



14th
**International Donor Registry Conference
& WMDA Meetings**

25 – 29 June, 2024 – Cape Town, South Africa

All Patients and Donors Matter

www.capetownidrc.co.za



Challenges and Emerging Issues in Stem Cell Processing: Laboratory Perspective

Dr Riana Cockeran

South African National Blood Service



SANBS
South African National Blood Service

Outline and Declaration

- Background
- Challenges
- Emerging Issues
- Presently in South Africa
- Conclusion

Declaration: No conflicts of interest

Background

Stem cells are the foundation for every organ, tissue, and cell in the human body.

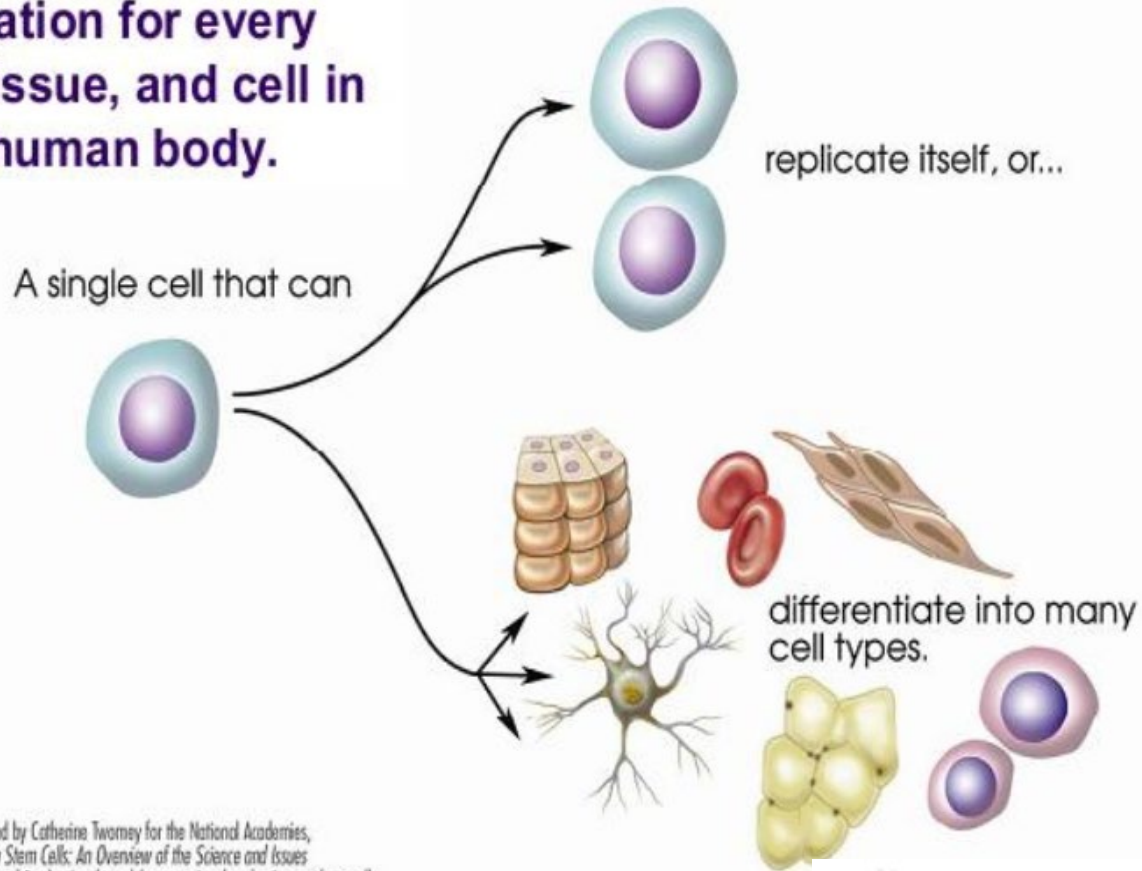
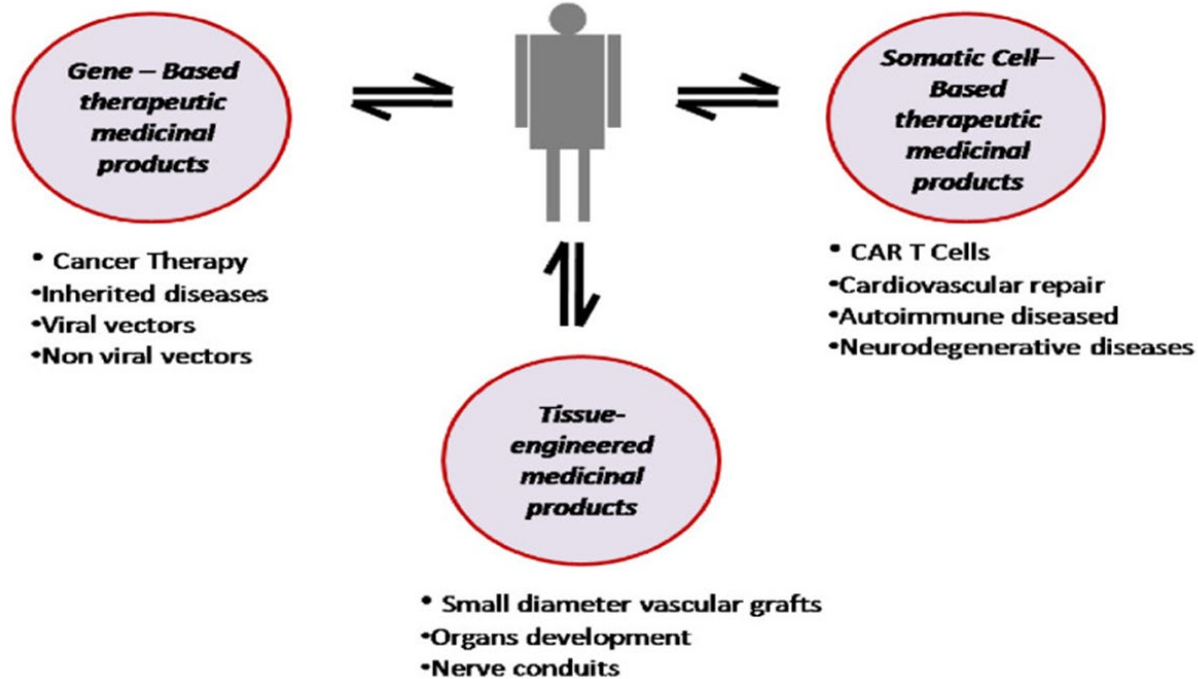


