Receiver:	Federal Office of Public Health	
Version:	17.03.2017	Authors: M. Straub & L. Soutter

Introduction

The purpose of this mandate was to prove the liability of QC Kits from Biodex and CellTech for 99mTc radiopharmaceuticals (RPH). We tested two kits available on the market for the following radiopharmaceuticals:

- Teceos (CIS bio international F-91192 GIF SUR YVETTE)
- Maasol (GE Healthcare AG, Opfikon)
- TechneScan® Sestamibi (Mallinckrodt Suisse SA 6312 Steinhausen)

Material and methods

Biodex (http://www.biodex.com)

Small and thin strips which migrate very quickly.

Biodex Tec-control™	Sestamibi	150-991	06-104Rev A	EXP : 20.12.2017
Biodex Tec-control™	DPD, HDP, MDP, DTPA, …	150-005	09-103Rev A	EXP : 20.04.2017
Biodex Tec-control™	DPD, HDP, […], MAA, sulfur coloid, …	150-001	09-011	EXP : 20.06.2017

Method 1: « Determination of free pertechnetate in Tc-99m labeled MAA, Sulfur colloid , Stannous chlorid, Albumin colloid and glucoheptonate »

1. Add 1cc of acetone solvent to a developing vial.

2. Using a red chromatography strip, spot approximately 10 ul of the test sample onto the bottom line (origin) of the test strip.

3. Immediately place the test strip into the developing vial containing acetone, and develop until the solvent front migrates to top line (solvent front).

4. Remove strip from the vial and allow drying.

5. Cut strip at central line (cut line), producing sections 1 and 2.

6. Using a gamma counter, count background and calculate the net counts by subtracting the background counts from the number of counts registered for each strip section.

Method 2: « Determining free pertechnetate hydrolyzed reduce3d Tc-99m and % labeling in Tc-99m labeled DTPA, Diphosphonate, Pyrophosphate and MDP »

1. Add 1cc of acetone solvent to a developing vial.

2. Using a red chromatography strip, spot approximately 10 ul of the test sample onto the bottom line (origin) of the test strip.

3. Immediately place the test strip into the developing vial containing acetone, and develop until the solvent front migrates to top line (solvent front).

4. Remove strip from the vial and allow drying.

5. Cut strip at central line (cut line), producing sections 1 and 2.

6. Using a gamma counter, count background and calculate the net counts by subtracting the background counts from the number of counts registered for each strip section.

7. In a clean developing vial place approximately 1cc of distilled H2O solvent.

8. Select one strip of the black chromatography paper and spot approximately 10 ul of the test compound onto the bottom line (origin). For MDP, pre-spot the black strip with 10 ul of unlabeled MDP (See note below).

9. Immediately place the test strip into the developing vial containing distilled H2O and develop until the solvent front migrates to top line (solvent front).

10. Remove the strip from the vial and allow drying.

11. Cut strip at center line (cut line) into sections 3 and 4.

12. Using a gamma counter, count background and calculate the net counts by subtracting the background counts from the number of counts registered for each strip section.

CellTech (http://www.cell-tech.it)

The kit contains all necessary equipment, TLC supports and a mobile phase.

Kit CQT09.0012	Sestamibi 12x	LOT : 2480	EXP : 31.03.2018
Kit CQT20.0012	DPD 12x	LOT : 2481	EXP : 31.03.2018
Kit CQT07.0012	MAA 12x	LOT : 2473	EXP : 31.03.2018

For these tests we did not use all the equipment provided by CellTech because we already have the equivalent setup with our material. Our installation is technically comparable to the equipment of the Celltech kit.

We have proceeded as described below:

1. Take the CellTech strip and make pencil marks to well center the spot and to identify the migration front.

2. Put the solvent into a plastic container of Celltech and place it in one of our migration tanks.

3. Hang the strip in the tank and put it into the solvent.

4. Take out the strip after the migration is complete and let dry.

5. Read on a miniGITA TLC scanner.

Method 1: « MAA »

Instructions:

1. Withdraw an 1 ml syringe, connect a needle and draw up 200 µl of the radiopharmaceutical.
   Disconnect the needle and connect the luer adaptor of the syringe to PCTE filter. Deposit the withdrawn volume of the radiopharmaceutical on the filter by pushing the piston of the syringe, paying attention to position the syringe vertically up. Disconnect the syringe and dispose of the syringe and the needle as radioactive waste.
2. Withdraw a 20 ml syringe pre-filled with physiological solution, connect the luer lock adaptor of the syringe to a PCTE filter. Re-aspirate slightly to avoid leakage from the filter and position the syringe with the filter in a dose calibrator to determine it's radioactivity (value **R1**).
3. Position the filter upon a 20 ml Falcon tube, with the syringe vertically up. Proceed with filtration, pushing the saline solution through the membrane until all the solution is in the tube. Position the syringe with the filter in a dose calibrator to determine it's radioactivity (value **R2**).Once the filtration is complete, dispose of the tube, the syringe and the filter as radioactive waste.
4. Radiochemical purity calculation:

   % PR= R2 / R1 x 100%

Method 2: « DPD »

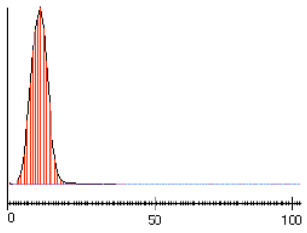
Instructions:

1. Open the plastic bottle containing glass bottle with the eluent. Pour the content of the glass bottle into the plastic bottle. Close the migration chamber with a plug.
2. Open the package containing stationary phase, withdraw the strip using apposite tweezers and place it correctly on the deposition device CQH11 reference.
3. Withdraw a capillary from the container and insert it into the top end of the capillary holder pen. Place the capillary holder pen in the apposite notch cut on the side of the support. Maintain the position and push the cap of the capillary holder pen until the capillary comes out. Draw up the radiopharmaceutical simply submerging the capillary tip in the solution for 1 second. Position the capillary holder pen in the apposite hole of the support. Proceed with deposition of the radiopharmaceutical, moving down the support in the way to allow the pen to go down slowly until it touches the stationary phase. A simple contact causes outflow of the radiopharmaceutical from the capillary to the strip in 2-3 seconds with formation of the precise spot. After deposition, release the support until it comes back to the initial position. Remove the capillary holder pen from the support, push the cap to extract the capillary. Dispose of the capillary as radioactive waste.
4. Withdraw the closure plug with hook CQH04 and hook the stationary phase. To position the stationary phase inside the chamber, insert the plug into the circular duct CQH03 until resistance is felt; in this way the plug closes the chamber allowing establishment of the saturation with eluent vapours, but the stationary phase doesn't come into contact with the eluent. Attend the necessary time depending on the type of the eluent until the saturation is established, then push the plug to the end of the run overcoming resistance; now the stationary phase comes into contact with the eluent and the chromatographic run begins.
5. Observe the migration with the light source CQH05. References marked on the migration chamber indicate measurements in cm for easy evaluation of the proceeding of the chromatographic run. Once the chromatographic run is completed (from 5 to 10 cm), remove the plug with the stationary phase and attend it's drying.
6. Cut the stationary phase in 2 pieces to examine with dose calibrator, alternatively perform the analysis with radiochromatography detector.
7. **Radiochemical purity calculation:**

   % PR = [Radioactivity at RF 0 / Total radioactivity] x 100%

   A percentage of complex ^{99m}Tc-dPD ≥ 95 % is to be considered an acceptable preparation.

