



Commentary

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Does Transfusion Medicine Belong to or Bridge with Biomedical Science and Research?

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Abstract

In many circumstances including professional education Transfusion Medicine is regarded a laboratory or Bio Science. However, the reality discloses Transfusion Medicine to be a supportive clinical science focused on the patient, enforcing clinical treatment and supporting the therapeutic effect of clinical treatment, whether pharmaceutical, radiological or surgical interventions.

Keywords: Transfusion medicine, Biomedical science, Biomedical research, Bridging science

Abbreviations: TM: Transfusion Medicine; HBsAg: Hepatitis B Surface Antigen; UK: United Kingdom.

Introduction

A relatively young medical discipline is Transfusion Medicine, developed since the turn of the 19th Century following the discovery of molecular characteristics or antigens on the red cell surface or cell membrane by Karl Landsteiner and his Laboratory team in Vienna [1,2]. He paved the way to a safer clinical use of blood when donor and recipient were of the same red cell surface antigen type

or blood group and was awarded in 1930 the Nobel prize in Physiology or Medicine [3]. Since those days many other different antigen or blood group systems were discovered. In 1937, with Alexander S. Wiener [4], he identified the Rhesus factor (named after the Rhesus monkey experiments), thus enabling physicians to transfuse blood without endangering the patient's life (Figure 1).

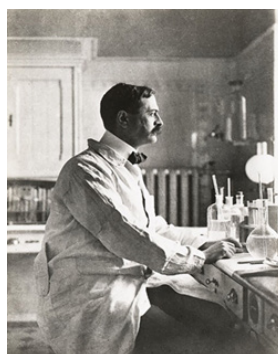


Figure1: Landsteiner in his laboratory.

His assistant Philip Levine and Rufus Stetson described in 1939 an unusual case of intra-group agglutination [5] and the Swedish scientist Birger Broman described in 1944 in his academic thesis the Rhesus blood group system of which the Rhesus antigen D is clinically the far most important factor [6]. Until 1944 pregnant women presenting with jaundice were believed to have syphilis, a sociomedical stigma, where the cause of the jaundice turned out to be a Rhesus D incompatibility causing jaundice due to haemolysis of red cells [6]. It was not the blood transfused but the immunological reaction of the recipient due to the anti-D antibodies present in the blood stream of the recipient. This science, later called biomedical science, was necessary to understand a clinical phenomenon following blood transfusion. We now are familiar with blood group incompatibilities for which compatibility testing was developed to prevent such clinical reactions following blood transfusion. The phenomenon bridged the developing clinical discipline Transfusion Medicine (TM) with the young laboratory science Biomedical Science.

The Next Episode

Biomedical Science is a science applying parts of natural science or formal science, or both, to develop knowledge, interventions, or technology that are of use in healthcare and/or public health. Disciplines like medical microbiology and clinical virology, clinical and genetic epidemiology and biomedical engineering are medically associated sciences. In explaining physiological mechanisms operating in pathological processes, however, pathophysiology could be regarded as basic science.

With the important breakthrough of Landsteiner [1,2], the interest focused on the biomedical laboratory research delving for new antigens and blood group systems. Additionally, following the discovery of Australia antigen by Blumberg found among Aborigines in 1964 [7] which actually was Hepatitis B Surface Antigen (HBsAg), exposing part of the hepatitis B virus and transmissible through the transfusion of blood, the focus was widened to transmissible infectious agents (e.g., microbiology and virology) and in particular to imaginary agents. These were included in the supportive biomedical science and research and pseudo-strengthened the efforts to increase safety and diminish or mitigate the transmission of infectious agents through the clinical use of blood and blood components. These sciences and sub-sciences bridged with TM as important allies in the ongoing battle for safety and the so-called 'zero risk' for patients.

A sub-set of biomedical sciences is the science of clinical laboratory diagnosis. This is commonly referred to in the UK as 'biomedical science' or 'healthcare science'. There are at least some 45 different laboratory-oriented specialisms within healthcare science, which are traditionally grouped into three main sections:

- a) specialisms involving life sciences
- b) specialisms involving physiological sciences
- c) specialisms involving medical physics or bioengineering

Thus, Biomedical Research explores in detail the different normal (physiological) and abnormal (pathophysiological) processes that take place in the human body - both in diseases and in health. What causes disease? What is the genetic or epigenetic background of disorders? How do microorganisms in the intestine (the gastrointestinal biotope) contribute to health and disease? What are the underlying mechanisms of diseases and what novel strategies e.g., fecal microbiota transplant or nanotechnology [8,9], can we design to more accurately diagnose and cure disease? The research in Biomedical Sciences relates to the maintenance of health and prevention of disease, to acquire a skill set suitable for a wide range of career opportunities not only in (biomedical) research, but also in pharmaceutical industry, policy making, communication or tertiary education.

Biomedical Sciences, as defined by the UK Quality Assurance Agency for Higher Education Benchmark Statement in 2015 [10], includes those science disciplines whose primary focus is the biology of human health and disease and ranges from the generic study of biomedical sciences and human biology to more specialized subject areas such as pharmacology, human physiology and human nutrition. It is underpinned by relevant basic sciences including anatomy and physiology, cell biology, biochemistry, microbiology, genetics and molecular biology, pharmacology, immunology, mathematics and statistics, and bioinformatics. As such the biomedical sciences have a much wider range of academic and research activities and economic significance than that defined by hospital laboratory sciences.

Conclusion

Biomedical Sciences are a major focus of bioscience research and funding today in the first quarter of the 21st Century to which TM, as a separate, though supportive clinical science, bridges, strengthening its medical environmental safety, efficacy, and quality-assurance.

Conflicts of Interest

The author declares no conflicts of interest.

Acknowledgements

None.

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