Image prepared by Catherine Twomey for the National Academies, *Understanding Stem Cells: An Overview of the Science and Issues* from the National Academies, <http://www.nationalacademies.org/stemcells>. Academic noncommercial use is permitted.



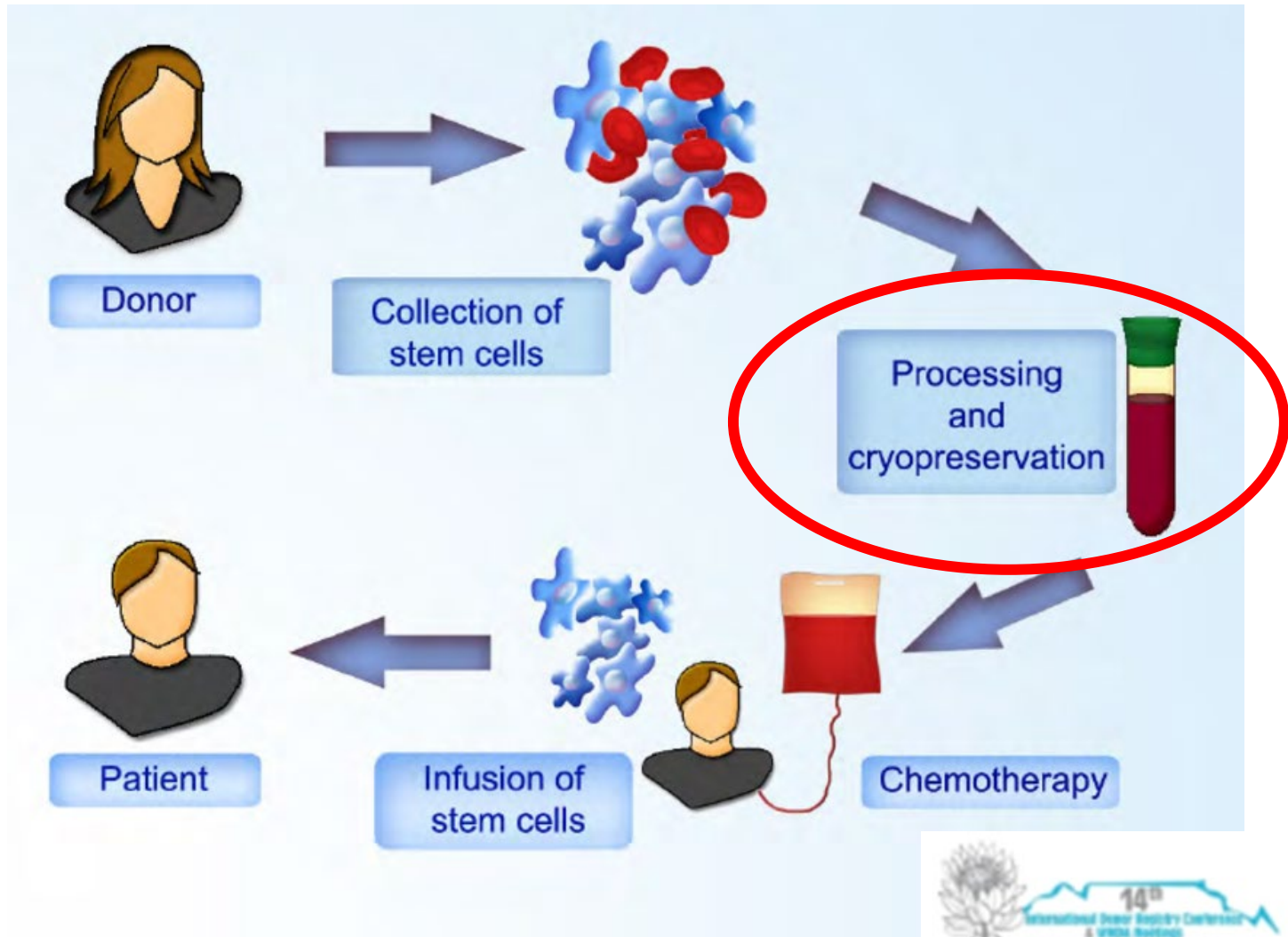
- Regenerative medicine

Advanced Therapeutic Medicinal Products (ATMP)



- Neurological disorders
- Autoimmune diseases
- Infectious diseases
- Oncology
- Drug discovery and development
- Cosmetic and surgery

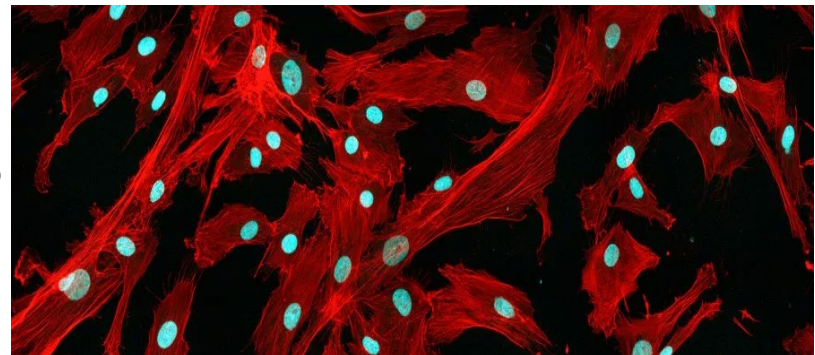
The role of the laboratory in stem cell treatment



- Cultivate, expand and manipulate stem cells
- Maintain integrity and stability of stem cells
- Ensure safety and efficacy of stem cells (release criteria)
- Advance understanding of stem cell biology and mechanisms of action
- Adhere to regulatory and ethical guidelines

Minimally Manipulated vs More than Minimally Manipulated Stem Cells

- Minimally manipulated: concentrated, washed (eg HPSC).
- More than minimally manipulated: any method of mechanical or chemical modification of the cells' physical state, incl. expansion (eg MSC, CAR-T, CAR-NK).
- Adherence to GMP
- Regulatory requirements



