

STUDENTS' PERCEPTIONS ON SOME IMMUNOLOGICAL CONCEPTS

*Anouar AIDOUN, Khalid MAHDI, Aïcha TARICHEN, Rajae ZERHANE, Mourad MADRANE, Rachid JANATI-IDRISSI,
and Mohamed Laafou*

Laboratoire Interdisciplinaire de Recherche en Ingénierie Pédagogique,
École Normale Supérieure,
Abdelmalek Essaâdi University, Tétouan,
Morocco

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ABSTRACT: The Immunology is a recent scientific discipline. The complexity of its concepts and their ever-changing could present educational challenges for teachers and barriers to learning for learners. In this article, we have tried, through an investigation by a survey, to highlight the views of a group of students for some immunological concepts concerning vaccines and vaccination. The analysis of the survey's results allows us to assess whether these perceptions can represent potential obstacles to the further acquisition of knowledge in Immunology.

KEYWORDS: Immunology, concepts, vaccine, vaccination.

1 INTRODUCTION

Immunology is the study of how the body defends itself against pathogens. The courses explore the cells and molecules involved in defense, the nature of disease and pathogens, the use of the components of the immune system in therapeutics and diagnostics, and the evolutionary lessons from the development of immune systems in different organisms.

In Moroccan's high schools, Immunology is the fifth unit of the second year of the bachelor's of Science, Stream LES (Life Earth Sciences). Placed just after the unit of Genetics and before the unit of Geology, it represents 17% of the hourly volume of the LES training courses.

1.1 THE TARGETED SKILLS BY THE TEACHING OF IMMUNOLOGY

Teaching the Immunology in high school, aims to develop different students skills:

- Acquire basic scientific knowledge about the functioning of the immune system in order to integrate them in understanding health problems.
- To acquire a correct scientific methodology to construct and solve scientific problems posed in the field of Immunology.
- Using different means of expression (oral, written, graphic) to translate data on the functioning of the immune system in order to build explanatory models of its operation through simplified block diagrams.
- Master the use of different instruments and laboratory tools and integrate them into scientific observation of the various structures involved in the immune system.
- Being aware of the danger of immune system disorders and the importance of the means of strengthening the immune response, to adopt responsible and positive attitudes in order to take care of itself in the field of health and achieve positive interaction with the environment [1].

1.2 THE OBJECTIVES OF TEACHING THE IMMUNOLOGY

The objectives of this unit in secondary education is to enable students to build self-concept and non-self, to understand the different mechanisms of the immune response, to see some examples of immune system dysfunction and ways strengthening of the immune response. The student is thus led to:

- Identify the main and secondary markers of self and distinguish between nonspecific and specific immune defenses, focusing on the role of self-markers in the presentation of self and non self molecules.
- Describe and interpret the various aspects of the inflammatory response and phagocytosis, highlighting their role in nonspecific defense (natural).
- Know the different components of the body involved in the immune response (different types of immune cells, lymphoid organs), and the origin and location of the maturity of immune cells.
- Understanding the mechanisms of specific immune response (cell-mediated and humoral) and determine their steps and characteristics, while stressing the importance of cell cooperation during this response
- Creation of a synthetic model summarizing the different stages of the immune response and their mutual interactions.
- Study of certain immune system function disorders, identifying the elements and mechanisms involved in these problems. In this context, the study of AIDS occupies a very important place.
- Study the ways to strengthen the immune response: vaccination, serum therapy, transplantation of bone marrow ... while integrating previous knowledge to explain the principles of these methods [2].

2 PROBLEMATIC

Although immune practices were known since the dawn of humanity, Immunology, as a science, emerged only in the late nineteenth century in connection with the development of microbiology [3]. Since then, immunological concepts have been evolving quietly. The late twentieth century has been a landmark in the history of Immunology, with the emergence of acquired immunodeficiency syndrome in humans, AIDS, enabling a real redevelopment of this young discipline.

