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АЛЛЕРГЕННОСТЬ БЕЛКОВ МОЛОКА И ПУТИ ЕЕ СНИЖЕНИЯ

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Сокращения

IgE, IgG – иммуноглобулин класса E и G;
IL – интерлейкин;
INF – интерферон;
mr – молекулярная масса, кДа;
α-ла – α-лактальбумин;
β-лг – β-лактоглобулин;
ААК – ароматические аминокислоты;
АКМ – аллергия на коровье молоко;
АКРЦ – аминокислоты с разветвленной цепью;
Ат – антитело;
БСА – бычий сывороточный альбумин;
БКМ – белки коровьего молока;
ВЭЖХ – высокоэффективная жидкостная хроматография;
ДСК – дифференциальная сканирующая калориметрия;
ДСН – додецил сульфат натрия;
ИФА – иммуноферментный анализ;
КД – круговой дихроизм;
ПА – пищевая аллергия;

Введение

Современное представление о развитии аллергических заболеваний придает определяющее значение иммунологическим нарушениям, которые вызваны аллергенами, в том числе пищевыми. Клиническим проявлением пищевой аллергии чаще всего выступает атопический дерматит – хроническое аллергическое воспаление кожи. Основной причиной заболевания являются нарушения функционирования иммунной системы [1]. Атопический дерматит встречается повсеместно, у людей разного возраста, но с большей частотой выявляется у женщин. В настоящее вроемя рост заболеваемости атопическим дерматитом связывают с загрязнением окружающей среды, продуктами питания, укорочением сроков грудного вскармливания, искусственным вскармливанием, токсикозами и погрешностью питания матери во время беременности и периода лактации [2–4].

По последним данным до 10% детей раннего возраста страдают пищевой аллергией. У 80% пациентов с проявлениями атопического дерматита установлена связь данного заболевания с пищевой аллергией [5]. Пищевая аллергия обусловлена развитием сенсибилизации организма больного к пищевым аллергенам [6]. Наследственная отягощенность по аллергическим заболеваниям обнаружена у 65,4% больных и только у 20,6% здоровых детей. У 31,4% больных отмечена аллергическая патология по материнской линии; в 20,4% были больны оба родителя [7].

У детей раннего возраста с признаками ПА обнаружены аллергенспецифические IgG и IgE не только к белкам коровьего молока, но и к наиболее распространенным пищевым антигенам животного и растительного происхождения. У больных выявлена поливалентная пищевая сенсибилизация. При этом преобладающими являются аллергические реакции на белки коровьего молока [8]. Наряду со сниженной сенсибилизирующей активностью белков козьего молока выявлена иммунологическая перекрестная реактивность с основными антигенами коровьего молока. Высокая частота сенсибилизации также обусловлена белковым компонентом мяса птицы и рыбы, фруктами, кисломолочными и глютенсодержащими продуктами (рисунок 1, 2).

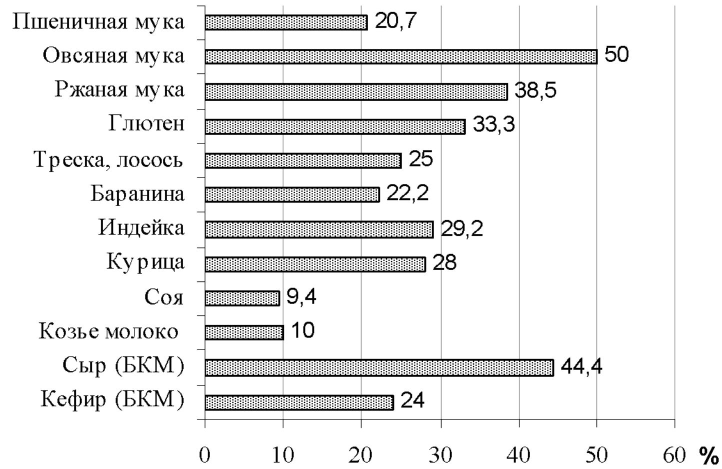

Рисунок 1 – Частота встречаемости специфических IgE к продуктам животного и растительного (содержащих глютен) происхождения у больных аллергией первых трех лет жизни [9]

Развитию ПА в раннем возрасте способствует повышенная проницаемость желудочно-кишечного тракта для белков пищи, которые проходят через слизистую в неизмененном или частично переваренном виде. Кроме того, с молоком матери в пищеварительный тракт ребенка могут поступать пищевые антигены, способные вызывать развитие сенсибилизации к соотвествующим продуктам [10].

