**Statement: The only materials that can be used in the human body are ones that are chemically inert**.

Answer: This statement is wrong.

A material is qualified in chemically inert when it does not react with other elements. This inert behaviour can be explained by the fact that these materials usually have an outer shell filled with electrons and as a consequence are very unlikely to share them and are not able to participate in any chemical reaction. The question here is to know if a material needs to have this particular behaviour in order to be used in the human body.

First of all, as it can be seen on the figure 1, materials are used almost everywhere in the human body. With the progress in medicine and our understanding of the body’s functionalities, more different materials can be used for implants, medical devices, drug delivery systems etc.

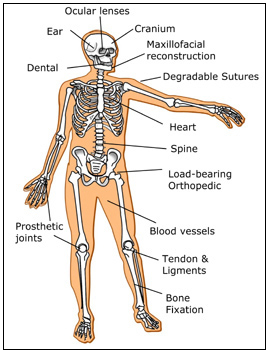


Figure 1: Biomedical applications of materials.1

These materials are usually selected regarding their mechanical properties. Indeed, optical properties for ocular lenses, strength, stiffness and durability for bone implants are examples among many others. However, because of implants are in contact with body fluids, their chemical properties are a least as important as their mechanical properties.

Also, because of the biogical response while new materials are introduced in the body must be harmless, they are usually inert which prevent them from oxidation for example. Corrosion influence would be a disaster because effects like pH variations, inflammation, infection, allergic response, bone lose or tumours at implant sites would appear.[[1]](#footnote-2) Considering this the statement would be correct.

Yet, some of the materials or implants in the body are actually not inert. Indeed, theory says that if the impact on human health of the chemical reactions is perfectly controlled and toxicological tests have been properly run, any infection would be avoided. With the advanced done in medicine during the past decades, we are now capable of doing this.

Furthermore, as far as dental implants or hip-joint implants are concerned inert behaviour is no longer possible. Indeed, materials used have to bond to human tissues and this automatically implies chemical reactions: sharing elections for primary bonding (ionic and covalent bonds) but also H bonding and Van der Waals bonding. Good materials for this use would be bioactive ceramics which are wear resistant but also bio compatible.

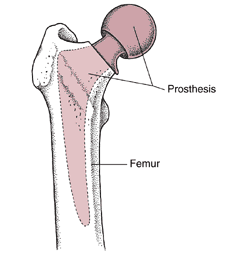


Figure 2: Hips and dental implants[[2]](#footnote-3)

CORROSION:

Moreover, recent researches[[3]](#footnote-4) have shown the possibility of developing bioactive materials assuring physiological functions (tissue engineering). Indeed, instead of directly replacing body tissues, and also because, as the humans life expectancy goes up, implant lifetime of 20 years is now not sufficient, we are now capable of manufacturing very special implants. Their bioactivity is used to activate the body’s own repair mechanisms and can for instance simulate genes that activate the proliferation of new cells.

As a conclusion, that considering all what have been said here, it has been proven the statement is wrong. With medicine progress, bioactive materials are now widely used in the human body. It just has to be verified that they will provide the appropriate host response without any infection or allergic response.

1. http://ocw.mit.edu/OcwWeb/Materials-Science-and-Engineering/3-051JSpring-2006/CourseHome/, viewed 12 Nov 2008 [↑](#footnote-ref-2)
2. http://healthbase.wordpress.com/2007/02/06/hip-replacement/, viewed 12 Nov 2008. [↑](#footnote-ref-3)
3. Hench L.L , Jones J.R, Sepulveda P, *Bioactive Materials for Tissue Engineering Scaffolds*, chapter 1

   http://www.worldscibooks.com/engineering/etextbook/p252/p252\_chap1.pdf [↑](#footnote-ref-4)