The Immunology is a recent science in constant evolution, which is not without educational problems. Its introduction in the official program of the Moroccan secondary education was made after the 1999 reform. It occupies a very important place in the life sciences program and the land of the final year of the bachelor's of Science, Stream LES (Life Earth Sciences), with an hourly volume 34h, 17% of the total number.

The Immunology is closely related to the daily lives of students who are in contact with certain immunological practices from an early age (vaccination practices, hygiene ...). This gives this science a privileged status among students, but could, however, cause some mistaken notions, as the construction of knowledge is gradually during the child's social history [4]. These concepts may thus constitute a barrier to further learning [5]. It has directed us to try to diagnose the difficulties of perceptions that can have students in Immunology.

The problematic of our study can be formulated as two main issues:

- What are the representations of students about immunization?
- If these representations represent obstacles to the later acquisition of the immunological knowledge's?

3 WORKING METHODOLOGY

3.1 THEORETICAL FRAMEWORK

During this work, the researchers chose to target the concepts of vaccine, vaccination and antibodies. The justification of this choice on the one hand by the fact that these concepts are widely publicized, and they are linked to social practices affecting students at an early age, on the other.

The targeted sample by this research was composed of 245 students of the last year of the high school (2nd BAC), Stream LES (Life Earth Sciences), comprises 7 schools from two delegations of the Ministry of Education: the delegation of Tetouan and delegation M'diq-Fnideq from the north-west of Morocco:

High Schools	Distributed survey	Returned surveys	Unreturned survey
Delegation of Tetouan			
Hassan II	40	12	28
Cadi Ayyad	30	09	21
Jaber Ibn Hayyan	40	08	32
Abi Rabiia Sebti	30	09	21
El Mehdi Bennouna	33	13	20
Abou Bakr Essadik	33	06	27
Delegation of M'diq-Fnideq			
Mohamed VI	39	19	20
Total	245	76	169

In order to proceed to the collection of our research data, the researchers used the survey in order to define the conceptual field of the students. This method does not always give a clear idea about the fields of students thought and their reasons, their logic and their proposed justifications.

3.2 DATA COLLECTION

The proposed questions reach on the students' perceptions regarding vaccines, vaccination and antibodies. The distribution of the survey occurred after the course on Immunology with the presence of their teacher. Subsequently, students had 30 minutes to answer the questions proposed in the survey.

Analysis of the collected answers requires an interpretation and comparison to identify what could be considered as perceptions which has sufficient of permanence and resistance properties.

4 ANALYSIS AND INTERPRETATION OF RESULTS

After a general reading of all the productions of the students, we have classified the responses for each question into categories. The results can be represented as below:

4.1 RESULTS RELATING TO THE VACCINE NATURE

The reply of the student to the question regarding the concept of the vaccine, the results can be represented as shown in Fig 1.