Expected graph:



Method 3: « Sestamibi »

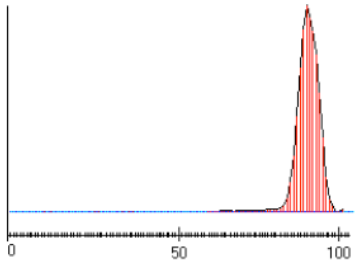
Instructions:

1. Open the plastic bottle containing glass bottle with the eluent. Pour the content of the glass bottle into the plastic bottle.
2. Open the package containing stationary phase, withdraw the strip using apposite tweezers and place it correctly on the deposition device CQH11 reference.
3. Withdraw a capillary from the container and insert it into the top end of the capillary holder pen. Place the capillary holder pen in the apposite notch cut on the side of the support. Maintain the position and push the cap of the capillary holder pen until the capillary comes out. Draw up the eluent simply submerging the capillary tip in the liquid for 1 second. Position the capillary holder pen in the apposite hole of the support. Proceed with deposition of the eluent, moving down the support in the way to allow the pen to go down slowly until it touches the stationary phase. A simple contact causes outflow of the liquid from the capillary to the strip in 2-3 seconds with formation of the precise spot. After deposition, release the support until it comes back to the initial position. Remove the capillary holder pen from the support, push the cap to extract the capillary. Dispose of the capillary.
   Without letting the drop of the eluent dry, repeat the procedure described above for the radiopharmaceutical, depositing it upon the drop of the eluent. Dispose of the capillary as radioactive waste.
   Position the plastic bottle inside the migration chamber CQH01. Close the migration chamber with a plug.
4. Withdraw the closure plug with hook CQH04 and hook the stationary phase. To position the stationary phase inside the chamber, insert the plug into the circular duct CQH03 until resistance is felt; in this way the plug closes the chamber allowing establishment of the saturation with eluent vapours, but the stationary phase doesn't come into contact with the eluent. Attend the necessary time depending on the type of the eluent until the saturation is established, then push the plug to the end of the run overcoming resistance; now the stationary phase comes into contact with the eluent and the chromatographic run begins.
5. Observe the migration with the light source CQH05. References marked on the migration chamber indicate measurements in cm for easy evaluation of the proceeding of the chromatographic run. Once the chromatographic run is completed (from 5 to 10 cm), remove the plug with the stationary phase and attend it's drying.
6. Cut the stationary phase in 2 pieces to examine with dose calibrator, alternatively perform the analysis with radiochromatography detector.
7. **Radiochemical purity calculation:**

   % RP = [Radioactivity at RF 1 / Total radioactivity] x 100%

   A percentage of complex ^{99m}Tc-Sestamibi ≥ 94 % is to be considered an acceptable preparation.

Expected graph:



Official methods of the radiopharmaceutical companies

We compared the methods of the CellTech and Biodex kits with the official SPC (summary of product characteristics) methods of the radiopharmaceutical companies.

SPC method Teceos (CIS bio international F-91192 GIF SUR YVETTE)

The quality control (labeling efficiency, unbound [99mTc] free fraction of free pertechnetate) of labeled DPD [99mTc] can be carried out in 10 minutes, 5 minutes after labeling, using upward chromatography on (ITLC-Gelman SG plates) using methyl ethyl ketone or 1N sodium acetate solution as solvent.

The methyl ethyl ketone quantitatively separates the free pertechnetate located on the "front line" (Rf 0.8-0.9) of the labeled DPD preparation (Rf 0.0-0.1) (start).

The distribution of the activity on the chromatogram is recorded using a gamma-scanner and thin layer paper. A mathematical calculation of the percentage of the different components found in relation to the total activity applied is applied.

The labeling yield should be at least 95% of the total activity applied, and the percentage of Tc-99m free pertechnetate and unbound oxidized Tc-99m should be less than 1% and 2%, respectively.

With the exception of the two Rf values mentioned for the two separating systems, the chromatograms must have no trace of other marked components.

Reference: http://www.swissmedicinfo.ch/ le 23.06.2016

SPC method Maasol (GE Healthcare AG, Opfikon)

a) Quantify the radioactivity not filterable 5 minutes after labeling:

- Membrane filter, pore filter, 3 µm diameter
- Filter volume 200 µl
- Washing solution 20 ml of saline solution

The radioactivity remaining in the membrane must be ≥ 90% of the total radioactivity (per 200 µl).

b) The labeling yield is determined by thin-layer chromatography support of silicic acid.

- Support TLC-SA Varian / Agilent Technologies
- Solvent methanol: water, 85:15 (v / v)
- Duration 25 to 30 minutes
- [...]

The marking efficiency must be at least 95%.

Reference : http://www.swissmedicinfo.ch/ le 23.06.2016

***TechneScan*® Sestamibi** *(Mallinckrodt Suisse SA 6312 Steinhausen)*

- Baker-Flex aluminum oxide plates, # 1 B-F, pre-cut of 2.5 cm x 7.5 cm.
- Ethanol > 95% ACS grade.
- Capintec, or an equivalent instrument for measuring radioactivity in the range of 5 - 300 mCi (0.2 - 11.12 GBq).
- 1 ml syringe with needle (caliber 22 - 26 gauge).

A small development tank with lid (a 100 ml beaker, covered with Parafilm®, is suitable).

Reference: http://www.swissmedicinfo.ch/ le 24.06.2016

Instruments used for reading the chromatograms: TCL Scanners MiniGita

1. Raytest MiniGita, IRA-3145 with BGO IRA-3146 (CHUV)

2. Raytest MiniGita, IRA-1520 with BGO IRA-1521 (CHUV)

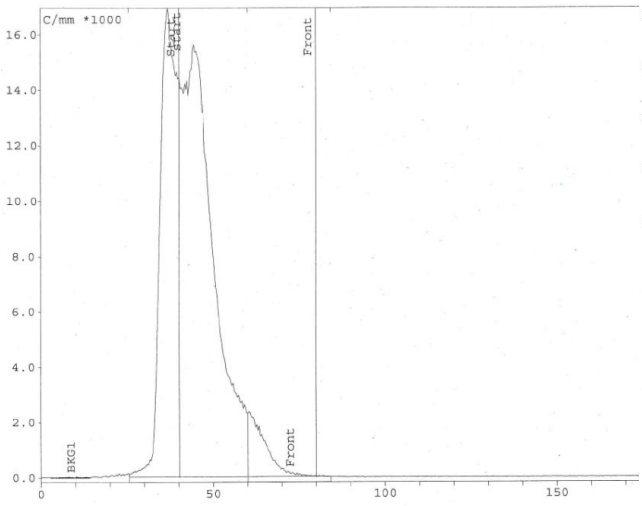
Results KIT Biodex

Applying paper chromatography, the MRPs were measured with the material and according to the instructions of the kits, and compared to the methods of the official SPCs. The measurements were made using a TLC scanner and the scissors cutting method applying a dose calibrator.

