



██████████ AIR PURIFIER SYSTEM

**HEALTH TECHNOLOGY ASSESSMENT SECTION
MEDICAL DEVELOPMENT DIVISION
MINISTRY OF HEALTH MALAYSIA
018/2011**

DISCLAIMER

Technology review is a brief report, prepared on an urgent basis, which draws on restricted reviews from analysis of pertinent literature, on expert opinion and / or regulatory status where appropriate. It has not been subjected to an external review process. While effort has been made to do so, this document may not fully reflect all scientific research available. Additionally, other relevant scientific findings may have been reported since completion of this review.

Please contact: htamalaysia@moh.gov.my, if you would like further information.

Health Technology Assessment Section (MaHTAS),
Medical Development Division
Ministry of Health Malaysia
Level 4, Block E1, Precinct 1
Government Office Complex
62590 Putrajaya.

Tel: 603 8883 1246

Fax: 603 8883 1230

Available at the following website: <http://www.moh.gov.my>

Prepared by:
Syful Azlie Md Fuzi
Senior Assistant Director
Health Technology Assessment Section (MaHTAS)
Ministry of Health Malaysia

Reviewed by:
Datin Dr. Rugayah Bakri
Deputy Director
Health Technology Assessment Section (MaHTAS)
Ministry of Health Malaysia

Dr. Junainah Sabirin
Senior Principle Assistant Director
Health Technology Assessment Section (MaHTAS)
Ministry of Health Malaysia

DISCLOSURE

The author of this report has no competing interest in this subject and the preparation of this report is totally funded by the Ministry of Health, Malaysia

EXECUTIVE SUMMARY

Introduction

██████████ is the top consumer and household electronics company in Korea since 1989, and was introduced to the Malaysian market in 2006. The company has extended its product line-up from water filtration appliances to air purifiers, bidets, water softeners and food waste disposers. ██████████ air purifier system is claimed to be the best and most advanced air purifier in the market using modern technology and excellent designs. The purification technique used in the ██████████ air purifier is high efficiency particulate air (HEPA) filtration.

Objective/Aim

The objective of this technology review was to assess the safety, effectiveness and cost-effectiveness of ██████████ air purifier system when used in clinical settings to improve indoor air quality.

Results and Conclusions

There was no retrievable information on US FDA approval or CE mark for ██████████ air purifier system. There was also no retrievable evidence on the adverse events related to the use of this product from the available scientific databases. There was no retrievable evidence on the effectiveness and cost-effectiveness of ██████████ air purifier system although it used HEPA filter technology. However, the company claimed that the cost for ██████████ air purifier system is approximately between RM ██████████ to RM ██████████ depending on product range.

Methods

Electronic databases were searched, which included Medline, PubMed, EBM Reviews-Cochrane Database of Systematic Review, EBM-Reviews-Cochrane Central Register of Controlled Trials, EBM Reviews-Health Technology Assessment, EBM Reviews-Cochrane Methodology Register, EBM Reviews-NHS Economic Evaluation Database, Database of Abstracts of Reviews of Effects (DARE), Horizon scanning databases - Centre, Birmingham, Australia and New Zealand Horizon scanning (ANZHSN), US FDA website, MHRA website and from non scientific database - Google search engine. In addition, a cross-referencing of the articles retrieved was also carried out accordingly to the topic. Relevant articles were critically appraised and evidence graded using US / Canadian Preventive Services Task Force.