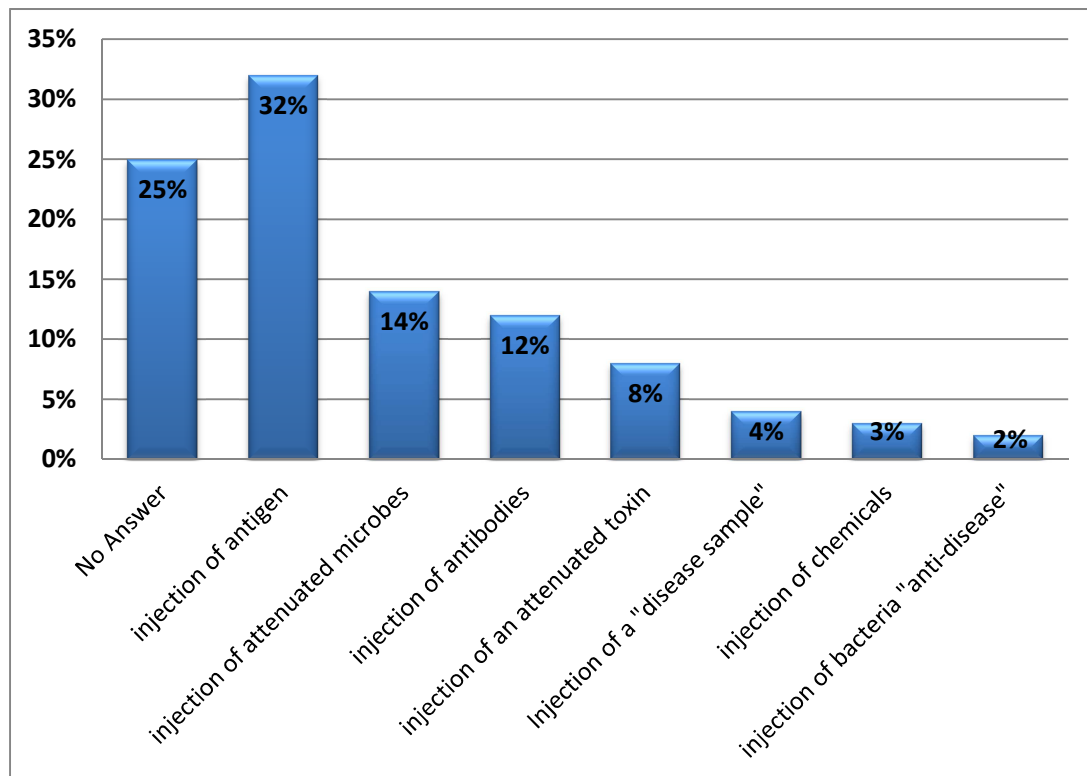


Fig 1: Answers for the question "What is the composition of the vaccine?"

Student responses can be divided into three categories:

- Modified pathogen (54%) : expressed by answers such as "antigen attenuated" (32%), "microbe attenuated" (14%) and "toxin attenuated" (8%), this idea dominates the responses with 54%. It reflects the design of the students towards the "bad" that can be turned into "good".
- Useful Microbes (6%): design of the vaccine as «sample of disease » (4%) or as « anti-disease bacteria » (2%) may have several explanations. For the first reply, it would be a question of dose and presumably threshold. One idea that has its origins in the first practice of vaccination, based on the inoculation of small doses of harmful product to protect against the disease.

The second response reflects to the students' perceptions that would be related probably to the confusion with the role of intestinal flora in natural immunity. Here we noted the idea of a sort of biological control using microbes "useful" to eliminate pathogens.

- Chemical molecules or biochemical (18%): represented by the "antibody" responses (12%) and "substance" (3%). This shows that effective striking students think that the vaccine acts as a drug (curative role), which comes probably from a confusion between vaccination and serum therapy.

4.2 RESULTS RELATED TO THE MODE OF ACTION OF THE VACCINE

By asking the question "why do we vaccinate? ", We tried to put the item on students' perceptions regarding the mode of action of a vaccine.

The responses are shown in **Fig 2**. They may be divided into two categories:

The body is active effectors (69%): it is a prevailing view among the majority of students, they expressed answers such as: "immunize the body" (55%), "push the body to produce antibodies» (9%), "body awareness" (5%). Students design, in this case vaccination just as a stimulation of the immune response mechanism.

- The body is a passive receiver (19%): Answers containing phrases such as "combat viruses", "provide immunity" ... suggest that the vaccine is only in a passive body. This is simply a battlefield where the injected vaccine and the assailant clash.

