bird Flu).

The result was that 10,000,000 viruses were totally killed in four hours using 4% M.A.C. with no embryo damage of the live chicken eggs.

Electron microscopic photos also shows complete infected cell destruction. ***(See H5N1 - CSIRO Study)***

CSIRO-Geelong Study of Efficacy of M.A.C. In Inactivating H5N1 Avian Influenza Virus

Table 1

	Treatment Time		
MegaBac™ concentration	**60 Minutes**	**120 Minutes**	**240 Minutes**
2%	4.1	4.5	3.1
3%	2.9	3.5	2.9
4%	3.1	2.7	0
Untreated virus	7.1		
Mock-treated virus	7.5		

Log 10 residual virus titre after MegaBac™ treatment in (EID_{50}/0.1 ml

Solutions were prepared for negative contrast electron microscopy as per the protocol described in the QA manual. All samples were imaged with a Philips CM120 at 100kK and recorded with a MegaView III digital camera.

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M.A.C. efficacy: H5N1 + Treatment

Figure 2. H5N1 - Treatment

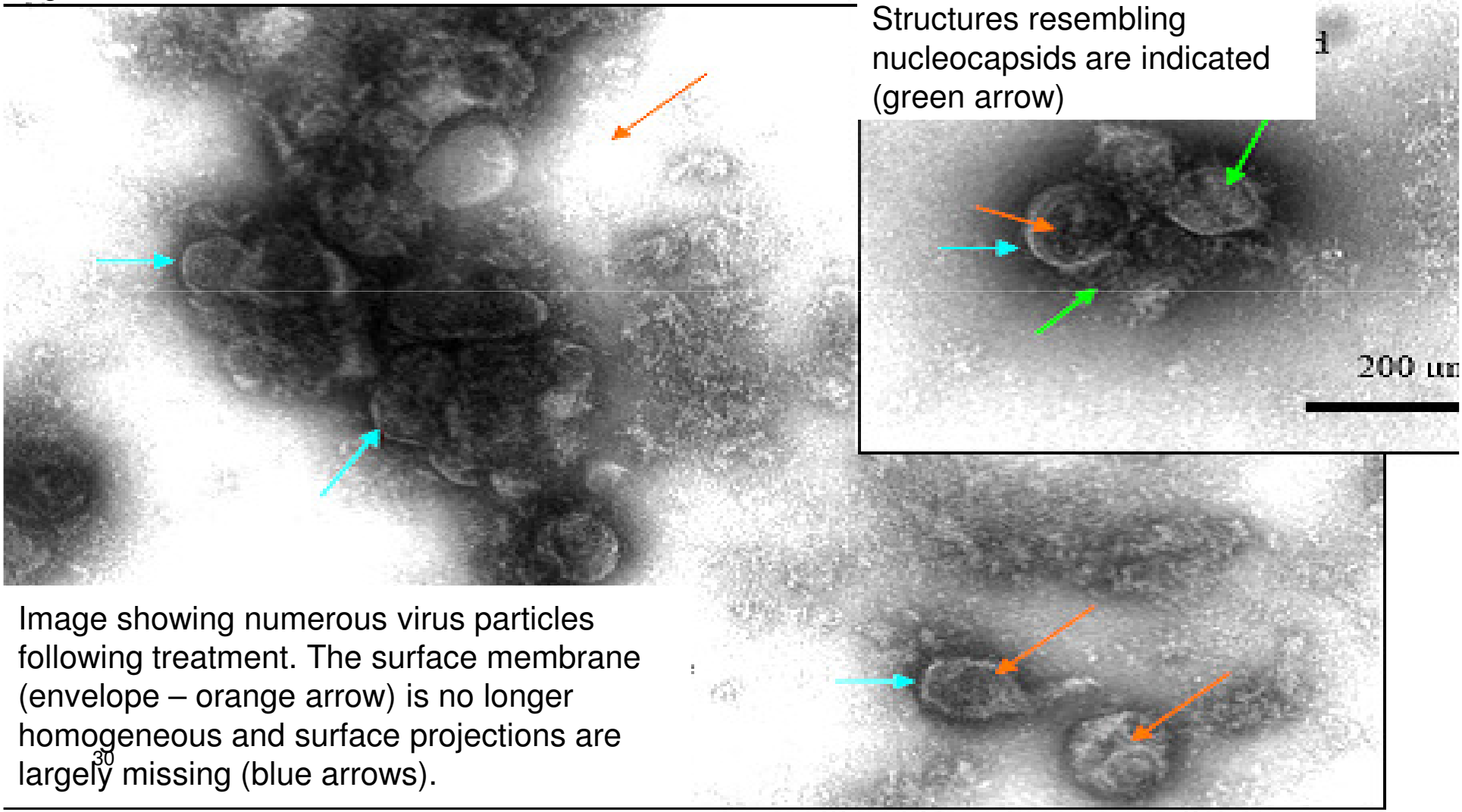


Image showing numerous virus particles following treatment. The surface membrane (envelope – orange arrow) is no longer homogeneous and surface projections are largely missing (blue arrows).

M.A.C. efficacy

Figure 1. H5N1 Control (treated with DMSO only)

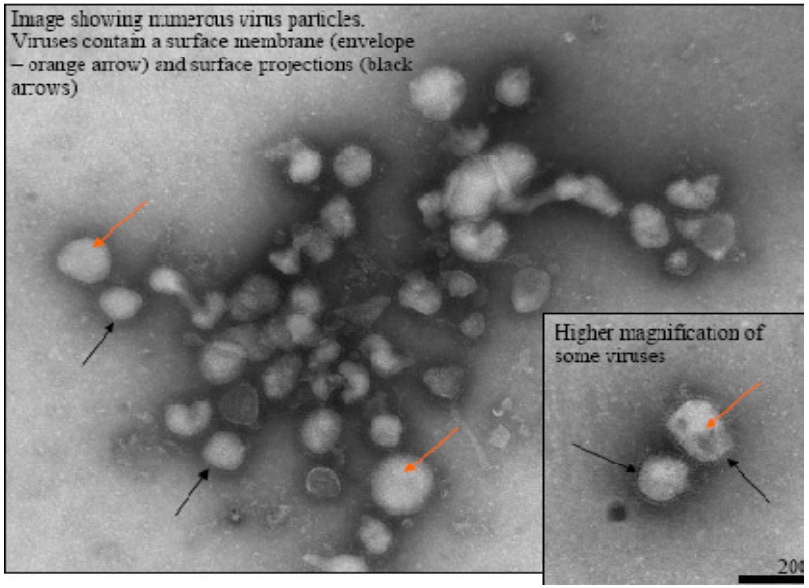
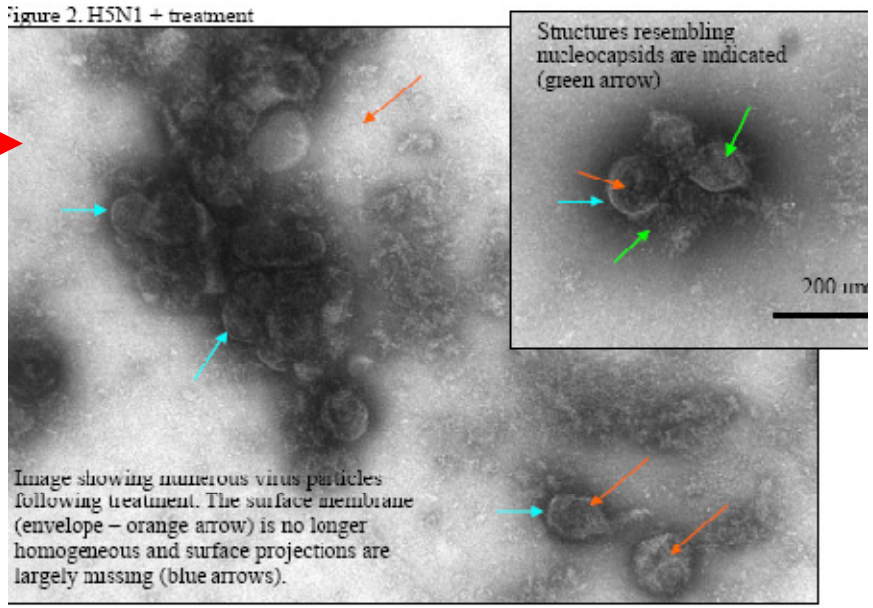