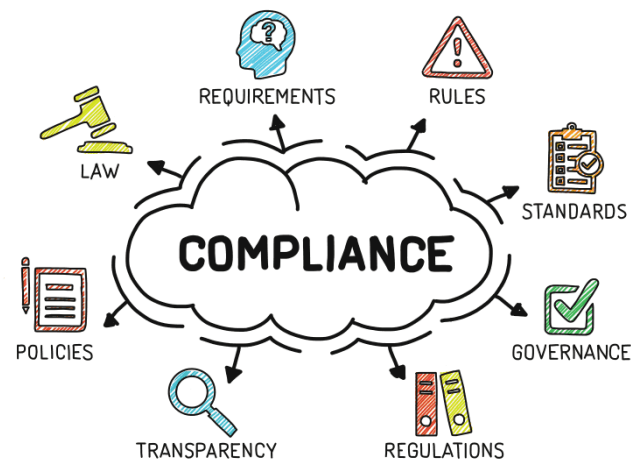
Challenges



- Cell viability and cell concentration
- Culture optimisation
- Standardisation of protocols
- Quality control
- Storage space
- Positive sterility
- Disasters
- Equipment failure



- Ethical and regulatory compliance
- Scalability and cost-effectiveness
- Long-term safety and efficacy
- Technological advancement and innovation



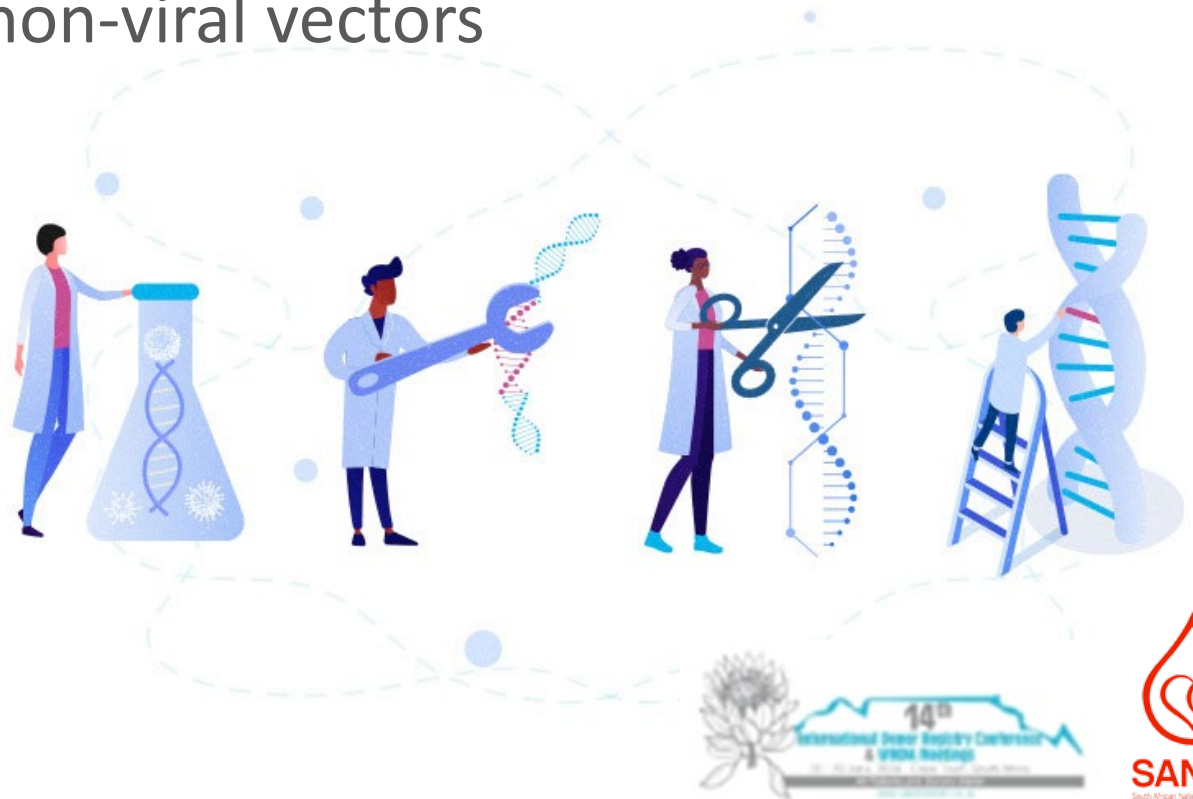
Additional Challenges Specific to South Africa

- Infrastructure
- Human resources
- Regulatory framework and ethical considerations
- Funding and resources
- Enhanced collaboration and networking