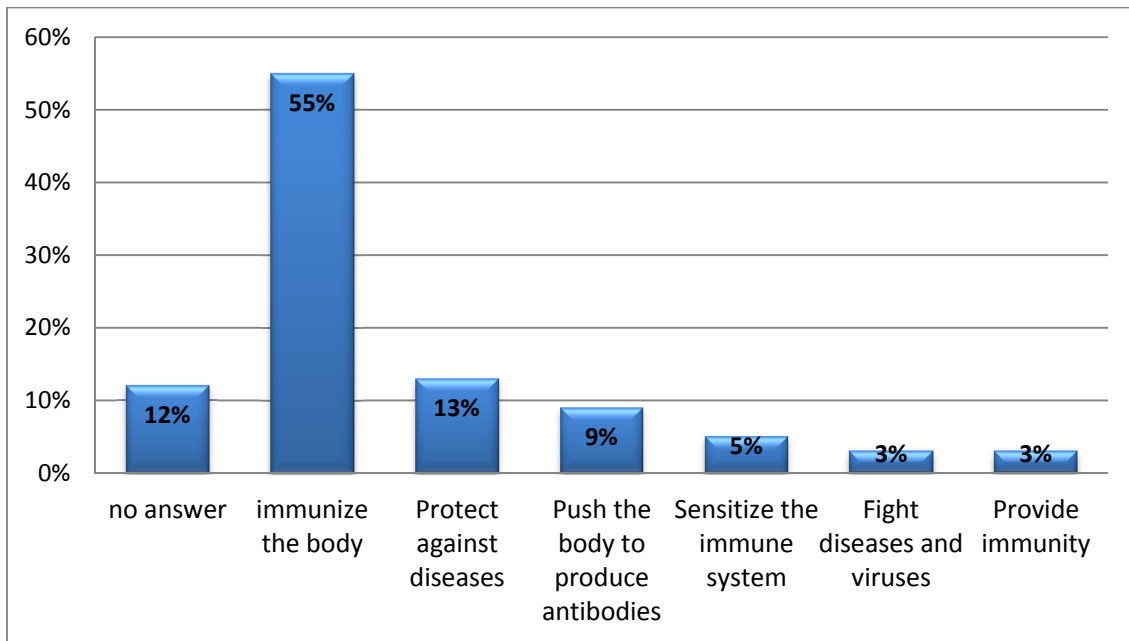


Fig 2: Answers for the question "Why do we vaccinate?"

4.3 THE ABILITY TO IMMUNIZE AGAINST ALL DISEASES

By analyzing student's responses to the question "Will we ever vaccinated against all diseases?" We found that the majority of students (74%) think it is impossible to reach vaccinated against all diseases, against only 5% who believe the contrary (Fig 3).

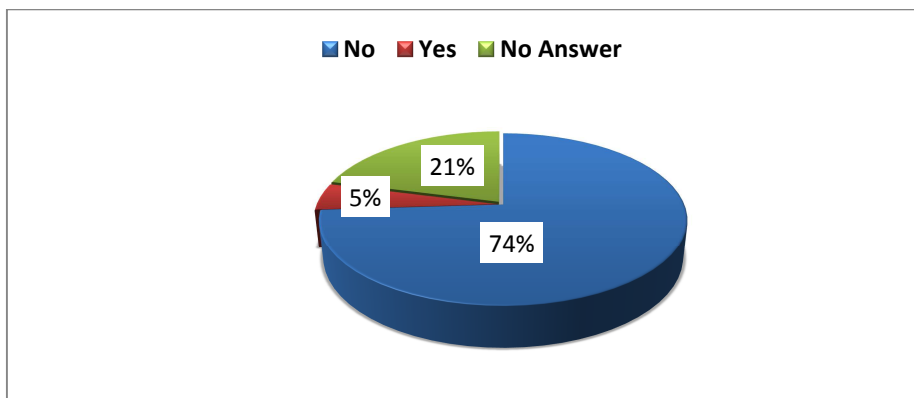


Fig 3: Answers for the question "Will we ever vaccinated against all diseases?"

Only 41% of students who answered "no" were able to justify their answer. The evidence supplied can be grouped into four categories, as shown in Fig 4:

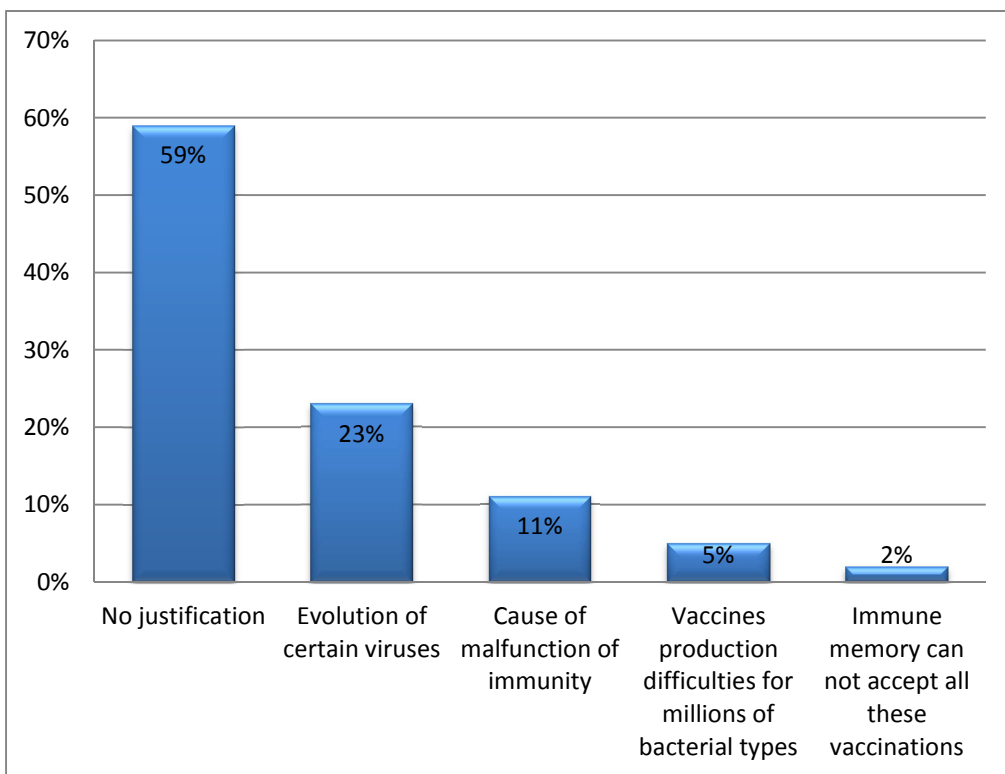


Fig 4: Justifications of students who answered "No" to the previous question

According to the results, we find that the most mentioned argument is "the evolution of some viruses", which means, by implication, the continuous change of form which makes them ineffective vaccines.

What caught our attention is that 2% of students provided an obvious argument is that "immune memory cannot accept all these vaccinations." This shows their design capacity limits of immune memory by analogy, probably, with digital memory.

4.4 RESULTS RELATED TO THE QUESTION "IS IT BETTER VACCINE THAN CURE? "

Fig 5 shows the distribution of responses to the question regarding students: "Is it better vaccine than cure? ":

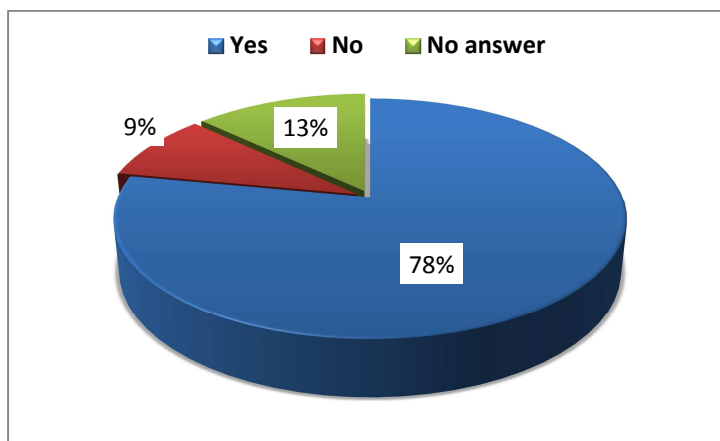


Fig 5: Answers for the question "Is it better vaccine than cure? "

Analysis of the results shows that the majority of students (78%) are aware of the importance of vaccination. Their Justifications are varied as shown in Fig 6:

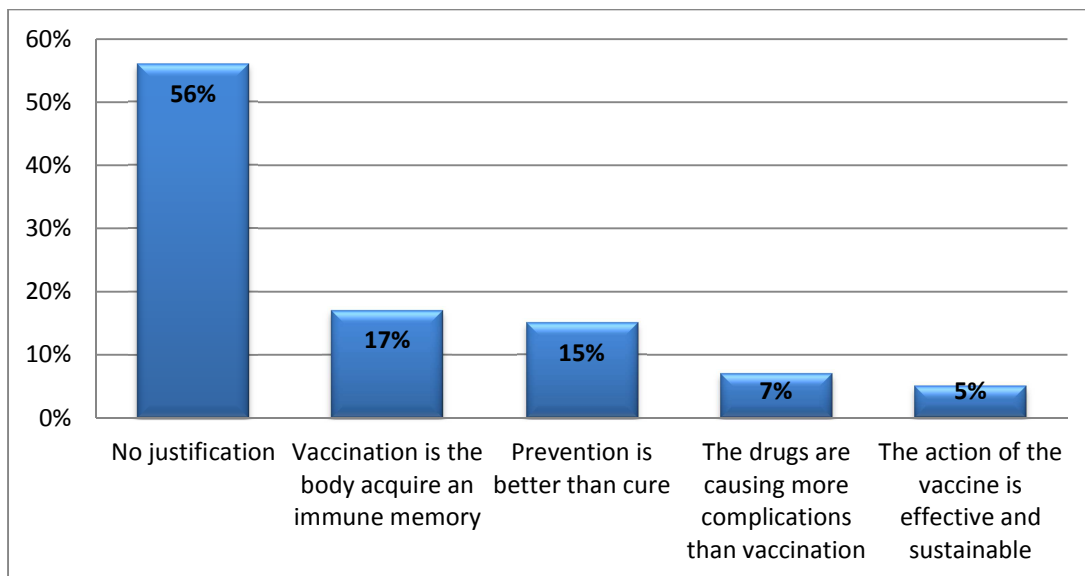


Fig 6: Justification of students answering "Yes" to the previous question

According to the results, we can conclude that the preventive aspect of vaccination is found in the majority of students, but with some overestimation of its effectiveness reflected in answers such as: "the action of the vaccine is sustainable and effective "or" drugs cause more complications than vaccination, "ignoring the potential dangers of certain adjuvants.

It is remarkable that "prevention is better than cure" justification represents 15% of student responses, showing that they are always based, even after learning on their knowledge inspired by their culture and daily life.

4.5 RESULTS RELATED TO THE QUESTION "VACCINATIONS ARE MANDATORY?"

"Why some vaccinations are mandatory? " answering to this question, the solicited students have given diverse arguments, as shown in Fig 7.