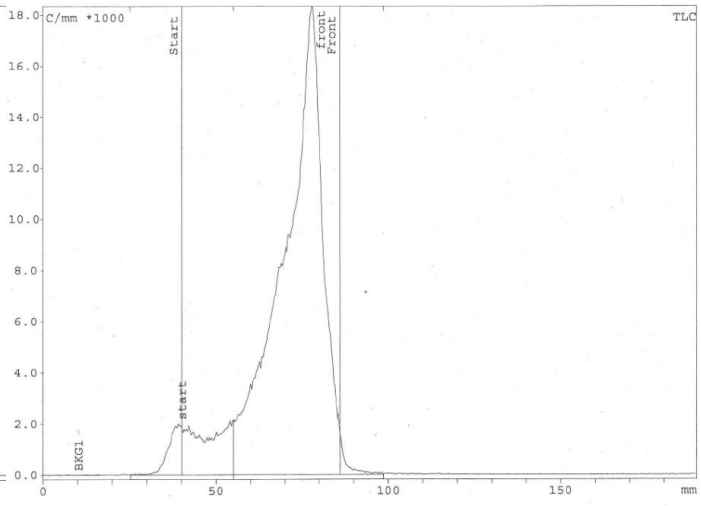
DPD Results Biodex™

Date	Hour	RPH	No°	Support	Mobile Phase	Sample Volume	% Start	% Front	SPC % start	SPC % front	Activity Start	Activity Front	Ratio: (%)
18.05.2016	11:30:00	DPD	F007B	Biodex 150-005	H2O	10	18.38	81.62	0.11	99.89	1.36	6.512	82.72
18.05.2016	11:35:00	DPD	F007B	Biodex 150-001	Acétone	10	94.40	5.60	100.19	-0.19	7.132	0.405	5.37
23.05.2016	10:41:00	DPD	F007B	Biodex 150-005	H2O	10	13.71	86.29	0.09	99.91	1.677	12.48	88.15
23.05.2016	10:36:00	DPD	F007B	Biodex 150-001	Acétone	10	98.15	1.85	100.22	-0.22	13.65	0.134	0.97
29.06.2016	10:17:00	DPD	G001E	Biodex 150-001	Acétone	10	97.54	2.46	100.20	-0.20	9.267	0.173	1.83
29.06.2016	10:22:00	DPD	G001E	Biodex 150-005	H2O	10	20.51	79.49	0.08	99.92	1.454	5.642	79.51
29.06.2016	12:52:00	DPD	G001E	Biodex 150-001	Acétone	10	95.05	4.95	100.20	-0.20	7.133	0.318	4.27
29.06.2016	13:03:00	DPD	G001E	Biodex 150-005	H2O	10	11.83	88.17	0.08	99.92	0.856	6.472	88.32
01.07.2016	10:21:00	DPD	G001E	Biodex 150-001	Acétone	10	95.84	4.16	100.10	-0.10	15.08	0.598	3.81
01.07.2016	10:29:00	DPD	G001E	Biodex 150-005	H2O	10	16.62	83.38	0.20	99.80	2.221	12.37	84.87
01.07.2016	10:48:00	DPD	G001E	Biodex 150-001	Acétone	10	96.31	3.69	100.10	-0.10	14.3	0.454	3.08
01.07.2016	11:01:00	DPD	G001E	Biodex 150-005	H2O	10	16.75	83.25	0.20	99.80	2.058	10.7	83.37
04.07.2016	08:24:00	DPD	G001E	Biodex 150-001	Acétone	10	96.59	3.41	100.12	-0.12	15.74	0.453	2.80
04.07.2016	08:30:00	DPD	G001E	Biodex 150-005	H2O	10	8.66	91.34	0.09	99.91	1.208	14.87	92.49
04.07.2016	09:03:00	DPD	G001E	Biodex 150-001	Acétone	10	94.72	5.28	100.12	-0.12	14.53	0.635	4.19
04.07.2016	09:12:00	DPD	G001E	Biodex150-005	H2O	10	12.32	87.68	0.09	99.91	1.636	13.03	88.84

*Example chromatogram **DPD** Biodex*



DPD Biodex 150-001 Acetone 10µl (TcO4)

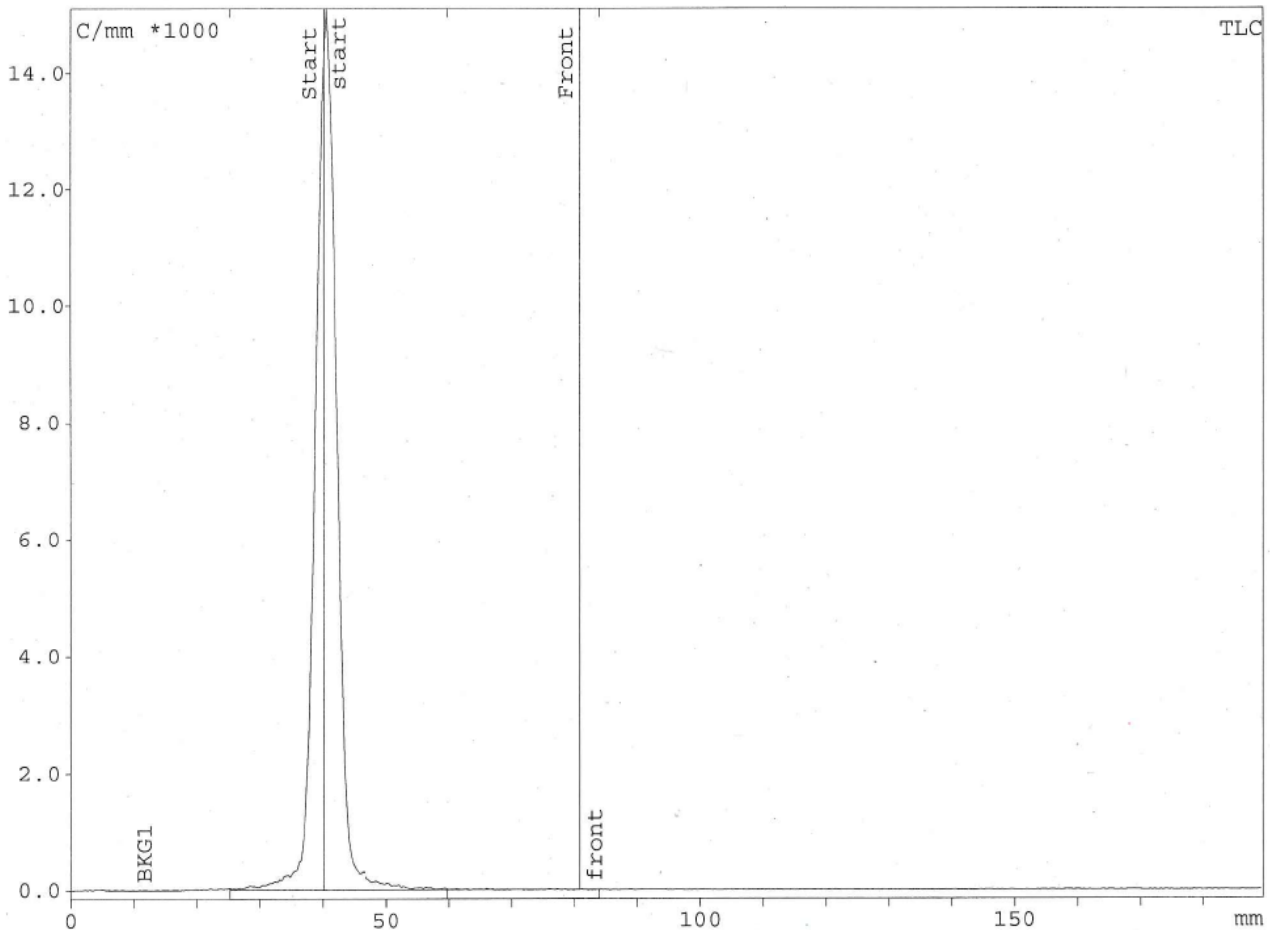


DPD Biodex 150-005 H2O 10µl (TcO2)

