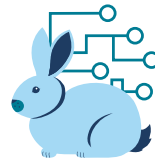


Autoimmune diseases



The prevalence of autoimmune disorders is increasing worldwide, but **effective options** to stop or reverse the progression of these diseases **are lacking**.



Animal models used to study disease mechanisms and test therapeutic strategies **fail to replicate** the complex biological interactions involved in autoimmune diseases.



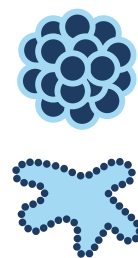
Biological differences between human and animal immune systems **limit extrapolation** from animal models to patients.



Human-based models offer more **efficient options** to elucidate disease mechanisms and discover potential drug targets.



The use of **human primary cells** is of great importance to understand the genetic, molecular and cellular factors that contribute to human pathogenesis.



Insulin-producing organoids and spheroids engineered from human cells are relevant models for studying autoimmune diabetes.



Human skin slices cultured with human immune cells allow the analysis of cell-tissue interactions, immune activation, and underlying biological mechanisms.



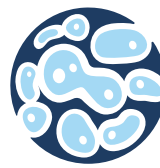
In silico models are a valuable means of **gaining new insights and testing hypotheses**, particularly when used in conjunction with clinical observations and *in vitro* models.

Autoimmune diseases

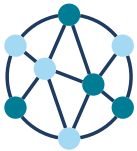
FUTURE DEVELOPMENTS AND CHALLENGES TO BE OVERCOME



The positive trend in the use of *in vitro* models to develop new therapeutic strategies suggests a demand for advanced non-animal models to better mimic human diseases.



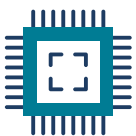
With appropriate development, human stem cell models will play a leading role in studying the molecular mechanisms of autoimmune diseases, and in identifying and testing new therapeutic strategies.



A better understanding of the complex network of dysfunctional interactions that lead to the development of most autoimmune diseases will allow the full exploitation of *in vitro* and *in silico* models.



The availability of donors represents a limit in the use of human primary cells.



There is a real need to enhance the development of human immune system cells, tissues and organs *in vitro* using integrated approaches such as tissue and body-on-chip platforms.



The establishment of a common platform to freely share *in humano*, *in vitro* and *in silico* data is crucial to advance the modelling of the highly complex human immune system and its disorders.