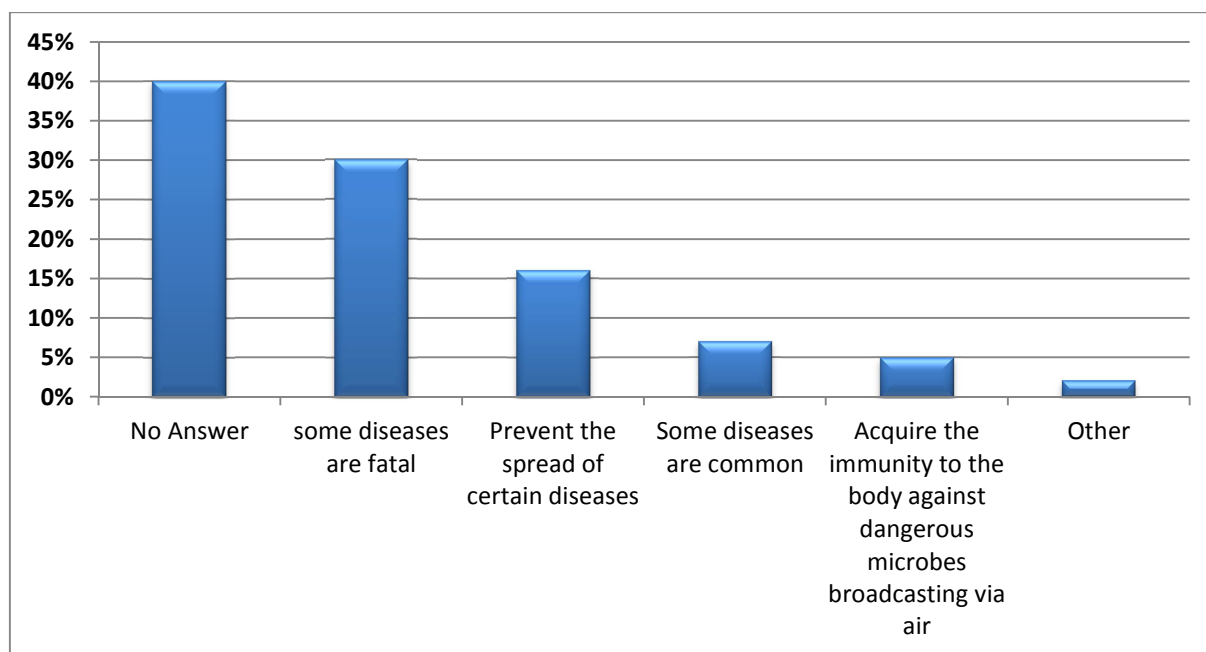


Fig 7 : Results related to the question « Why some vaccinations are mandatory ? »

The majority of the justifications presented can be considered acceptable: immunization is required to address life-threatening diseases (30%) and frequent (7%), and to prevent their transmission (16%).

It should be noted that a minority of students (5%) considers that vaccination is used to "acquire the body immunity against dangerous microbes broadcast via the air." Confirming in their answers that the air is the only instrument of spreading germs, the respondents show gaps in knowledge in the field of microbiology.

4.6 PERCEPTIONS RELATED TO THE CHEMICAL NATURE OF ANTIBODY

In response to the question about the chemical nature of antibodies, the majority of students (70%) gave a correct response (Fig 8). On the other hand, 3% think it is "cells", probably due to confusion between functional antibodies and cytotoxic T cells, which may induce a structural confusion. Other (3%) believe that the antibodies are "tissue", which could be explained by a level of observation, imagination and perception that remains macroscopically.

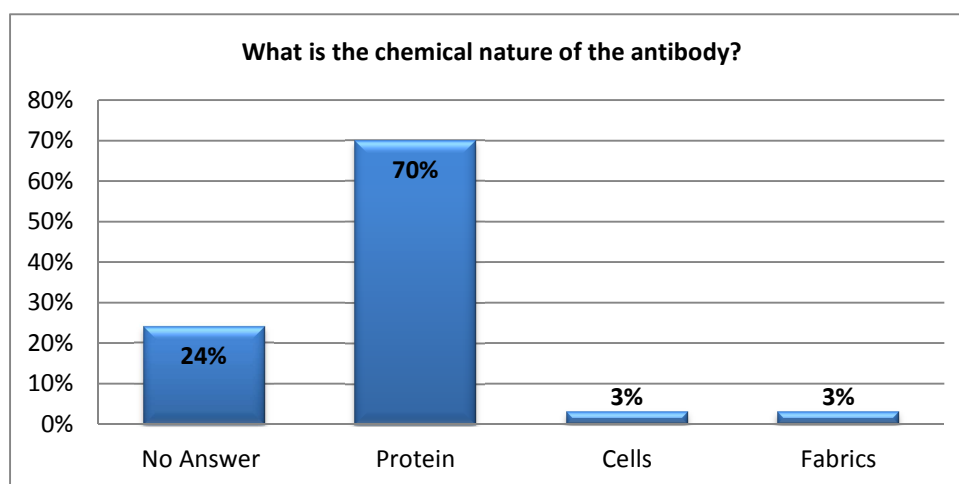


Fig 8: Answers on the question "What is the chemical nature of the antibodies?"

4.7 RESULTS RELATED TO THE ROLES OF ANTIBODIES

Roles that can be attributed to antibodies, as perceived by the surveyed students, are summarized in Fig 9.