Maasol Results Biodex™

Date	Hour	RPH	No°	Support	Mobile Phase	Sample Volume	% Start	% Front	SPC % start	% front	Activity Start	Activity Front	Ratio: (%)
02.06.2016	10:40:00	MAASOL	F00415005	Biodex 150-001	Acetone	10	99.17	0.83	100.21	-0.21	0.338	0.001	0.29
08.06.2016	14:32:00	MAASOL	F00415005	Biodex 150-001	Acetone	10	99.39	0.61	100.00	0.00	0.138	0.002	1.43
29.06.2016	13:22:00	MAASOL	F00415006	Biodex 150-001	Acetone	10	99.86	0.14	100.16	-0.16	1.568	0.003	0.19
29.06.2016	13:29:00	MAASOL	F00415006	Biodex 150-001	Acetone	10	99.73	0.27	100.16	-0.16	0.078	0.003	3.70
01.07.2016	11:19:00	MAASOL	F00415006	Biodex 150-001	Acetone	10	99.97	0.03	100.03	-0.03	2.358	0.001	0.04
01.07.2016	11:27:00	MAASOL	F00415006	Biodex 150-001	Acetone	10	99.97	0.03	100.03	-0.03	2.004	0.001	0.05
04.07.2016	09:40:00	MAASOL	F00415006	Biodex 150-001	Acetone	10	99.90	0.10	100.28	-0.28	2.636	0.001	0.04
04.07.2016	09:46:00	MAASOL	F00415006	Biodex150-001	Acetone	10	99.78	0.22	100.28	-0.28	0.538	0.002	0.37

*Example chromatogram **Maasol** Biodex*

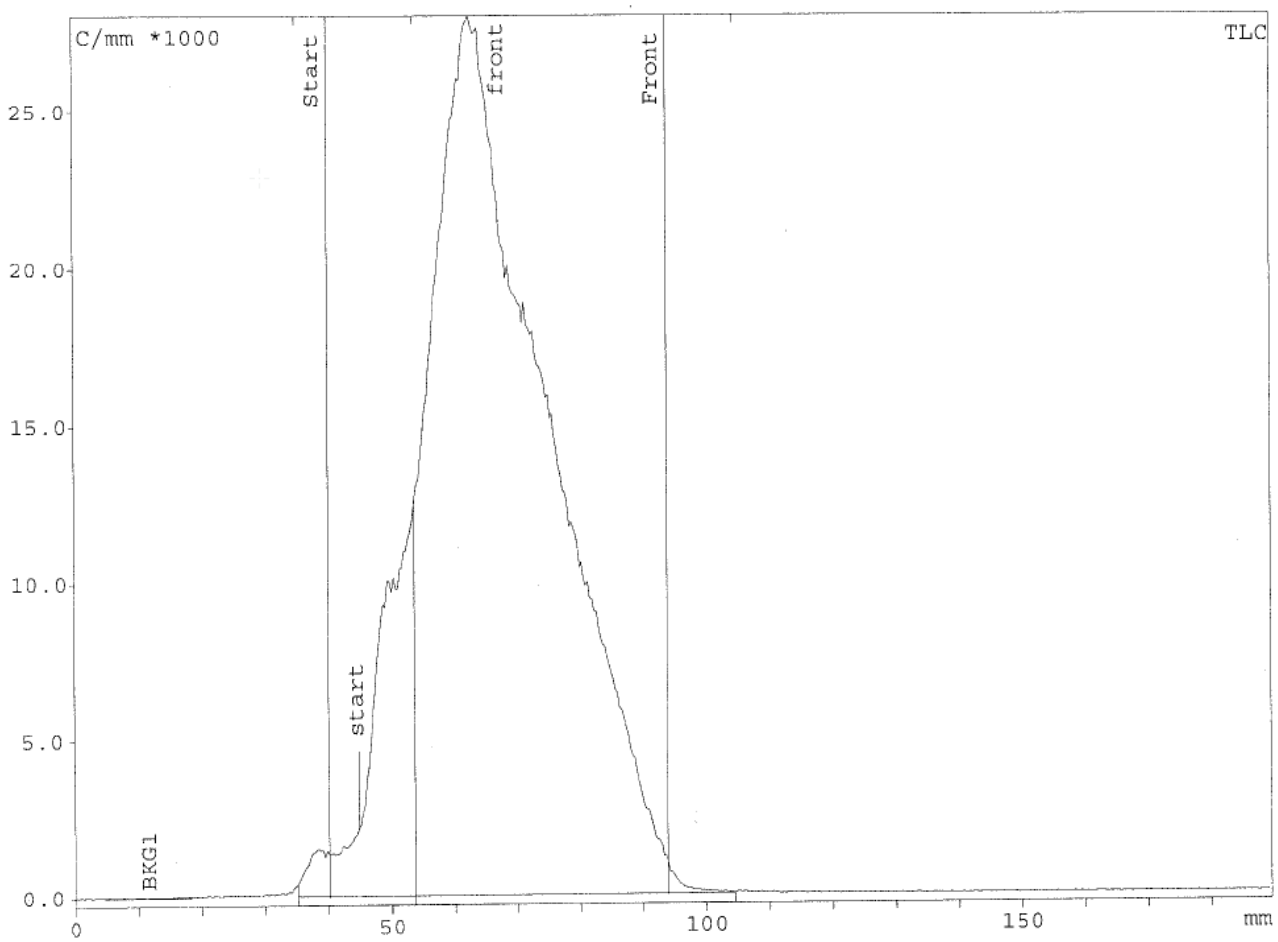


MAASOL Biodex 150-005 Acetone 10 µl

Sestamibi Results Biodex™

Date	Hour	RPH	No°	Support	Mobile phase	Sample Volume	% Start	% Front	SPC % start	SPC % front	Activity Start	Activity Front	Ratio : (%)
27.05.2016	12:43:00	SESTAMIBI	343767	Biodex 150-991	Ethyl Acetate IRA	10	9.6	90.4	1.77	98.23	-	-	-
27.05.2016	12:33:00	SESTAMIBI	343767	Biodex 150-991	Ethyl Acetate Sigma	10	12.39	87.61	1.77	98.23	-	-	-
30.05.2016	11:39:00	SESTAMIBI	338988	Biodex 150-991	Ethyl Acetate Sigma	10	31.66	68.34	2.02	97.98	3.534	6.164	63.56
30.05.2016	11:49:00	SESTAMIBI	338988	Biodex 150-991	Ethyl Acetate IRA	10	11.49	88.51	2.02	97.98	0.992	8.125	89.12

