

SEMIOTICS STUDY OF WARNING SYMBOL FOR COMMON REACTIONS CAUSED BY COW'S MILK PROTEIN ALLERGY (CMPA)

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ABSTRACT

Cow's milk protein allergy or known as CMPA among healthcare professionals, is one of the most common allergy reactions among infants and children in Malaysia. It is different from lactose intolerance. It usually happens to infants aged 6 months and below and to children under 3 years old. However, no data or statistics have been officially recorded on cow's milk protein allergy in Malaysia. Not all mothers are capable of breastfeeding their child even though a mother's milk is the best to nourish said child. Thus, mothers are given the choice of formula milk, to replace their own milk. There are many brands available in the market with regards to infant milk formula but there are three types of milk formula for babies; the common one being cow milk base formula. However, there are infants or babies who are hypersensitive to cow's milk protein or casein. Warning signs to alert the parents about CMPA is imperative. In this study, the researcher studied the best possible warning sign, which is in pictorial visual so that it can be easily recognised by the public, with the difference in background and lifestyle. Eight categories or common symptoms of pictograms designs have been created to discern the most suitable pictogram as the ultimate warning sign. The result of the study suggests that the pictograms has to be clear and can be understood by the public coming from different backgrounds. The choices of warning signs and warning statements also play a big role in creating the warning sign. It is hoped that the study can contribute to the consumers and public especially for those with children suffering from CMPA.

Keywords

Cow's milk protein allergy; semiotics; warning sign; allergy reactions; packaging; labelling; ;infants' milk formula; Malaysia

INTRODUCTION

Not all of us are awarded with good health and there are some of us who have to struggle with our health since the day we were born. Having allergies to a certain type of food can sometimes be frustrating. There are no cures for food allergies; the only way to stay well is to avoid certain food and for this, food labels must contain sufficient information or warnings that can be easily understood by the consumer. Dr Amir Hamzah Latiff (2010), said that "*allergy is an abnormal over-reaction of the body's natural immune mechanism to substances that are normally not harmful to the human body.*" Practically any substance can become an allergen, or allergy – which can cause discomfort and be a nuisance. In case of CMPA (Cow's Milk Protein Allergy), a person can suffer as early as from birth. The allergic reactions can provoke symptoms ranging from the itchy, watery eyes of hay fever, breathing difficulties of asthma, itchy inflamed skin with hives and eczema, to breathing problems following a severe reaction (anaphylaxis). Even though allergy symptoms are not serious or life threatening, in some cases allergies can make a person's life miserable. Based from the journal, Guidelines for the Management of Cow's Milk Protein Allergy Children (2012), cow's milk protein allergy (CMPA) is the most common form of food allergy in infants. Local epidemiological data is limited; however, milk has been found to be the most common food allergen in Asia and in Malaysia.

CMPA ranges between 5-6% worldwide, 5-15% of infants suffer from cow's milk protein allergic. CMPA has been documented to be between 10-17.5% in preschoolers and 1.0-13.5% in children aged 6-16 years old. (Hill DJ, Hosking CS, Zhie CY, et al. 2010). The purpose of this semiotic study for cow's milk protein allergy in babies' products is to create an effective warning sign that could be used on the labeling of babies' product to help consumers identify the risks of ingredients contained in the babies product, especially those that have cow's milk protein. In some cases in Malaysia, cow's milk protein allergy may cause reactions such as vomiting, diarrhea, swollen mouth, nose, and throat, hives, rashes and anaphylaxis that could be fatal. Due to these reactions, it is necessary to have allergy symbols, or icons on the product's label that could give information to consumers about the reactions that may occur after consuming the products. This research also would help build a collaborative among allergy experts and graphic designers to deliver medical information effectively. The aim of this research is to discover the challenges of identifying and designing allergy warning symbols, icons, or signs rather than depending solely on text. The objectives of this study are to examine which symbol, icon or sign can best represent cow's milk protein allergy reaction on the food packaging or label, and to develop an allergy warning design using the symbols, icons, or signs approach to provide sufficient communication. Based on this study, the design would create awareness about the reactions of cow's milk protein allergy in babies. The designs would also give immediate signal to the consumer that they would need medical consultation if there are any reactions after consuming the products.