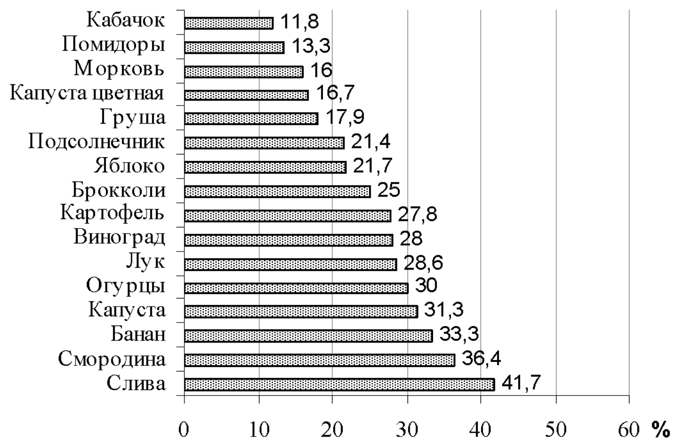

Рисунок 2 – Частота встречаемости специфических IgE к овощам и фруктам у больных аллергией первых трех лет жизни [9]

По результатам исследования детей с ПА установлена высокая частота обнаружения аллергенспецифических IgE к белкам коровьего молока (68,9%) и его фракциям: казеину (70,6%) и β-лактоглобулину (66,3%), а также к белку сои (68,9%). Частота обнаружения специфических IgE к козьему молоку в 2 раза ниже (35,9%) [9]. Таким образом, развитие атопического дерматита, главным образом, обусловлено аллергией к белкам коровьего молока.

Цель обзора – рассмотрение иммунных механизмов развития пищевой аллергии, характеристика основных белковых аллергенов молока и определение оптимальных способов снижения их иммунореактивности; анализ современных данных в области применения ферментативных гидролизатов в специализированном питании.

Выводы

Большинство белков коровьего молока являются потенциальными аллергенами. Иммунореактивность белковых макромолекул определяется особенностями их структуры и физико-химическими свойствами.

В настоящее время для снижения аллергенности и повышения питательной ценности белков молока используют различные технологические приемы: ферментативный гидролиз, денатурацию под действием температуры и высокого гидростатического давления и др.

Физическое воздействие направлено на изменение конформации белковых молекул, что обеспечивает доступ к ранее скрытым сайтам протеолиза и разрушение областей антигенных детерминант. Уменьшение аллергенного потенциала гидролизатов обусловлено ферментативным расщеплением антигенных детерминант белков молока. Совместное применение физического воздействия, в частности термоденатурации, и протеолиза представляется наиболее приемлемым путем получения гипоаллергенного белкового компонента.

Кроме протеолиза, для изготовления гидролизатов с заданными свойствами: определенным пептидным и аминокислотным профилем и низким антигеным потенциалом, – предполагается использование развитых пост-гидролитических процессов.

Применение ферментативных белковых гидролизатов актуально при создании гипоаллергенных детских молочных смесей, продуктов диетического питания при фенилкетонурии, хронических заболеваниях печени.

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ALLERGENICITY OF MILK PROTEINS AND WAYS OF ITS DECREASE

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Review has been devoted to the problem of milk proteins allergenicity and the methods that allows to receive a hypoallergenic protein component for products of baby and specialised food. Current information about the immune mechanism of food allergy formation, physical and chemical properties and antigene determinants of casein and whey proteins has been presented. As the basic approaches of decrease in milk proteins allergenicity have been defined heating, processing by a high pressure, chemical modification (Maillard reaction), enzymatic hydrolysis. The combination of physical influence, in particular thermodenaturation, and proteolysis have been represented in the capacity of the most accessible and effective way of hypoallergenic protein component making. Importance of post-hydrilysis processes for enzymatic hydrolysates manufacture with the desired properties has been shown. The main categories of products of specialised food on the basis of protein hydrolysates have been characterised.