Example chromatogram ***Sestamibi*** *Biodex*



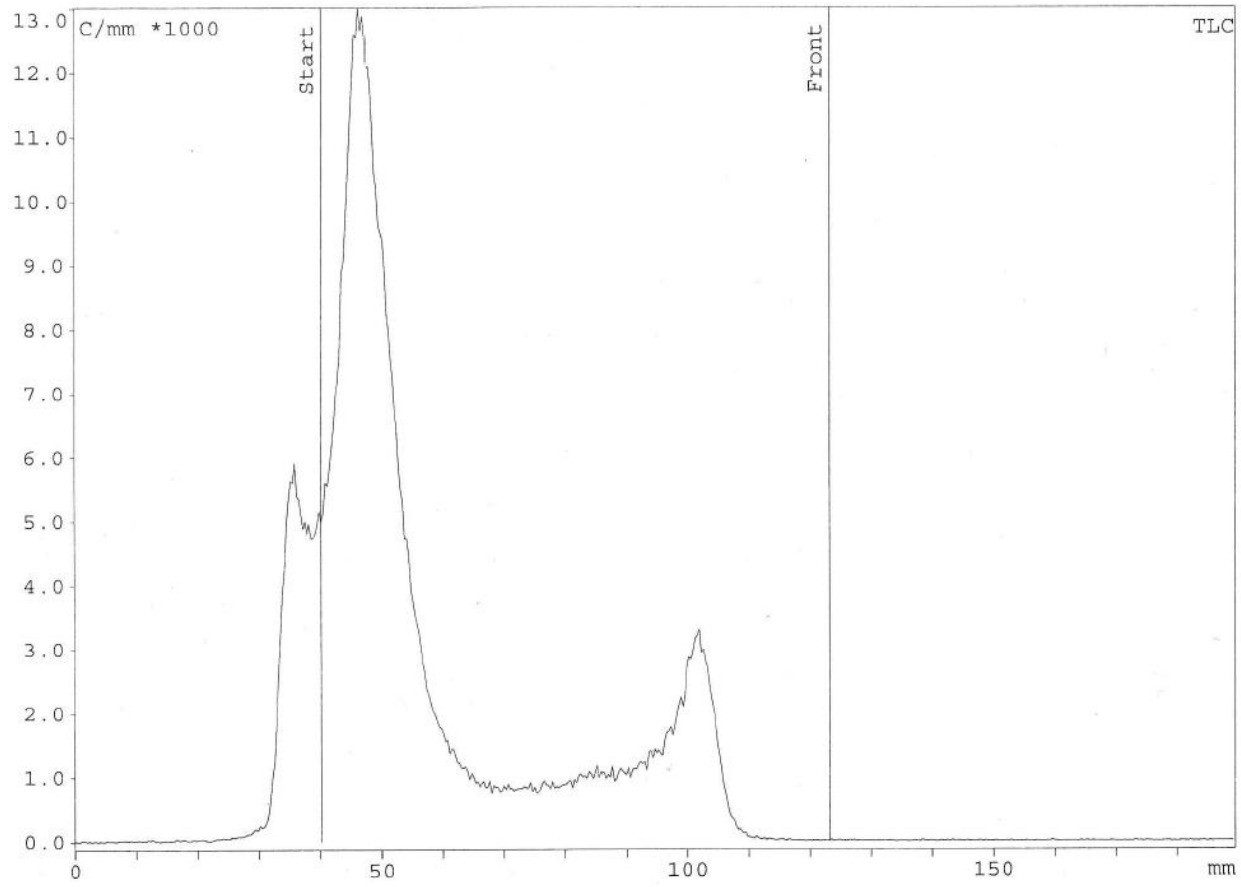
Sestamibi Biodex 150-991 Ethyl Acetate 10µl

Results KIT CellTech

DPD Results CellTech

Date	Hour	RPH	No°	Support	Mobile Phase	Sample Volume	% Start	% Front	SPC % start	SPC % front	Activity Start	Activity Front	Ratio: (%)
18.05.2016	12:09:00	DPD	F007B	CellTech Whatmann 1	MeOH 70%	10	-	-	100.19	-0.19	2.641	0.262	9.03
23.05.2016	11:08:00	DPD	F007B	CellTech Whatmann 1	MeOH 70%	10	-	-	100.22	-0.22	10.14	1.394	12.09
08.06.2016	10:26:00	DPD	F005H	CellTech Whatmann 1	MeOH 70%	10	-	-	100.07	-0.07	12.51	1.854	12.91
05.07.2016	12:42:00	DPD	G001E	CellTech Whatmann 1	MeOH 70%	10	-	-	99.9	0.01	-	-	-
05.07.2016	14:48:00	DPD	G001E	CellTech Whatmann 1	MeOH 70%	10	-	-	99.9	0.01	-	-	-
05.07.2016	12:40:00	DPD	G001E	CellTech Whatmann 1	MeOH 70%	10	88.12	11.88	99.9	0.01	-	-	-

*Example chromatogram **DPD** CellTech*



DPD CellTech Whatmann1 MeOH 70% 10µl

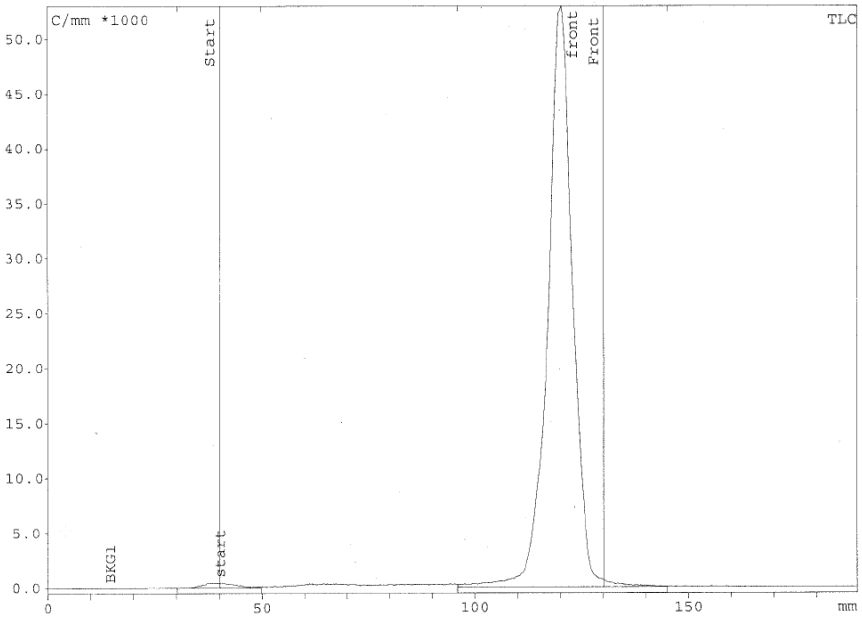
Maasol ResultsCellTech

Date	Hour	RPH	No°	Kit	Measure Before	Measure After	Purity
01.06.2016	11:00:00	MAA	F00415005	CellTech	33.91	34.61	? activity higher than before filtration
01.06.2016	11:00:00	MAA	F00415005	CellTech	31.87	31.48	98.78
27.05.2016		MAA	F00415005	CellTech	76.88	78.27	? activity higher than before filtration
		MAA	F00415005	CellTech	10.39	10.32	99.33
02.06.2016	10:00	MAA	F00415005	CellTech	12.54	12.47	99.44
08.06.2016	14:00	MAA	F00415005	CellTech	15.06	14.78	98.14
		MAA	F00415005	CellTech	12.17	12.13	99.67
15.06.2016		MAA	F00415005	CellTech	25.79	25.67	99.53

Sestamibi Results CellTech

Date	Hour	RPH	No°	Support	Mobile Phase	Sample Volume	% Start	% Front	SPC % Start	SPC % Front
27.05.2016	12:50:00	SESTAMIBI	343767	Celltech Aluminium Oxide	Ethanol	10	1.32	98.68	1.77	98.23
30.05.2016	12:47:00	SESTAMIBI	338988	Celltech Aluminium Oxide	Ethanol	10	1.43	98.57	2.02	97.98
10.06.2016	11:20:00	SESTAMIBI	338988	Celltech Aluminium Oxide	Ethanol	10	1.69	98.31	1.94	98.06
17.06.2016	13:07:00	SESTAMIBI	170616	Celltech Aluminium Oxide	Ethanol	10	1.14	98.86	1.31	98.69
24.06.2016	10:50:00	SESTAMIBI	343767	Celltech Aluminium Oxide	Ethanol CellTech	10	2.27	97.73	2.76	97.24
24.06.2016	10:55:00	SESTAMIBI	343767	Celltech Aluminium Oxide	Ethanol CellTech	10	2.18	97.82	2.76	97.24
08.07.2016	17:40:00	SESTAMIBI	343803	Celltech Aluminium Oxide	Ethanol CellTech	10	1.34	98.66	1.70	98.30