Limitation and Delimitation

This research and testing is only limited to the products of babies aged below 6 months that contain cow's milk protein. Data input will be collected from one on one interviews and close-ended questions survey. These questions will be answered by the experts and the public to interpret allergy-warning sign.

LITERATURE REVIEWS

Dr. Amir Hamzah, President of Malaysian Society of Allergy and Immunology (2014) said that, cow's milk protein allergy (CMPA) is the most common form of food allergy amongst children while Dr. Marco Ho, Dr. June Chan & Dr. Tak Hong Lee in their journal "*Guideline for the diagnosis and management of cow's milk protein allergy in Hong Kong*" (October 2014) define CMPA as an adverse immune response towards cow milk proteins or as a form of a food intolerance associated with a hypersensitive immune response to cow's milk protein. Prof. Dr. Lee Way Seah (2012) defined CMPA as an immune-mediated hypersensitivity to cow's milk protein and it can be divided into immune-mediated hypersensitivity (milk allergy) and non-immune-mediated hypersensitivity (milk tolerance). Dr. M Yadav, (2010) in his book mentioned that there are three types of CMPA reactions. The first reaction is an immediate reaction for those who are IgE mediated to CMPA (50% of babies with CMPA). The symptoms occur within minutes to a few hours after consuming cow's milk protein and the immune system reacts to cow's milk protein, which triggers an immediate allergic reaction. IgE-mediated allergic reaction could also lead to anaphylaxis – a potentially life threatening allergic reaction that comes on quickly, affects the whole body, and requires immediate medical help (allergic reaction is uncommon). The second reaction is, delayed reaction for those who is Non-IgE-mediated to CMPA (25% of babies with CMPA). The symptoms appear after many hours or up to a few days after consuming anything containing cow's milk protein. The allergic reaction comes on more slowly, as IgE antibodies are not involved. Some symptoms of a non-IgE-mediated allergy can be similar to those of an IgE-mediated allergy and others might be less obvious and could be mistaken for something other than a food allergy. The third reaction is the combination of immediate and delayed reaction. This is for those who have both IgE mediated and Non-IgE-mediated milk allergy (25% of babies with CMPA). The symptoms can appear on quickly or after a few days of cow's milk consumption.

A research by Dr. Carlo Caffarelli and Dr Francesco Baldi, *Cow's milk protein allergy in children: a practical guide* (2010), they found that instead of IgE mediated or Non-IgE-mediated, age also can differentiate the symptoms. From their research, the symptoms for children under 1 year old with IgE mediated are nausea and vomiting, hives, swelling lips or eyes, dry cough and runny nose while the children with Non-IgE-mediated will show symptoms such as eczema, diarrhea, loose or blood stool and colicky abdominal pain. The symptoms for children from 1 year old to 3 years old with IgE mediated are dry cough, blocked nose, breathing difficulties and anaphylaxis while the symptoms for the Non-IgE-Mediated are diarrhea, nausea and vomiting, reflux, failure in gaining weight, loose or bloody stool and colicky abdominal pain. Dr. Chai Pei Fan, (2013) said, CMPA is most common among children, especially infants and toddlers. Majority will outgrow after 3 years old but some will not and it will continue until the age of 18. The crucial age for CMPA is below 1 year old.

Semiotic

According to online dictionary, semiotic is the study of signs and symbols and how they are used as elements of communication. Ferdinand De Saussure (1857 – 1913), a French linguist working in the early 1900s, was one of the first to develop a semiotic theory. According to him, a sign is made up of two elements, the signifier and signified. In its simplest form, semiotics can be described as the study of signs. Charles Sanders Peirce (1839 – 1914), an American philosopher and logician formulated his theory during the same time as Saussure. Peirce's first use of the term semiotic was in 1897. He described semiotics as a relationship between a symbol, an icon and an index. In its simplest form, semiotics can be described as the study of signs. Not signs as we normally think of signs, but signs in a much broader context that includes anything capable of standing for or representing a separate meaning. Semiotics is about 'visual signs'. That signs can also be drawings, paintings and photographs.

