Evaluation of Consistency Between Local and Imported Seafood Allergen Extracts

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Abstract

Background : Seafood is a common cause of food allergy in Thai adults and children. Skin prick test is a safe and convenient way to screen seafood allergy. To date, the Allergy Unit, Department of Pediatrics, Faculty of Medicine Siriraj Hospital, Mahidol University uses imported extracts for seafood skin prick test. The extracts are expensive and may not be the same species as seafood in Thailand.

Objectives : To compare the consistency between local seafood allergen extracts prepared by the Department of Pharmacology, Faculty of Medicine Siriraj Hospital, Mahidol University and imported seafood allergen extracts.

Methods : The study was a prospective comparative trial performed in children who attended the Pediatric Allergy Clinic, Siriraj Hospital from March 1999 to October 2000. The skin prick test was performed with the local seafood allergen extracts prepared by a pharmacist from the Department of Pharmacology and the imported seafood allergen extracts included shrimp, fish and crab. Histamine and normal saline were used as positive and negative control respectively. The positive result was recorded when wheal reaction was $\geq$ 3 mm larger than negative control.

Results : Eighty eight patients (57 boys and 31 girls) were included in this study. The average age was 7.7 years (1-15 years). Half of the patients had a history of seafood allergy. The study showed probable consistency between imported and local skin prick test of shrimp and crab extracts (kappa = 5-7) but no consistency between imported and local skin prick test of fish extracts (kappa < 5). The study also showed no consistency between history of seafood and skin prick test result.

Conclusion : Local seafood allergen extracts from the Department of Pharmacology, Faculty of Medicine Siriraj Hospital, Mahidol University are safe but they cannot replace the imported seafood allergen extracts. Further investigations about sensitivity and specificity of both kinds of allergen extracts are necessary.

Key word : Local Seafood Allergen Extracts, Imported Seafood Allergen Extracts, Seafood Allergy, Skin Prick Test With Seafood Allergens

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The exact incidence of seafood allergy is difficult to demonstrate. Seafood is one of the most common causes of food allergy in children apart from cow's milk and eggs. A study in school children aged 6-12 years showed that the prevalence of food allergy was 3.89 per cent and 66 per cent of the cases were seafood allergy(1). Santadusit S et al, (1999), showed that the prevalence of food allergy in Thai preschool children (6 months -6 years) was 6.25 per cent and seafood was the most common cause (31.7%) of food allergy. Skin prick test is a safe and convenient way to screen seafood allergy. To date, the Allergy Unit, Department of Pediatrics Faculty of Medicine Siriraj Hospital, Mahidol University has used imported extracts for seafood skin prick test. The extracts are expensive and may not represent the species of seafood in Thailand. With the help of the Department of Pharmacology, Faculty of Medicine Siriraj Hospital, Mahidol University, local seafood allergen extracts were prepared from common seafoods available in Thailand.

The objective of this study was to compare the consistency between local seafood allergen extracts prepared by the Department of Pharmacology, Faculty of Medicine Siriraj Hospital, Mahidol University and imported seafood allergen extracts.

MATERIAL AND METHOD

The study was a prospective comparative trial in Thai children who attended the Pediatric Allergy Clinic, Siriraj Hospital from March 1999 to October 2000. The skin prick test was performed and evaluated as the international standard(2,3). with local seafood allergen extracts prepared by a pharmacist from the Department of Pharmacology, Siriraj Hospital and the imported seafood allergen extracts included shrimp, fish and crab (Allertech®). Histamine (10 mg/ml) and normal saline were used as positive and negative control respectively. A positive result was recorded when wheal reaction was $\geq$ 3 mm larger than negative control.

In imported seafood allergen extracts (Allertech®), shrimp allergen extract was the combination of Penaeus spp, lobster and oyster allergen; mixed fish allergen extract was the combination of flounder, codfish and halibut allergen; and crab allergen extract was paralithodes allergen. Local seafood allergen extracts were prepared for each of the seafoods below:

- Shrimp: giant tiger prawn (Panaeus monodon), Panaeus merguiensis
- Fish: Acanthocybium solandri, Pampus spp, snapper fish
- Crab: swimming crab (Portunus pelagicus), blue crab (Scylla serrata)
- Squid
- Mussel: green-lipped mussel (Mytilus saragdinus)

Methods of local seafood extract preparation(4).

1. Collection of local seafood raw materials
2. Lyophilization and grinding

3. Defatting with diethylethers

4. Extraction and separation of the protein compartment

5. Purification by separation and dialysis

6. Sterilization. The sterility test was checked every 6 months

7. Standardization with Kjeldahl Method acid Digestion method. Protein Nitrogen Unit (PNU) was used as the standardization. PNU test was checked every 12 months

8. Toxicity test was performed in the rabbit model.

Statistical analysis

The consistency between skin prick test results of local and imported allergen extracts and the consistency between history of seafood allergy and result of skin test were evaluated by Kappa analysis[5]. Kappa ≥ 0.7-1.0 = good consistency, 5-7 = probably consistency and < 5 = poor consistency.