*Example chromatogram **Sestamibi** CellTech*



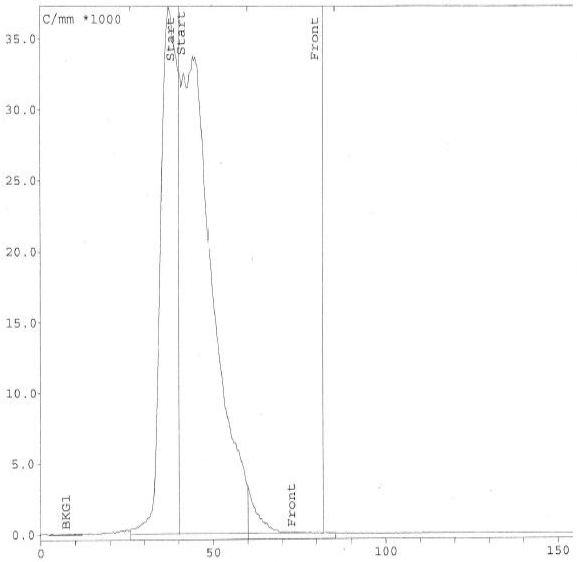
Sestamibi CellTech Aluminium Oxide Ethanol 10µl

Discussion of the results

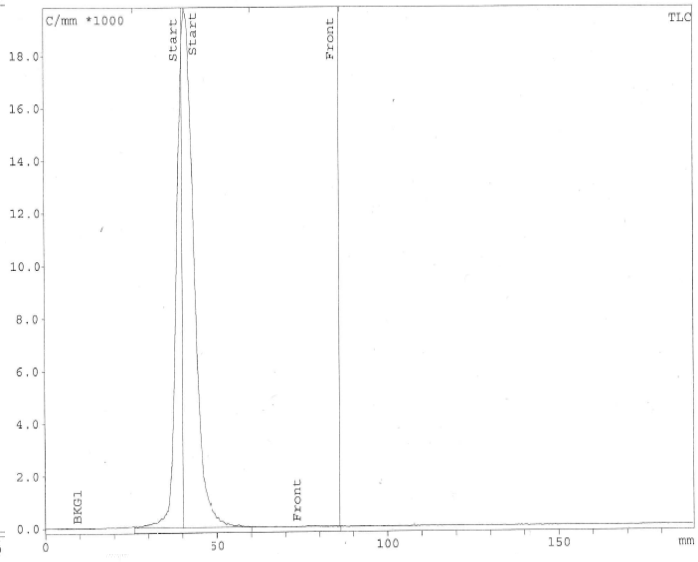
1) RPH DPD BIODEX

Biodex TLC bands are small bands that offer very fast migration. But we have seen several problems with these kits.

The main problem is the amount of radiopharmaceutical that Biodex asks to put on the strips. The 10 µl requested are not suitable. The product makes a too large spot at the start and the spot often comes into contact with the mobile phase in the tank. We tried to improve the results with a sample of 2 µl. The two chromatograms below show the difference between the two volumes deposited.

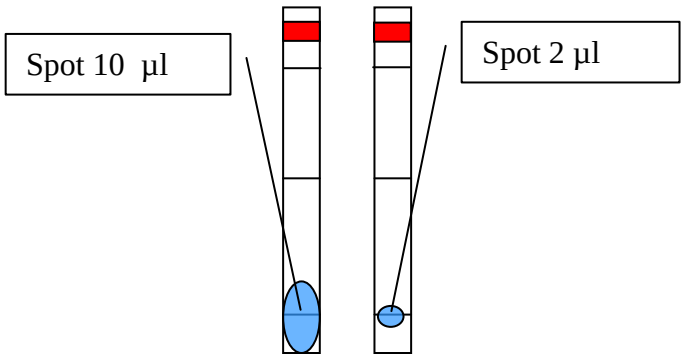


DPD Biodex 150-001 (Red) 10 µl



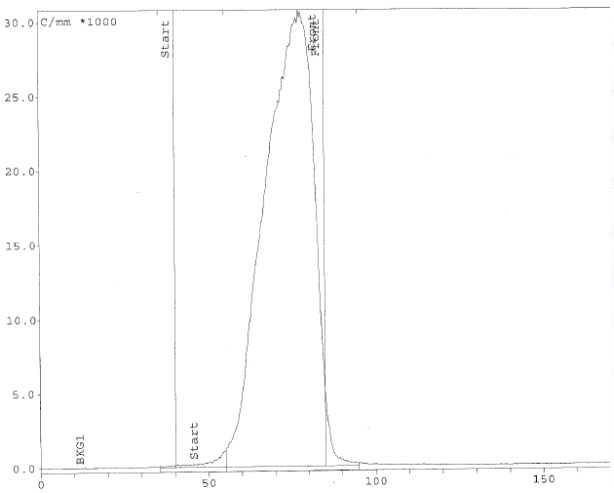
DPD Biodex 150-001 (Red) 2 µl

18.05.2016	11:35:00	DPD	F007B	Biodex 150-001	Acetone	10	94.4%	5.6%
18.05.2016	12:21:00	DPD	F007B	Biodex 150-001	Acetone	2	99.98%	0.02%

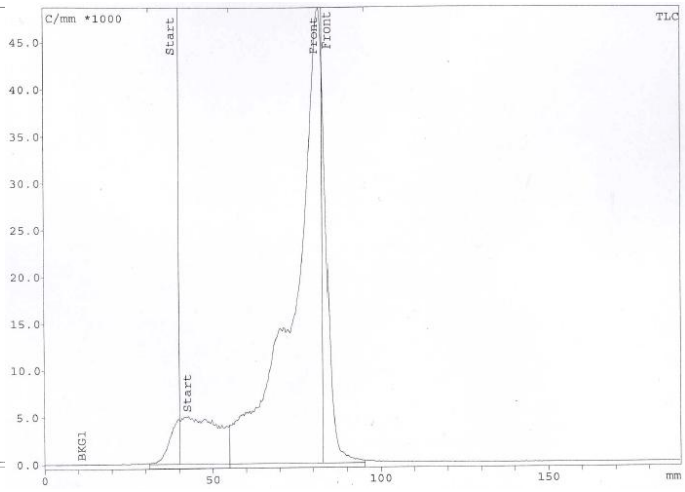


Problem with the solvent applied for identification of TcO_2

We suggest using a different solvent for identifying the TcO2. For the QC of DPD, the Biodex method proposes H2O as the mobile phase. This is not compliant with the official SPC method and not an ideal solvent for identifying TcO2. We have therefore tested the strip with the official solvent as a mobile phase, Na-Acetate. The difference in results is surprising. We move from 13.71% impurities for H2O to 0.99% for Na-Acetate.