Pictogram and Symbol

Pictograms and symbols are important and they play an important role in our daily lives. It is applied in road signs, food and health, poisonous products and many more. It is also used to indicate direction, place, action, information, warning, caution and danger. According to Rayan Abdullah, *Pictogram, Icons & Signs* (2006), a pictogram is a pictorial representation. It is an iconic and simple sign that represents a complex fact. It is to convey information and communication through visual that carries the meaning. General definitions of pictogram are a stylized figurative drawing to indicate an object or to express an idea. Writing information can be enhanced by using the method of pictograms. Some people or organization has used pictograms to express and highlight certain points that has become important. Road sign cases, pictograms used to tell about what drivers should avoid and not do without using explanation of text.



Figure 1: Examples of pictograms/symbol

Warning Sign

Warning signs are used to inform and warn about something that is a possible danger or as safety precaution. They come in different shapes to indicate warning signs. Different countries use different shapes of warning signs. Some country use diamond shape and some use triangular shape to represent danger and warning. There are countries such as Finland, Poland, South Korea and Sweden that use red border with amber background. The universal warning sign is the one with equilateral triangle with white background and red border frame.



Figure 2: General Warning Sign According to Country



Figure 3: Malaysia's Warning Sign

PROBLEM STATEMENTS

CMPA is the most common allergy among children under 3 years old and there are no specific or consistent symbol, icon or sign for cow's milk protein allergy reaction on the food label, especially in baby products. Most of the time, the warnings of the ingredients are only highlighted by making the text or the typeface bold and this has been agreed by Dr. M. Yadav, an allergy expert and Dr. Amir Hamzah Latiff, also an allergy expert and pediatrician.

METHODOLOGY

In this case study, the methodology used were qualitative and quantitative method such as interviews experts, collecting images of label allergen warning in packaging especially for cow's milk protein and images of the packaging for infant milk formula from the United States, Turkey, Vietnam and Malaysia. Analysis on the allergen warning statement on infant milk formula packaging was conducted in order to gather information regarding proportion, visual, and place on the label, online surveys and paper surveys.



Figure 4: Sample of Popular Infant Milk Formula in Three Countries

Figure 4 shows the packaging from popular demand of infant cow's milk formula in the United States, Turkey and Vietnam. They are the countries with the highest cow's milk protein allergy cases in the world, Europe and Southeast Asia.

Comparison of Infants' Milk Formula Milk Packaging / Labelling Between U.S, Turkey, Vietnam & Malaysia

In this analysis, the researcher will be comparing the packaging of U.S, Turkey & Vietnam labeling to Malaysian labeling to find the difference between these countries. However, the numbers of samples of those three countries are very limited and the researcher had to combine them to balance it with the Malaysian labeling samples.

- i. 100% of the text placements of cow's milk as allergen are stated in bold typeface at the ingredients section for US, Turkey and Vietnam and only 60% for Malaysia.
- ii. 100% from the samples of Malaysia labeling of infants' cow's milk protein formula base have not contained any warning regarding cow's milk protein.
- iii. 100% of the warning on infants' cow's milk formula base has been designed and placed in a frame on the box. This is to highlight the warnings. The warning statements included the importance of breast milk, how to store the milk and the steps of preparing the milk. 20% of the U.S, Turkey and Vietnam packaging did not place their warnings in a frame or box.
- iv. The samples from Malaysia packaging shows 80% used bright color scheme to highlight their warning statements, 10% used dark colors in their designs to deliver the warning statements and 10% used light colors for that purpose.
- v. There are no warnings for cow's milk protein allergy on the samples from Malaysia formula milk packaging or labeling. 60% of the samples from United States, Turkey and Vietnam showed the cow's milk protein allergy warning are near to the ingredients label while the other 40% are not.
- vi. There are no warnings for cow's milk protein allergy on the samples from Malaysia formula milk packaging or labeling. 100% of the samples from United States, Turkey and Vietnam showed the used of San Serif typeface as the warning statements.
- vii. Sentence case typeface is widely used to show the warning statements for cow's milk protein allergy compare to uppercase typeface. It is 80% of usage for sentence case typeface while only 20% of uppercase typeface.
- viii. 100% of the cow's milk protein warning statements are used bold typeface to show the warning in the packaging.