RESULTS

Eighty eight patients (57 boys and 31 girls) were included in this study. The average age was 7.7 years (1-15 years). Twenty four per cent of the cases were less than 5 years old while Twenty three per cent were more than 10 years old. Half of the patients had a history of seafood allergy.

Most of the patients in this study had a history of allergy. Thirty nine per cent (35 cases) had allergic rhinitis, 40.9 per cent (36 cases) had asthma and 4.5 per cent (4 cases) had atopic dermatitis. The duration of seafood allergy was between 2 months to 5 years. Forty eight patients (54.5%) had a history of seafood allergy as shown in Table 1. Among 48 cases with a history of seafood allergy, 30 cases had a history of shrimp allergy, 23 cases had crab allergy and 7 cases had fish allergy.

The local seafood allergen extracts prepared by a pharmacist from the Department of Pharmacology, Siriraj Hospital, Mahidol University were checked for sterility test every 6 months and showed no positive organisms 4 years after the preparation. The standardization of the extracts were checked with Kjeldahl Method acid digestion method every year and showed stable PNU until 4 years after the preparation of the extracts. There were no side effects from the skin prick test with both local and reported seafood allergen extracts.

Twenty-eight of 88 cases (31.8%) showed positive skin prick test to imported shrimp allergen extract while 17 cases (19.3%) showed positive skin test to local allergen extract. In 28 positive skin prick tests to imported shrimp allergen extract, 14 cases showed a positive result to local shrimp extracts. The statistical analysis for consistency showed Kappa = 0.503 which means that the imported extract and the local extract probably had consistency as shown in Table 2.

Table 1. History of seafood allergy in the study patients.

History of seafood allergy	Number of cases	Per cent
None	40	45.5
Positive history of seafood allergy	48	54.5
1 kind of seafood	28	31.8
>1 kind of seafood	20	22.7

Table 2. The results of prick skin test with imported and local shrimp allergen extracts.

	The result of prick skin test with imported shrimp allergen extract		
	Positive	Negative	
The result of prick skin test with local shrimp allergen extracts			
Positive	14	3	17
Negative	14	57	71
Total	28	60	88

Kappa = 0.503

Seven of 88 cases (8%) showed positive skin prick test to imported fish allergen extract while 8 cases (9.1%) showed positive skin test to local allergen extract. In 7 positive skin prick tests to imported fish allergen extract, 3 cases showed positive result to local fish extracts. The statistical analysis for consistency showed Kappa = 0.344 which means that the imported extract and the local extract had no consistency as shown in Table 3.

Nineteen of 88 cases (21.6%) showed positive skin prick test to imported crab allergen extract while 26 cases (29.5%) showed positive skin test to local allergen extract. In 19 positive skin prick tests to imported crab allergen extract, 16 cases showed positive results to local crab extracts. The statistical analysis for consistency showed Kappa = 0.615 which means that the imported extract and the local extract probably have consistency as shown in Table 4.

This study showed no consistency between history of shrimp allergy and skin prick test result with imported shrimp allergen extracts (Kappa = 0.435), between history of shrimp allergy and skin prick test result with local shrimp allergen extracts (Kappa = 0.350), between history of fish allergy and skin prick test result with imported fish allergen extracts (Kappa = 0.069), between history of fish allergy and skin prick test result with local fish allergen extracts (Kappa = 0.199), between history of crab allergy and skin prick test result with imported crab allergen extracts (Kappa = 0.439) and between history of crab allergy and skin prick test result with local crab allergen extracts (Kappa = 0.463).

DISCUSSION

This study was a prospective comparative trial in Thai children to compare the consistency between local seafood allergen extracts prepared by the Department of Pharmacology, Faculty of Medicine Siriraj Hospital, Mahidol University and imported seafood allergen extracts. The local seafood allergen extracts were stable, checked by the sterility test and

Table 3. The results of prick skin test with imported and local fish allergen extracts.

	The result of prick skin test with imported fish allergen extract		
	Positive	Negative	
The result of prick skin test with local fish allergen extracts			
Positive	3	5	8
Negative	4	76	80
Total	7	81	88

Kappa = 0.344

Table 4. The results of prick skin test with imported and local crab allergen extracts.

	The result of prick skin test with imported crab allergen extract		
	Positive	Negative	
The result of prick skin test with local crab allergen extracts			
Positive	16	10	26
Negative	3	59	62
Total	19	69	88

Kappa = 0.615

annual standardization, until the end of the study (4 years after the preparation of the extracts). There were no side effects from the skin prick test using both local and imported seafood allergen extracts. Previous studies showed that skin prick test with allergen extracts was safe, easy and reproducible [2,3] and the allergen extracts for skin test were stable after dilution, mixing and storage[6,7].