1.0 INTRODUCTION

There is growing public awareness of the risks associated with poor indoor air quality. The World Health Organisation (WHO) assessed the contribution of a range of risk factors to the burden of disease and revealed that indoor air pollution accounts for 2.7% of the global burden of disease, and is recognized as important risk factors for human health in both low-income and middle-and high-income countries.¹ Indoor air pollutants comprises of a variety of health-damaging pollutants such as particles (complex mixture of chemicals in solid form and droplets), high and low molecular weight allergens, biologic contaminants such as mould and bacteria, gaseous pollutant such as carbon monoxide, nitrous oxide and sulphur oxide, volatile organic compounds (VOCs) such as formaldehyde and carcinogen like benzo(a)pyrene and benzene, radon and others.² Dust, pollen, pet dander, mold spores, and dust mite faeces can act as allergen, triggering allergies in sensitive people. Exposure to various pollutants components such as VOCs increases the likelihood of experiencing symptoms of Sick Building Syndrome.³

An air purifier is a device which removes contaminants from the air. These devices are commonly marketed as being beneficial to allergy sufferers and asthmatics, and at reducing or eliminating passive smoking. Commercial grade air purifiers are manufactured as either small stand-alone units or larger units that can be affixed to an air handler unit (AHU) or to heating, ventilation, and air conditioning (HVAC) unit found in the medical, industrial, and commercial industries.³ There are many different technologies that are used in air purifiers so they can deliver clean and safe air to users. The different types of technologies that are used include high efficiency particulate air (HEPA), ultraviolet germicidal irradiation (UVGI), activated carbon, photo catalytic oxidation (PCO), ionizer purifiers, liquid ionizer purifiers, ozone generators, and titanium dioxide (TiO₂).⁴

is the top consumer and household electronics company in Korea since 1989, and was introduced to the Malaysian market in 2006. The company has extended its product line-up from water filtration appliances to air purifiers, bidets, water softeners and food waste disposers. air purifier system is claimed to be the best and most advanced air purifier in the market using modern technology and excellent designs. The purification technique used in the air purifier is HEPA filtration (Figure 1 and 2).⁵

This technology review was conducted based on a request from the Director of Disease Control Division, Ministry of Health Malaysia, who received a proposal from a company to promote the usage of air purifier system in Ministry of Health facilities.

2.0 OBJECTIVE /AIM

The objective of this technology review was to assess the safety, effectiveness and cost-effectiveness of air purifier system when used in clinical settings to improve indoor air quality.

3.0 TECHNICAL FEATURES

HEPA technology is one of the most popular technologies used in an air purifier. It has been around since the 1940's and is still being improved upon and advanced. Many air purifier models are so efficient due to the use of these filters. A HEPA filter is a type of air filter that satisfies certain standards of efficiency such as those set by the United States Department of Energy (DOE). By government standards, an HEPA air filter must remove 99.97% of all particles greater than 0.3 microns from the air that passes through.⁶

Some of the air purifier products from [REDACTED] such as [REDACTED] which eliminate odour or cigarette smoke, [REDACTED] which is claimed as an anti-virus air purifier, and [REDACTED] which is claimed to have high performance for purifying air in a large space (Figure 3).⁵