Design and Development

Pictogram is a symbol or icon that represents certain images or objects to replace a statement or any written words. Pictograms use pictures as a basis for the formation of a sign or symbol that can be understood by people despite their different backgrounds, languages and educations.

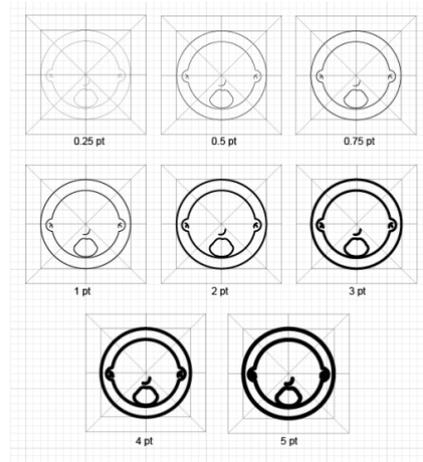


Figure 5: The analysis of variety line thickness for the pictogram

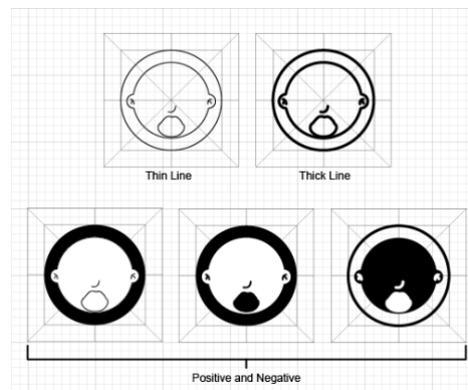


Figure 6: The analysis of variety line thickness for the pictogram

Figure 5 and 6 showed the analysis of a variety of styles was used in creating the pictogram. Quality of different thickness in line and the use of positive and negative concept gave more selection and comparison in creating the design of the pictograms.

The Design of Common Reaction for Cow's Milk Protein Allergy

Finding and creating the appropriate pictures in designing a pictogram for allergy reaction was difficult. Finding a right motif requires a large number of pictures to represent allergy symptoms. The pictograms have to be something that is understandable by people with different background, education and knowledge. Through visual range displayed on mind mapping, themes can be associated easily. There are 10 designs of different quality lines and styles. This means that 30 different styles for each pictogram design was created. The thinnest line used in this design is 0.75 point and the thickest is 3 point. There are also positive and negative design style to give different looks to the design. This is based from the analysis that the researcher conducted earlier.

Warning Sign

In this research, a warning sign is used as an attention grabber, to alert and caution consumers about cow's milk protein milk formula. The researcher used three types of warning signs in this research. The researcher used the common warning sign that can be found around the world, less common warning sign that is only used in certain country in the world and warning sign that has been redesigned.

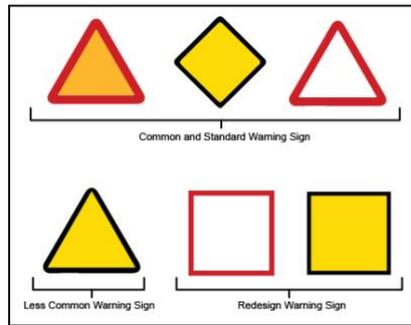


Figure 7: Various designs of warning sign for this research

RESULTS & DISCUSSION

The questionnaire comprises of five sections: (a) demographic profiles; (b) child and cow's milk protein allergy (CMPA) information; (c) formula milk packaging information; (d) cow's milk protein warning in packaging information and (e) warning design of pictorial symbol for milk allergy caused by cow's milk protein. Demographic data for each respondent were collected to assist with data interpretation and analysis.