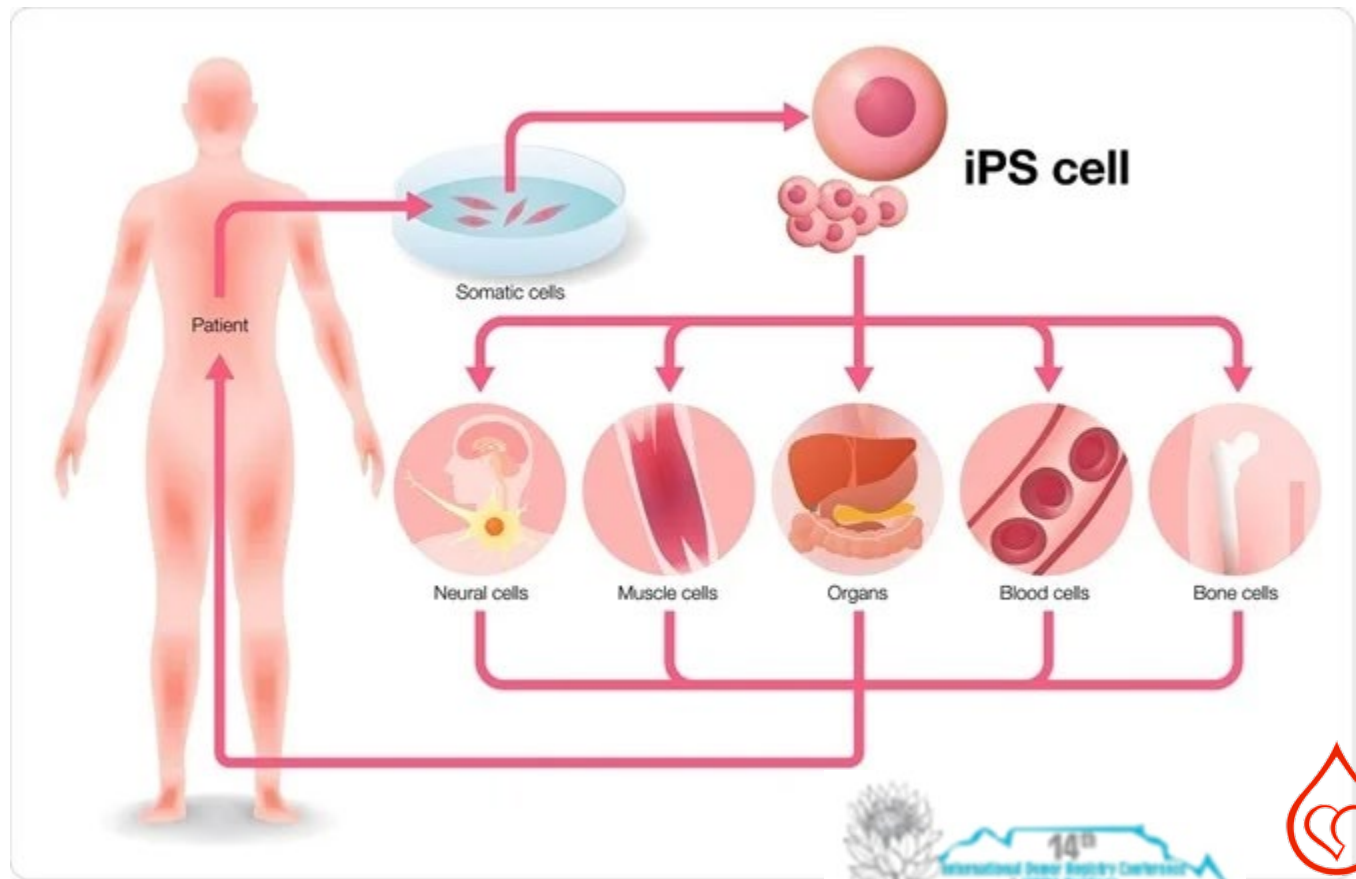
Emerging Issues



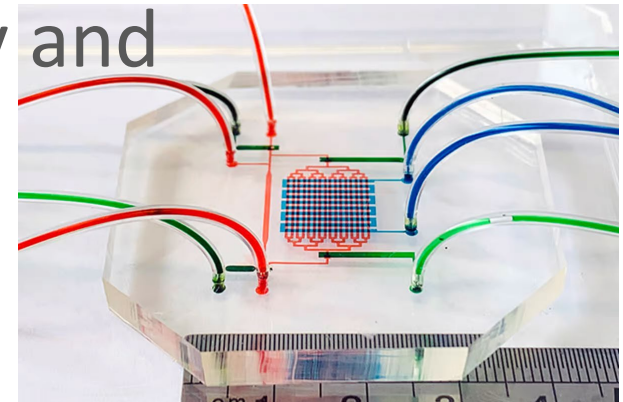
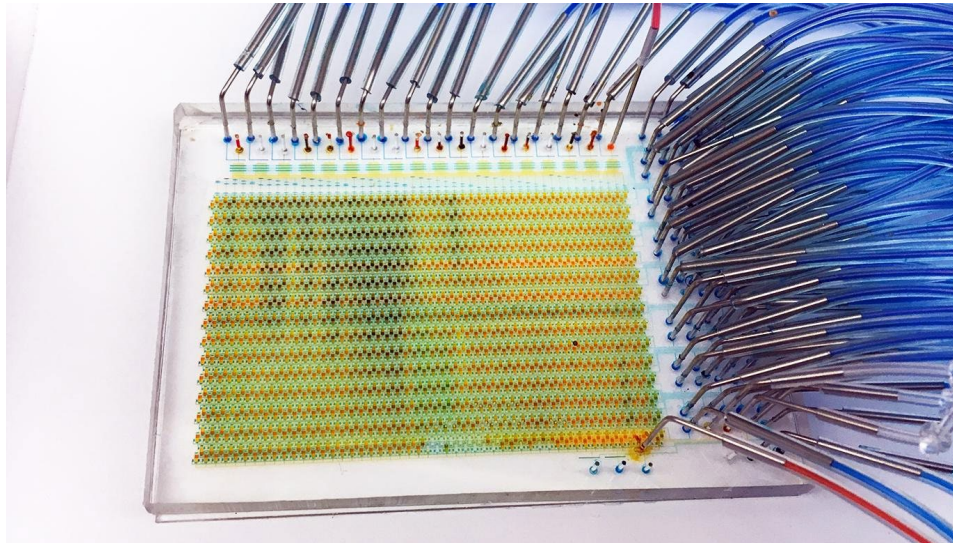
- Gene editing technologies
 - CRISPR-Cas9
 - Viral and non-viral vectors



- Inducible pluripotent stem cells (iPSC)



- 3D cell cultures and organoids
- Microfluidics, nanotechnology and automation
- High throughput screening



- International guidelines
- Consumables
 - Serum-free
- Cell-based assays
 - High-contrast screening technologies



AI in regenerative medicine

- AI empowers researchers to
 - analyse vast amounts of data
 - recognise patterns
 - make predictions based on that data

ARTIFICIAL INTELLIGENCE

MACHINE LEARNING

DEEP LEARNING

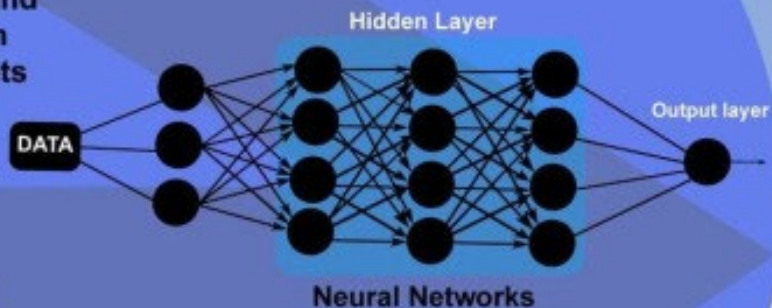


Programs that allow machines to mimic human behavior



Techniques that enable computers to improve at tasks without being explicitly programmed

Algorithms that adapt and learn from vast amounts of data



Artificial Intelligence Through Time

- Computations simulation
- Drug development
- Disease modeling
- Predictive modeling
- Personalised medicine
- Tissue engineering
- Cell therapy



Presently in South Africa

- Haematopoietic stem cells
 - Various transplant centers
 - SANBS JACIE accredited collection (mobile) and processing (central) facility
 - SANBS services both the public and private sector
 - ACT JACIE accredited, servicing private sector
- CAR-T cells
 - Safety trial by ACT and Oncolab

Conclusion

There are numerous challenges

Technology develops fast

Collaboration is essential

Promising future transforming health and well being