Figure 1: HEPA filter

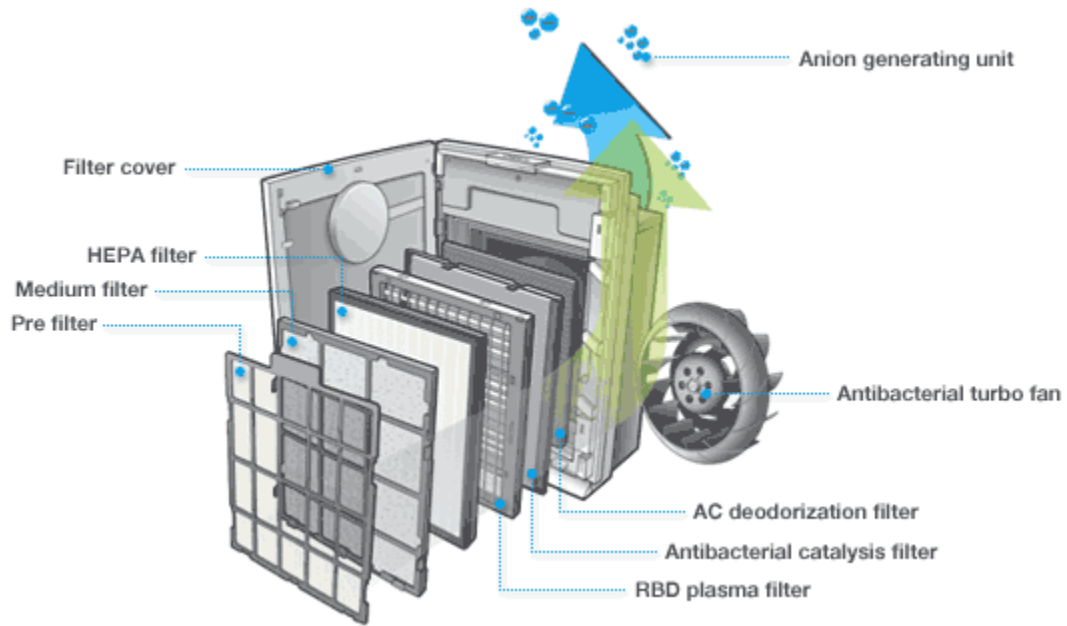


Figure 2: HEPA filter used in [redacted] air purifier system

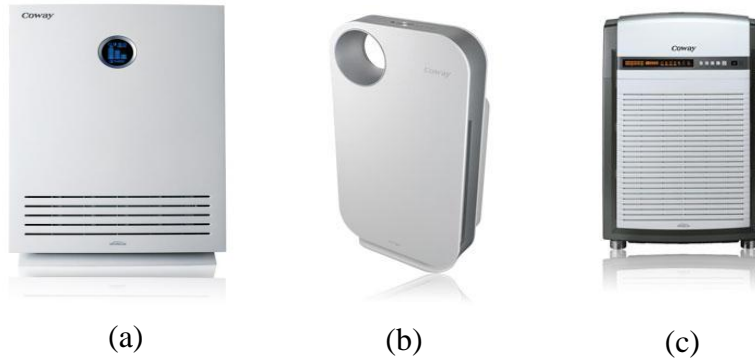


Figure 3: (a) [redacted] (b) [redacted] and (c) [redacted]

4.0 METHODOLOGY

4.1. Searching

Scientific databases such as Medline, PubMed, EBM Reviews-Cochrane Database of Systematic Review, EBM-Reviews-Cochrane Central Register of Controlled Trials, EBM Reviews-Health Technology Assessment, EBM Reviews-Cochrane Methodology Register, EBM Reviews-NHS Economic Evaluation Database, Database of Abstracts of Reviews of Effects (DARE), Horizon scanning databases - Centre, Birmingham, Australia and New Zealand Horizon scanning (ANZHSN), USFDA website, MHRA website and from non scientific database - Google search engine were searched for evidence of safety, effectiveness and cost-effectiveness of [redacted] air purifier system.

The following keywords were used either singly or in combinations: [REDACTED] air purifier system, HEPA filter, indoor air quality, safety, adverse events, effectiveness, cost-effectiveness.

4.2. Selection

All published articles related to safety, effectiveness and cost-effectiveness of Coway air purifier system were included. Relevant articles were critically appraised using Critical Appraisal Skills Programme (CASP) and evidence was graded according to US/Canadian Preventive Services Task Force (Appendix 1).

5.0 RESULTS AND DISCUSSION

No relevant articles were retrieved on [REDACTED] air purifier system from the scientific databases although it used HEPA filter technology. There was no retrievable evidence on the safety, effectiveness and cost-effectiveness of this technology. However, there was a Technology Review (TR) reports in 2008 conducted by Health Technology Assessment Section, Ministry of Health Malaysia on Atmosphere Air Purifier that used the HEPA filter technology.

5.1 Safety

There was no retrievable information on US FDA approval or CE mark for [REDACTED] air purifier system. There was also no retrievable evidence on the adverse events related to the use of this product from the available scientific databases.