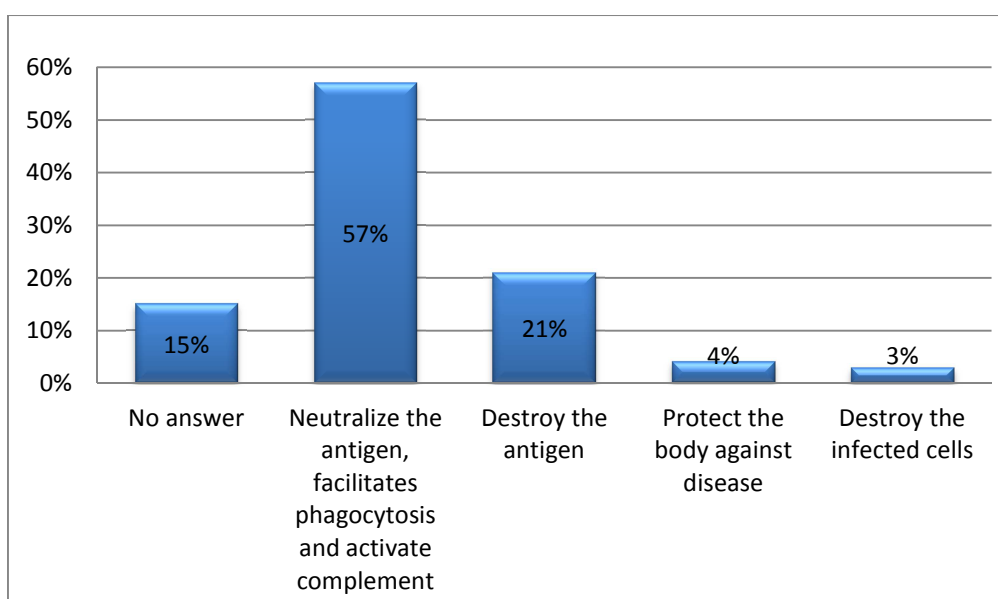


Fig 9: Answers on the question "What are the roles of antibodies?"

We noted that the majority of students (57%) are aware of the roles of both specific and limited antibodies in the fight against antigens. However, a fairly high number of students (21%) showed an overestimate of the role of antibodies, believing they are able to "destroy the antigen."

The results showed also that 4% of students believe that the antibodies "protect the body against diseases", referring probably to the principle of serum therapy.

It remains to note that 3% responded that the antibodies are able to "destroy infected cells" in likely confusion with Perforin secreted by cytotoxic cells, which confirms our previous explanation about the confusion between antibodies and cytotoxic T cells in some students.

5 CONCLUSION AND RECOMMENDATIONS

In light of the results of this work, we found that the perceptions of the students on the concepts of vaccination, vaccine and antibodies are still influenced by their common social knowledge, even after following a supposed course help them build a scientific knowledge

The analysis of student responses allowed us to highlight some persistent misperceptions, with the properties of resistance and continuity, which may impede the assimilation of some concepts of Immunology during higher education.

In order to overcome obstacles, an intervening should be done at different levels of the learning process on the Immunology:

A textbook revision will correct certain ambiguities or some scientific errors, unless warn the reader against any possible confusion. It is very important to think about the integration of the students perceptions in the training programs in teaching.

The use of ICT (Information and Communication Technologies) could facilitate the presentation of concepts, since there are tools that foster in students a new way of acquiring knowledge and know-how, ensuring:

- Better motivation;
- Active participation in the construction of knowledge;
- Improved cognitive abilities, by positively influencing skills of thinking and processing information;
- A greater margin of autonomy in students [6].

The programming of practical sessions could be beneficial for students, given their importance in the learning process of science subjects and more particularly that of biology.

An initial basic training in Immunology quality, future teachers, proves essential for good control of immunological concepts from them, and subsequently a better transmission of knowledge in the classroom. This comes from evidence that a teacher who does not control the immunological concepts would be able to properly transmit to his students.

On the other hand, an online ongoing training courses for teacher in education sciences is considered very important to upgrade their teaching knowledge [7], and can also put the finger on how can teacher reduce most of students' misperceptions on some immunological concepts without causing dropout of school while teachers are undertaking training.

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