Biodex 150-005 (Black) 10 µl Na-Acetate

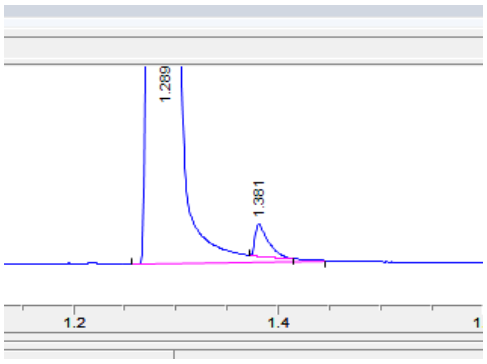


Biodex 150-005 (Black) 10 µl H_2O

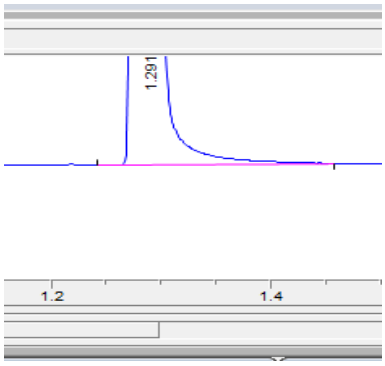
2) RPH DPD CellTech

For the CellTech Kit, the results are not suitable because we obtain an unresolved peak and therefore we can't integrate them correctly. For the scissors method we measure therefore very high impurity levels (see chromatogram in CellTech results).

We also compared the mobile phase given by CellTech with our mixture for QC method (MeOH/H2O 85:15 internal preparation CHUV). We found an impurity of CellTech MeOH (peak at 1.381 min), detectable by GC.



MeOH/H2O 70% CellTech



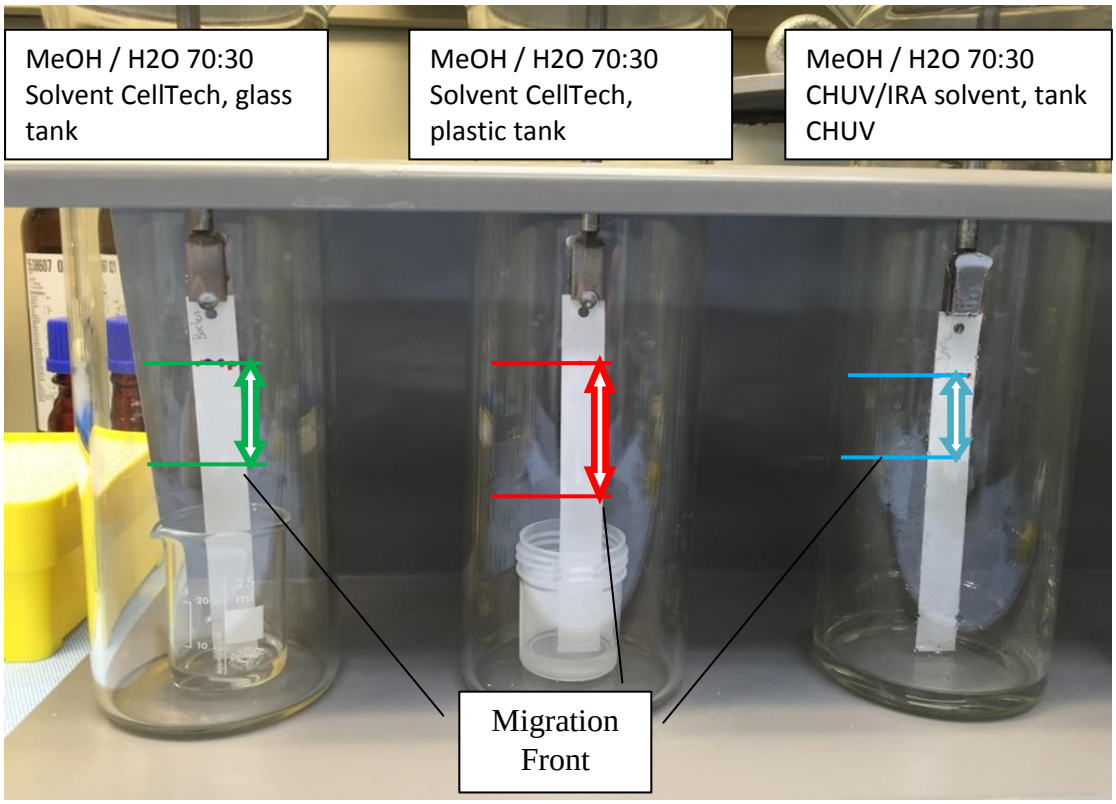
MeOH/H2O 85:15 mixture CHUV/IRA

Comparison of the tank systems with the one from CellTech

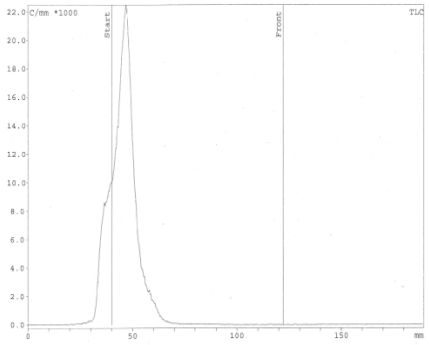
We tried 3 different tank setups:

- 1x MeOH/H2O 70:30 solvent CellTech but poured into a glass vial and not into their suggested plastic container.
- 1x MeOH/H2O 70:30 solvent CellTech poured into its own plastic container provided by CellTech.
- 1x MeOH/H2O 70:30 mixtures made with our own solvents (Merck Methanol 1.06007.1000 I809707 550, distilled H2O).

Already after a few minutes of migration we can see a clear difference between the containers and the mobile phase made by us. The migration of MeOH/H2O with the solvents of the our laboratory is faster. The MeO/H2O band in the plastic tank is the one that migrates most slowly.

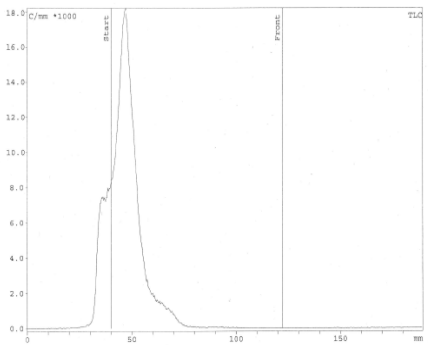


The chromatograms below show the additional migration time from CellTech compared to the migration time of the the official method (CHUV/IRA solvent).



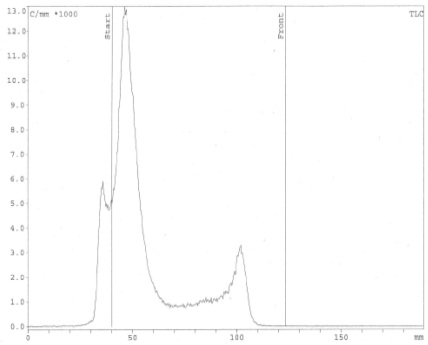
CHUV/IRA Solvent

+ 00’ 00’’ migration



CellTech solvent, glass vial

+ 5’ 45’’migration



CellTech solvent, plastic container

+ 17’ 45’’ migration

3) RPH Maasol BIODEX

Biodex bands are very performing for Maasol. The peak is well resolved and the area to cut is well defined. However, there is always a small concern with the amount of radiopharmaceutical deposited on the strip. Again, results can be improved by depositing only 2 µl instead of the 10 requested.