Warning Design Of Pictorial Symbol For Milk Allergy Caused By Cow's Milk Protein.

In this pre-test, 240 pictograms were created for the 118 respondents to choose. These pictograms were created followed by design criteria, format, and discussion with Dr. Amir Hamzah Latiff. There were 9 common symptoms for cow's milk protein allergy (CMPA) such as vomiting, colic, diarrhoea, dry cough, itchy rashes, runny nose, swollen eyes, swollen lips and eczema.

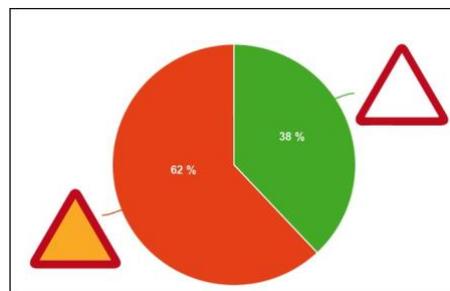


Figure 8: The Highest Percentage of Warning Sign Form

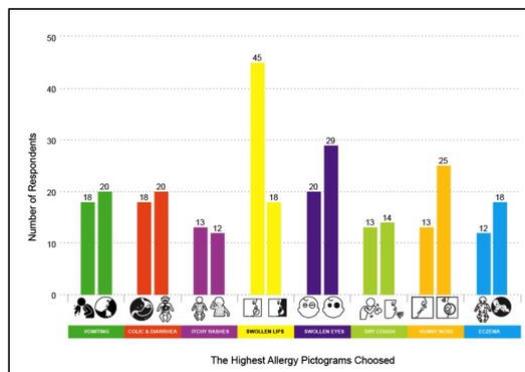


Figure 9: The Highest Pictograms Chosen for Cow's Milk Protein Allergy Common Reactions

Based on Figure 8 and 9, all 118 respondents chose allergy pictograms, which clearly explains and represents the symptoms. Based on the analysis that the researcher had gathered from the pre-test conducted, majority of the respondents agreed that they are no symbols, icons, or signs that represent allergic symptoms such as warning label on the baby formula milk especially on cow's milk formula base. Of most of the pictograms design, the respondents chose thick line approach to create a more effective pictogram symbol, rather than the positive and negative approach. This means that the respondents were attracted to bold and thick line image for focal domination. The result also shows that thick line images can attract more focus to the symbol while thin line gets less attention when it comes to this manner. The fastest information delivered to the eye and brain is actually based on how the pictograms are constructed. Dr. Amir Hamzah Latiff and DR. M. Yadav, doctors from Pantai Medical Centre and paediatrics and allergy nurses, have conducted this post-test. It is also conducted on parents with children suffering from cow's milk protein allergy (CMPA), and the general public. The total number of respondents of this post-test is 50. The post-test was conducted to see which allergy symbol is recognized as a warning sign among the public and professional doctors and nurses. It is also used to observe the appropriate placement of allergy symbol on the infants' formula milk packaging that affects public attention.



Figure 10: Warning Sign Background That Had Been Chosen by Respondents

Warning Statement

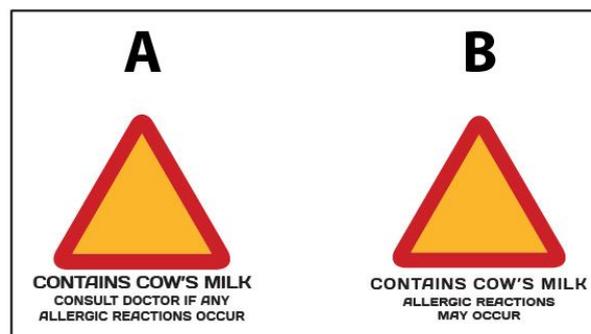


Figure 33: Choices of Warning Statement

66% of them chose warning statement that stated A: 'Contains cow's milk. Consult doctors if any allergic reactions occur' as the warning statement that should be included with the warning sign. These warning statements were chosen based on the researcher's discussion with Dr. Amir Hamzah on what the suitable warning statements were that should be included with the warning sign, so consumers can read it as a warning sign and be appropriately alerted to the risks.