5.2. Effectiveness

There was no retrievable evidence from scientific databases on the effectiveness of [REDACTED] air purifier system. However, the TR report in 2008 conducted by Health Technology Assessment Section, Ministry of Health Malaysia on Atmosphere Air Purifier that used the HEPA filter technology, concluded that air purifier or air cleaner with the HEPA filter could remove air pollutant and particulate matter such as moulds, bacteria, smoke contaminant, allergens caused by cat and dogs. Insufficient scientific evidences were obtained with regards to the efficacy of HEPA filter in capturing viruses, gaseous pollutants or radon and its progeny. The stand alone air purifiers with HEPA filters are not designed to remove gaseous chemicals or odours from the air, they are often combined with other technologies which remove smoke and odours, such as carbon filter. Similarly, the HEPA filter does not actually kill disease-causing agents like bacteria and viruses. A HEPA filter may trap most bacteria and prevent them from re-entering the air. However, some bacteria (such as *Pseudomonas*, *Legionella*, *Candida*, and *Mycobacterium*) and almost all viruses are too small to be filtered.⁷

5.3. Cost-effectiveness

There was no retrievable evidence on the cost-effectiveness of [REDACTED] air purifier system.

6.0 CONCLUSION

There was no retrievable evidence on the safety, effectiveness and cost-effectiveness of [REDACTED] air purifier system although it used HEPA filter technology. The company claimed that the cost for [REDACTED] air purifier system is approximately between RM [REDACTED] to RM [REDACTED] depending on product range.

In Malaysia, Code of Practice of Indoor Air Quality was developed by the Department of Safety and Health (DOSH) in 2005 to address the requirement to have standard indoor air quality in the building by way of objective assessment to ensure that occupants are protected from poor indoor air quality. It establishes the ceiling limit allowable of certain pollutants, and mechanism to evaluate and control which applied to all non industrial place of work in industries listed under Schedule 1 of the Occupational Safety and Health Act 1994. Table 1 listed all the indoor air contaminants and the maximum limits according to DOSH Malaysia. However, there was no minimum requirement being addressed on indoor air quality in hospitals and health facilities environment or specific requirement of air cleaning device recommended to be used.⁸

Indoor Air Contaminants	Eight-hour time weighted average airborne concentration	
	ppm	mg/m ³
Carbon dioxide	C1000	
Carbon monoxide	10	
Formaldehyde	0.1	
Respirable particulate		0.15
Total volatile organic compounds	3	

Table 1: List of Indoor Air Contaminants and the Maximum Limit

7.0 REFERENCES

1. World Health Organization. Indoor Air Pollution, Health and the Burden of Disease. Available at <http://www.who.int/mediacentre/factsheets/fs292/en/index.html>
2. United States Environmental Protection Agency. Residential Air Cleaners (Second Edition). A Summary of Available Information. Available at <http://www.epa.gov/iaq>
3. Air Purification from Wikipedia. Available at http://en.wikipedia.org/wiki/Air_purifier
4. The Technology of Air Purifier. Available at <http://www.airpurifiers.com/technology/index.htm>
5. [REDACTED] (M) Sdn. Bhd. Available at [http://www.\[REDACTED\].com.my/Home.aspx](http://www.[REDACTED].com.my/Home.aspx)
6. US Department of Energy Specification for HEPA Filters Used by DOE Contractors, 1997 Edition. Available at <http://www.hss.doe.gov/nuclearsafety/ns/techstds/docs/standard/std3020.pdf>

7. Krishnasamy M. Atmosphere Air Purifier. Putrajaya; Health Technology Assessment Section, Medical Development Division, Ministry of Health Malaysia: 2008
8. Department of Safety and Health. Code of Practice on Indoor Air Quality. Ministry of Human Resources Malaysia 2005.

8.0 APPENDIX

8.1 Appendix 1

DESIGNATION OF LEVELS OF EVIDENCE

- I Evidence obtained from at least one properly designed randomized controlled trial.
- II-I Evidence obtained from well-designed controlled trials without randomization.
- II-2 Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one centre or research group.
- II-3 Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence.
- III Opinions or respected authorities, based on clinical experience; descriptive studies and case reports; or reports of expert committees.

SOURCE: *US/CANADIAN PREVENTIVE SERVICES TASK FORCE
(Harris2001)*