02.06.2016	10:40:00	MAASOL	F00415005	Biodex 150-001	Acetone	10	99.17 %	0.83 %
02.06.2016	10:50:00	MAASOL	F00415005	Biodex 150-001	Acetone	2	99.56 %	0.44 %
08.06.2016	14:32:00	MAASOL	F00415005	Biodex 150-001	Acetone	10	99.39 %	0.61 %
08.06.2016	14:28:00	MAASOL	F00415005	Biodex 150-001	Acetone	2	99.88 %	0.12 %

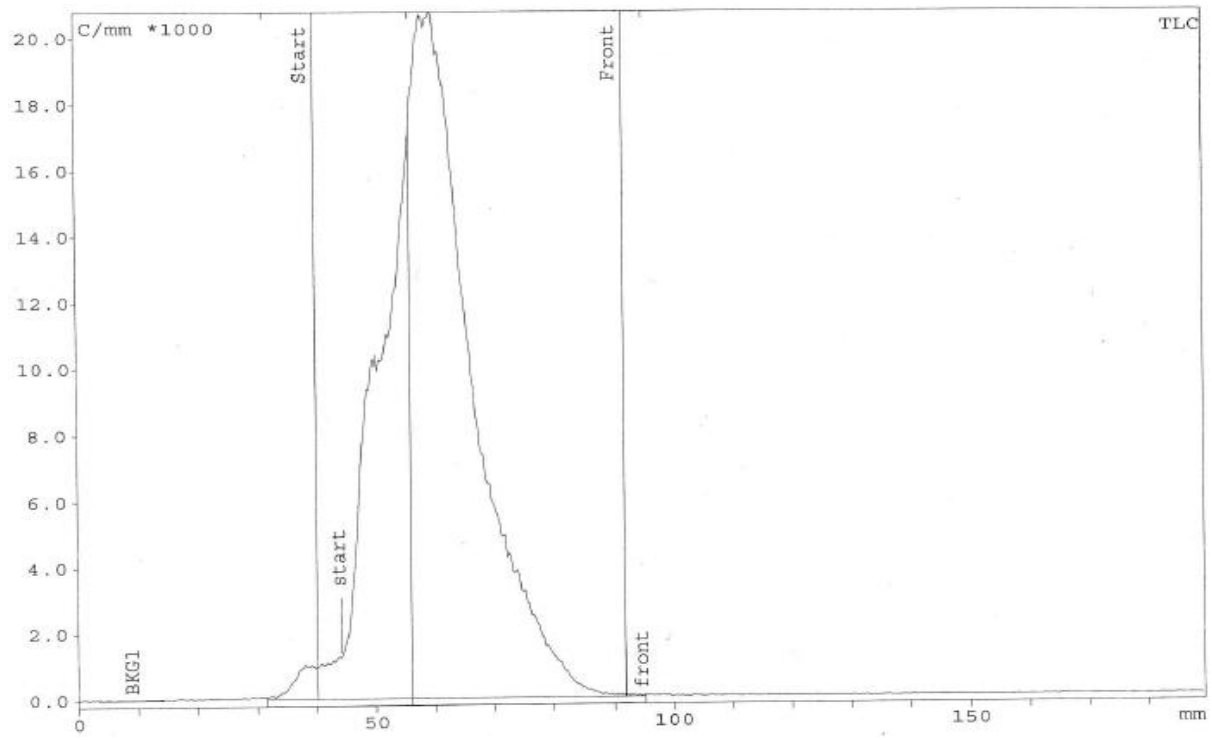
4) RPH Maasol CellTech

The CellTech Kit works well despite some volume problems. We found a concern with the filter because the procedure indicates to put 200 µl of the radiopharmaceutical in the filter even it can contain only a maximum of 145 µl. Also, the procedure is not really optimized in terms of radiation protection because there is a great risk of projections.

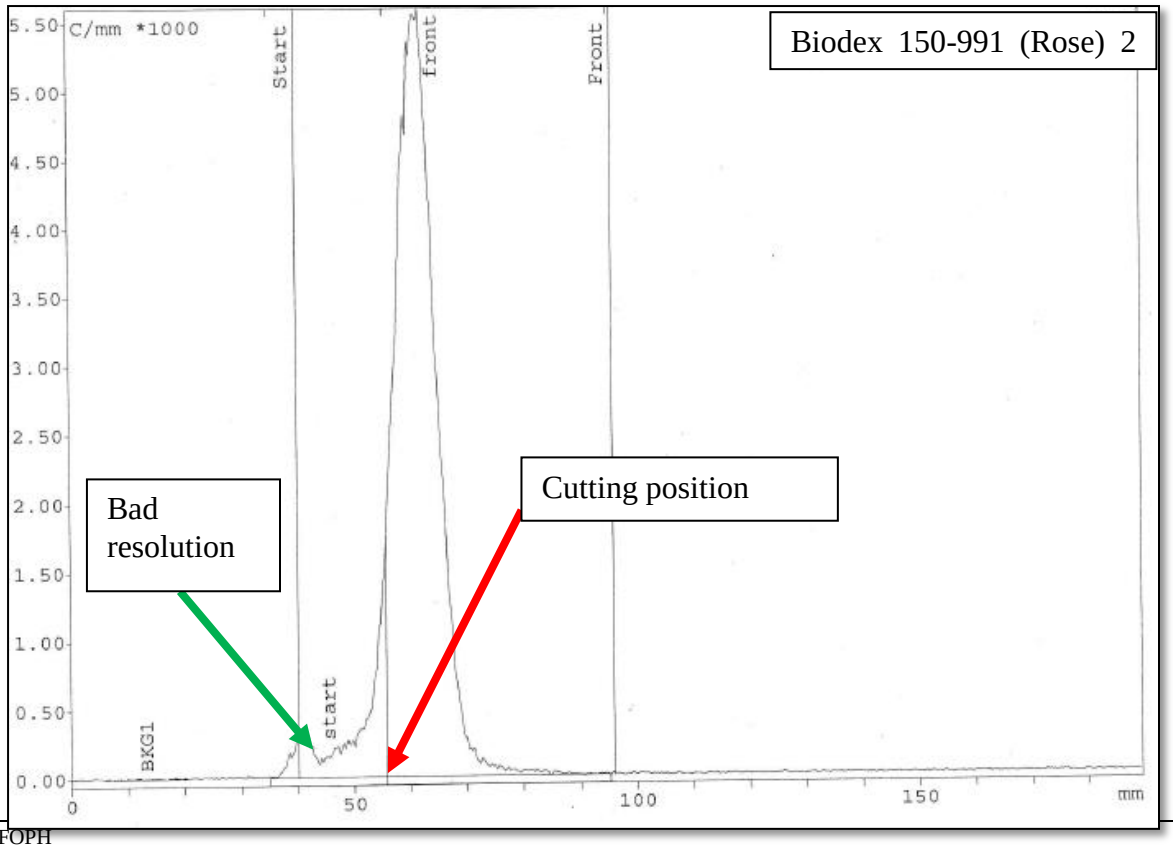
5) RPH Sestamibi Biodex

For the Biodex bands, we found several problems for the QC of Sestamibi.

The volume to be deposited of 10 µl is not suitable. The chromatogram below shows the width of a peak from a 10 µl sample. A volume of 2 µl is more suitable and gives a better but still not sufficient resolution.



The indication of the cutting line for the "scissors cutting" method by does calibrator measurement is not ideal, even with a smaller volume of 2 µl. As it can be seen from the graph below, the peak is often already reassembled before the cutting line as indicated in their instructions. The resolution of the peaks is not sufficient to correctly identify the percentages of the peaks.



6) RPH Sestamibi CellTech

The CellTech kit works well for this radiopharmaceutical, but unfortunately has a very long migration time. We found about 70 minutes of migration for a chromatogram. This is not suitable for use in nuclear medicine centers and the SPC method is preferable.

Conclusion

The tests carried out allowed us to take test the reliability of these kits. We think these kits are not a bad idea in itself but the methods proposed are clearly to be improved. The methods do not seem to be validated by the selling companies. Some of the kits give false-negative results, others false positives. The official methods of the SPC remain the reference methods for the quality control of these radiopharmaceuticals.