Most of the study population had a history of seafood allergy (39% allergic rhinitis, 40% asthma and 4.5% atopic dermatitis). This occurrence of allergy history in the study group was higher than in the normal population. The most common types of seafood that the patients were allergic to were shrimp (34%) and crab (26% of the total cases) as found in a previous study[8]. The species of shrimp, crab and fish in imported and local seafood extract are different but may have cross reactivity of allergenicity. This study showed probable consistency between imported shrimp allergen extract and local shrimp allergen extracts (Kappa = 0.503) and between imported crab allergen extract and local crab allergen extracts (Kappa = 0.615). There was no consistency between imported fish allergen extract and local fish allergen extracts (Kappa = 0.344). The number of studied patients who had positive skin prick test to both local and imported fish extracts was too small to show significant consistency. This study also showed no consistency between history of any kinds of seafood allergy and the result of skin prick test from each of imported and local extracts from the same group of seafood in the studied populations (Kappa < 0.5). A previous study found that not more than 30 per cent of patients who had a history of seafood allergy had a positive seafood challenge test[8]. Skin prick test with food extract is useful and shows good negative predictive value (95%) for IgE-mediated reaction. The positive predictive value of skin test for food is less than 50 per cent[9,10]. The duration from the time that they have a seafood allergic reaction to the time of the study is also important because allergy to some kinds of seafood may recover as time passes. Further study should be done to confirm the efficacy of local seafood extracts, sensitivity and specificity of local seafood allergen extract using seafood challenge test as a gold standard[8,10].

SUMMARY

The study showed a probable consistency between imported and local shrimp and crab allergen extracts but no consistency between imported and local fish allergen extracts nor history of seafood allergy and skin prick test result. The study showed that local seafood allergen extracts from the Department of Pharmacology, Faculty of Medicine Siriraj Hospital could not replace the imported seafood allergen extracts. Further investigations should be performed to compare the sensitivity and specificity of local of allergen extracts to seafood challenge which is a gold standard test.

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การเปรียบเทียบสารสกัดภูมิแพ้จากอาหารทะเลที่ผลิตในประเทศและต่างประเทศ

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อาหารทะเลจัดเป็นอาหารที่แพ้บ่อยที่สุดอย่างหนึ่งในคนไทยทั้งเด็กและผู้ใหญ่ การทดสอบการแพ้อาหารทะเลด้วยการสะกิดนับว่าเป็นวิธีที่สะดวก ปลอดภัยและเหมาะแก่การตรวจในเบื้องต้น ปัจจุบันนี้น้ำยาสะกิดอาหารทะเลที่ใช้อยู่ในโรงพยาบาลศิริราชเป็นน้ำยานำเข้าจากต่างประเทศซึ่งมีราคาแพงและอาจมีบาง species ที่ไม่ตรงกับอาหารทะเลในประเทศไทย ดังนั้นคณะผู้ศึกษาร่วมกับภาควิชาเภสัชวิทยา คณะแพทยศาสตร์ศิริราชพยาบาลจึงได้ทำการสกัดน้ำยาทดสอบทางผิวหนังจากอาหารทะเลที่รับประทานกันบ่อยในประเทศไทยขึ้น วัตถุประสงค์ของการศึกษานี้คือการศึกษาความสอดคล้องของผลการทดสอบของน้ำยาสกัดที่ผลิตในประเทศและน้ำยานำเข้าจากต่างประเทศ

การศึกษาได้ทำ prospective comparative trial ในผู้ป่วยเด็กที่เข้ารับการรักษาในคลินิกโรคภูมิแพ้ ภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์ศิริราชพยาบาล จำนวน 88 ราย โดยทำการทดสอบผิวหนังด้วยการสะกิดโดยใช้ทั้งน้ำยาที่ผลิตในประเทศและน้ำยานำเข้าในผู้ป่วยแต่ละราย แล้วนำมาตรวจหาความสอดคล้องกัน

ผลการศึกษาพบว่าน้ำยาสกัดสำหรับทดสอบกุ้งและปูทั้งสองชนิดมีความสอดคล้องกันในระดับปานกลาง (kappa = 5–7) ส่วนน้ำยาสกัดสำหรับทดสอบปลาทั้งสองชนิดไม่มีความสอดคล้องกัน (kappa < 5)

สรุปจากการศึกษานี้พบว่าน้ำยาสกัดสำหรับทดสอบอาหารทะเลที่ผลิตในประเทศยังไม่อาจนำมาใช้แทนที่น้ำยานำเข้าจากต่างประเทศได้ ควรจะต้องทำการศึกษาเพิ่มเติมถึงแม่นยำและความไวของน้ำยาสกัดสำหรับทดสอบอาหารทะเลที่ผลิตในประเทศโดยเทียบกับ gold standard คือการทำ food challenge test

คำสำคัญ : สารสกัดภูมิแพ้จากอาหารทะเลที่ผลิตในประเทศ, สารสกัดภูมิแพ้จากอาหารทะเลที่ผลิตจากต่างประเทศ, การแพ้อาหารทะเล, การทดสอบผิวหนังด้วยการสะกิด

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