Typeface

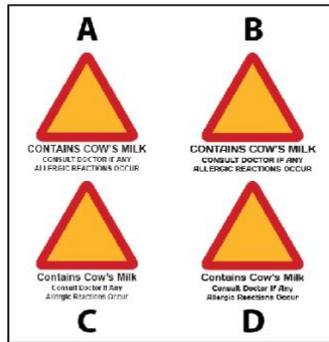


Figure 11: Different Typefaces and Cases

42% of the respondents chose A: 'Arial' with 'uppercase' and bold letter as the typeface for the warning statement and 40% of them chose B: 'Days Regular' with 'uppercase' and regular letter.

Warning Statement Position

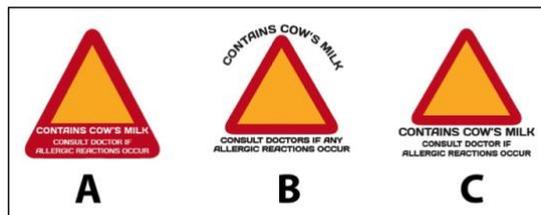


Figure 12: Warning Statement Position and Style

62% of the respondents chose position C to be the position for the warning statement and 32% chose position A while only 6% chose position C.

Warning Sign / Pictogram Design

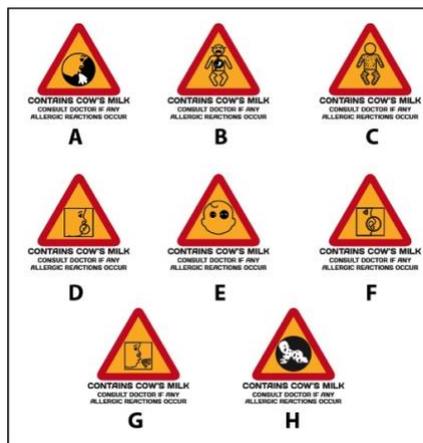


Figure 13: Highest Percentage Pictogram Design for Each Symptoms Of CMPA

26% of the respondents chose pictogram A which is vomiting sign to be the warning sign for CMPA while 22% chose pictogram H which is eczema sign and 20% chose pictogram B which is colic and diarrhea sign.

Placement of Allergy Warning Sign on Infant Cow's Milk Formula Base



Figure 14: Placement of CMPA Warning Sign On Cow's Milk Formula Base Packaging

40% of the respondents prefer to allocate allergy-warning sign near to the ingredients label (B). 32% of them prefer to allocate on the front side bottom (C) of the packaging. Dr. Amir Hamzah prefers the warning sign to be on the front top of the packaging, but he is concerned about the acceptance from consumers if the warning sign is placed in front of the packaging.

The Effectiveness of Allergy Warning

60% of the respondents strongly agree that allergy-warning sign should be applied on children's cow's milk protein base formula packaging and labelling. 38% of them agree and only 2% of them disagree with the statements. 56% of the respondents strongly agreed and 42% of them agree that the allergy warning sign should be placed on all cows' milk protein drinks and food for children.

