

Addressing Critical Logistics Attributes

Logistics is the connection between manufacturing and the patient. Without an effective logistics platform advanced therapies will fail to treat patients, at scale. However, there are many variables when shipping a live cell across international boundaries, within a defined time-period and under strict temperature control.

To understand these variables and to support therapy developers in designing their logistics platforms. The Advanced Therapy Treatment Centres (ATTCs) have used the principles of [Logistics by Design](#) to develop a matrix of Import Guides. Creating an individual Import Guide for 16 key, global, locations. Each guide gives information on areas such as import regulations, flight times and average transit through customs time.

Logistics by Design builds on the established principles defined within Quality by Design and advises therapy developers to create a Target Logistics Profile (TLP) and define Critical Logistics Attributes (CLAs). This TLP is effectively a vision of what a supply chain should look like at commercial scale, whilst CLAs are the challenges expected when logistically delivering a therapy.

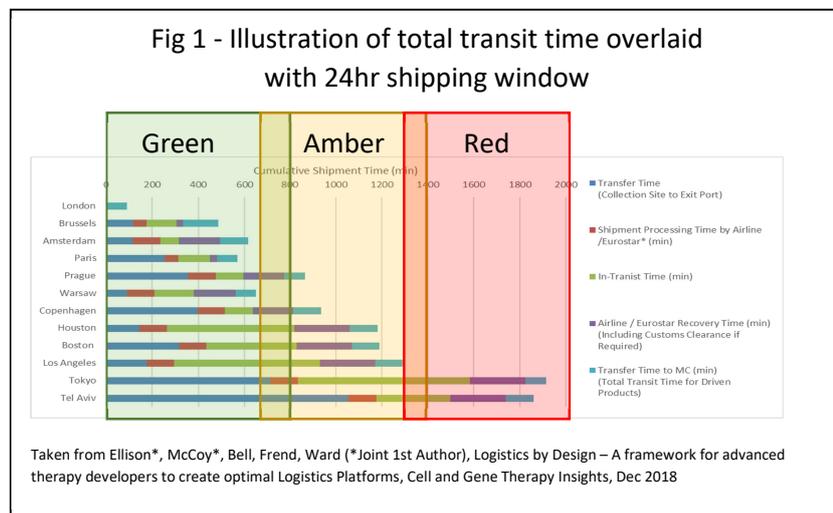
A defined TLP allows therapy developers to align the development of their logistics platform with their manufacturing and clinical platforms, ensuring that they don't create a therapy that works but can't be made, or one that can be made but can't be delivered.

An example of this would be in understanding the impact of a cryopreserved supply chain on the manufacturing strategy. Fig 1 shows total transit times from London Heathrow to multiple

locations. If we assume a 24 shipping window it can be seen that any of the countries in "green" can be supported from a manufacturing site in London, there is risk for those in "amber", and "red" is unrealistic. In this example, understanding these logistical facts will help

therapy developers invest early to either develop a cryogenic supply chain, or plan for multiple manufacturing sites.

Taking this logic further, early identification of CLAs can help therapy developers build robust clinical trial plans by identifying clinical sites that can issue donations and/or receive therapies within the defined shelf life. Whilst at commercial scale the same CLAs can help define the optimal donation times and optimise manufacturing



slot utilisation, especially when there may only be one flight per day between some cities.

In the creation of the Import Guides, multiple CLAs were identified, such as: -

- First flight out (on a carrier that has a track record of success)
- Shipping lane reliability (shipping A->B is not always the fastest route, sometime A->C->B is more effective)
- Established systems to maintain security whilst not exposing the cells to radiation
- Individual countries regulations (e.g. GMO restrictions)
- Customs operating hours (i.e. some ports-of-entry will only process advanced therapy shipments during limited working hours)

This risk based understanding of the challenges to advanced therapy transport has created a matrix of information. A sub-section of the matrix is show in Figure 2 and illustrates transit times for import into London. Within the import guides the matrix is supported by other key information required to start a conversation about creating a robust logistics platform at clinical and commercial scale (e.g. individual countries import regulations)

Fig 2 - Indicative Transit Times for import into London Heathrow

Port of exit	First flight out (24hr clock) ¹	Customs transit (export) ²	Lane Map and Duration ³	Customs transit (import)	Total time ⁴
Shanghai	0950	18	20 (SHA-ZRH-LHR)	4	42
LA	1610	4	11 (LAX-LHR)	4	19
Amsterdam	1015	6	2 (AMS-LHR)	4	12
Buenos Aires	1805	15	14 (BUE-FRA-LHR)	4	33

These import guides are now being used within the ATTCs to support therapy developers create logistics platforms that not only operate at clinical scale but can evolve into commercially viable operations. Part of the ATTCs' mission is to develop a supportive ecosystem for advanced therapies and companies not collaborating within the ATTCs can gain from the import guides by contacting sellison@worldcourier.co.uk.

¹ Times based on first available flight and the assumption that the shipment will be available at this time.

² This is an average time calculated using metrics from World Courier movements through this customs station, including tender-to the airline. It assumes that all paperwork has been completed correctly and in a timely manner.

⁴ This is the cumulative time taken (hours) from entry into port-of-exit until available for collection by World Courier driver, at the port-of-entry