Image showing numerous virus particles following treatment. The surface membrane (envelop orange arrow) is no longer homogenous and surface projections are largely missing (blue arrows)



Interpretations by CSIRO

Upon treatment of H5N1 with 4% M.A.C. for three hours, the ultrastructure of the virus changes.

Positive control samples displayed ultrastructure consistent with that described for viruses belonging to the family Orthomyxoviridae

(Virus Taxonomy. Eighth Report of the International Committee on Taxonomy of Viruses. Edited by C.M. Fauqet, M.A. Mayo, J. Maniloff, U. Desselberger, L.a. Ball. Elsevier, Academic Press, 2005, p 681-693).

The ultrastructure of H5N1 treated as described differed in that the stain penetrated the membrane envelope and the majority of surface projections were absent.

The ability of the stain to penetrate a greater proportion (subjective observation) of viruses following treatment may be indicative of disruption to the envelope.

CSIRO Interpretation (cont.)

*To gain an appreciation of the **significance** of the above changes it should be noted that the surface membrane incorporates various viral proteins and support the surface projections (which are required for infection of host cells) whilst encompassing the viral nucleic acid (nucleocapsid) which is required for replication.*

*One interpretation of the ultrastructural changes could be the inference that they are consistent with the data in Table 1 which show **a substantial rise in viral inactivation when H5N1 is exposed to a 4% concentration of M.A.C. for a contact time of greater than 120 mins**.*

Dr Alex Hyatt BSc(Hons), DipEd, PhD, Senior Principal Research Scientist , Project Leader "Bio-Imaging and Ecohealth", CSIRO, Geelong.

Cancer Studies

Associate Professor Steve Ralph, of Gold Coast Griffith University, showed in 2007 that M.A.C killed breast cancer cells at 0.01% concentration.

Further work using M.A.C has shown it to be effective at killing prostate cancer cell lines (IncaP at 0.035% and PC3 at 0.125%)..

The study has now been expanded to include the following cancers:

Breast cell liner BHK-21 is killed at 0.07%

Epithelial cell liner MCF-7 is killed at 0.06%

A Cell Liner study by the USA NCI (National Cancer Institute) showed 9

types and 50 different strains of cancer were effected.

Other work is being carried out on Epithelial Skin, Epithelial Liver and lung cancers.

This work is being conducted at the Gold Coast Medical Centre of Griffith University and Peking University, China.

NCI Cell liner cancer trials.

A short list of known food pathogens

Organism	*Melaleuca* Oil	M.A.C.	% efficacy +
Staphylocccus auerus	10,000 ppm	50 ppm	200
Escherichia coli	4000 ppm	100 ppm	40
Klebsiella pneumoniae	2,500 ppm	100 ppm	40
Bacillus cereus	No kill	100 ppm	!
Proteus vulgaris	4000 ppm	50 ppm	80
Pseudomonas aeruginosa	8000 ppm	900 ppm	9

The bacteria challenge level was 10^7 - (10,000,000 cells per ml)

In all 53 other strains were tested against M.A.C. all proving increased efficacy.

This work was carried out by Professor Thomas Riley in 2005 at the University of Western Australia Queen Elizabeth II Centre, Biotest Laboratories (TGA & NATA Listed Laboratory) and Queensland Pathology Department, Brisbane.