The Cow's Milk Protein Allergy Warning Sign

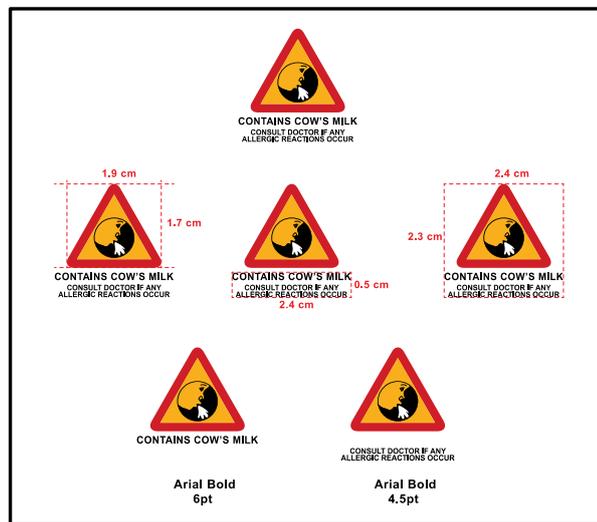


Figure 15: The Final Design for CMPA Warning Sign with Measurement

Based on Figure 15, it is the final design that has been chosen by the majority of respondents. The typeface for the warning statement is 'Arial' bold size 6 point and 4.5 point.

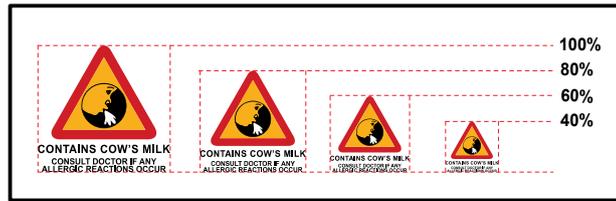


Figure 16: The maximum and minimum percentage of the warning sign sizes

Figure 16 shows the maximum and minimum percentage of the warning sign scale. The maximum is for the biggest packaging and the minimum is for the smallest packaging of infant formula milk cow’s milk base.

Overall Finding For Post-Test Result

Overall, the general public and healthcare professionals agree that allergy warnings in pictogram symbols have the potential to alert the consumers of cow’s milk allergy reaction issues. The placement of allergy warning should be near to the ingredients label because it is related and gives a better and quicker warning to alert the consumers that the products contain cow’s milk and that they would need to consult doctors if any reactions occur after their babies consume this product.



Figure 17: The maximum packaging size for infant cow’s milk protein formula base



Figure 18: Allergy Warning Applied on Infant Cow’s Milk Formula Base

CONCLUSION

Based on the overall findings, allergy warnings in the visual form such as pictograms have the potential to be recognized as symbols that can be used in Malaysia and all over the world. Appropriate allergy warnings will help to increase consumer awareness especially for those who are not familiar with the language the manufacturer uses on their packaging, especially for ingredients. It can be confusing – with regards to the use of scientific jargon. Designers and healthcare

professionals should work together to create allergy warning signs and convince the Ministry of Health that cow's milk protein allergy warning is really important as it will create awareness among the public, especially for parents with children suffering from cow's milk protein allergy (CMPA).

Recommendation and Further Research

It is highly recommended that:

1. The cow's milk protein allergy warning should be included in the Ministry of Health of Malaysia, Food Regulations 1985.
2. Expand the way they communicate about cow's milk protein allergy through television and print advertisements, and not through cow's milk formula packaging only as it will increase awareness among consumers, especially in parents.
3. To use all eight pictograms designs of the cow's milk protein allergy common reactions on the packaging, because different babies have different types of symptoms or reactions to cow's milk protein allergy.

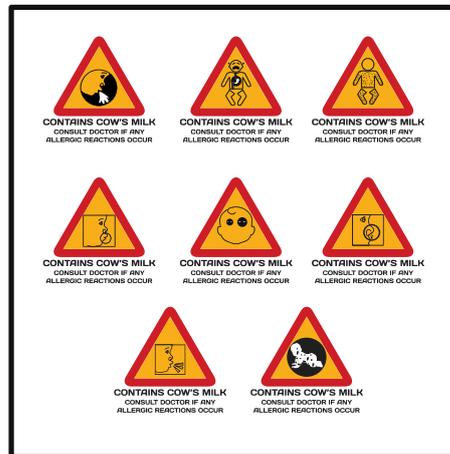


Figure 19: The Eight Warning Symbol for Cow's Milk Protein Allergy



Figure 20: Recommendation to Use All Eight Warning Symbol on the Packaging / Labelling

4. Optional: Design proposal can be expanded to different layout options.

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