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Antibiotic Resistant Strains

Organism	Number of Strains	M.A.C. Kill Level
MRSA	20 wild strains	150 ppm
Acinebacter baumanni	14 wild strains	150 ppm
Escherichia coli	10 wild strains	150 ppm
Klebsiella pneumoniae	10 wild strains	150 ppm
Enterobacter cloacae	6 wild strains	150 ppm
Klebsiella oxytoca	2 wild strains	150 ppm
E faecium Van A	6 wild strains	150 ppm
E faecalis Van B	14 wild strains	150 ppm

These results are from the Queensland Gov. Pathology Department's Library of Antibiotic Resistant Strains Project (2005-06).

Antibiotic Resistant Strains (cont.)

Since these earlier tests we have challenged and killed over a 100 pathogenic bacterial strains including:

Listeria monocytogens
Clostridium difficile
Yersinia enetrocolitica
Clostridium perfergens
Salmonella typhimurium
Vibro chlorea
Legonella sp.

Specific work has recently been carried out on *Helobacter pylori** suspected of being a causative agent in stomach cancer.

Our work has shown that M.A.C will kill both the normal and antibiotic resistant strains of this bacteria.

**** This work has been carried out by Professor Huan Yao Lei - Dept. of Microbiology & Immunology, College of Medicine, Taiwan National Chey Kuy University, Taiwan***

Bacterial Lung Infections

In conjunction with Dr Rachel Thomson* we are preparing for clinical trials on Non tuberculosis *Mycobacterium* lung infections.

This follows on from our preliminary studies of specifically aging patients who fail to respond to 1st and 2nd line antibiotic. Patients using M.A.C for over 4 years by nebuliser into the lungs with successful outcomes.

Thoracic Specialist – GreenSlopes Private Hospital, Brisbane

International Cooperating Centers

China

Chinese Academy of Medical Science* – Tuberculosis Murine Trials and Cancer Studies

Sun Yat-sen University – Human Dengue work and Murine Avian Studies H1N1 & H3N2

Beijing Chest and Infectious Hospital is working on Tuberculosis with us.

Taiwan

National Cheng Kung University – Antibiotic Resistant *Helobacter pylori*

National Defence Medical Centre – Wound Care Study

Australia

Griffith University – A number of cancer studies and Murine Immune System Study

Green Slopes Hospital – Non TB *Mycobacterium* lung infections

University of Western Australia - Transdermal Patch Study

*see next slide

USA

Southern Research Organisation – HIV & H5N1 Ferret Model trials

ICR Inc. - Mosquito Repellent Studies

Diabetic Wound Care Project

Indonesia

Gadjah Mada University – Dengue Fever Phase II Study and 90 Day Oral Toxicity Study
Starting Phase III Dengue Sept 2011 at the Airlungga Infectious Reseach University
And HIV studies are to be carried out at the Sul Saroso for Infectious Disease Hospital is under way

Previous Studies

AMS Labs - H1N1, Corona Virus (SARS) and HS II

BioTest Labs – Face Mask Studies, Food Pathogens and Textile Impregnation Trials

CSIRO – H5N1 (Australian Government)

Gadjah Mada University – Dengue Fever Phase I Study and Acute & Subacute Toxicity Studies

ICR Inc. – Bed Bug Repellent and Mortality Studies

Queensland Pathology – Antibiotic Resistant Bacterial Strain Study

Chinese Academy of Medical Science, Beijing, China

The human cancer cell lines included in the testing:

- **Colon cancer**: HCT-116, HT-29, SW480
- **Liver cancer**: HepG2, Hep3b, SK-HEP-1
- **Breast cancer**: MCF-7, MDA-MB-231, BT-474
- **Gastric cancer**: NCI-N87, MGC-803
- **Glioma cancer** (a kind of brain cancer): U-87MG, U251, U-118MG
- **Brain cancer**: SF126, SF17, SF763
- **Pancreatic cancer**: BxPC-3, Panc-1, AsPC-1
- **Prostate cancer**: DU145, PC-3
- **Kidney cancer**: A498, Caki-1, 786-O

Presenters

Developed by Professor Max Reynolds
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