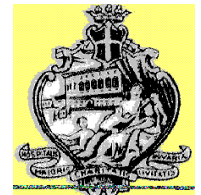




# **IORT IN THE MULTIMODALITY TREATMENT OF LOCALLY ADVANCED PROSTATE CANCER**

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**CLINICAL INVESTIGATION**

**Prostate**

**INTRAOPERATIVE RADIOTHERAPY DURING RADICAL PROSTATECTOMY FOR  
LOCALLY ADVANCED PROSTATE CANCER: TECHNICAL AND DOSIMETRIC  
ASPECTS**

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*Oncology  
Hematology*  
Incorporating Geriatric Oncology

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**May intra-operative radiotherapy have a role in the treatment  
of prostate cancer?**

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Roberto Orecchia<sup>e</sup>

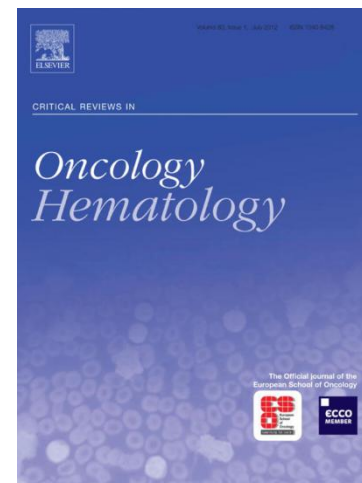
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## INCLUSION CRITERIA

**At least 2 of the following preoperative risk factor:**

iPSA > 10 ng/ml

Gleason Score  $\geq$  7

Clinical stage  $\geq$  cT2c

Positiveness in > 2/3 of biopsy cores

**Probability of organ confined disease < 25%  
(Kattan, MSKCC)**

From September 2005 to September 2014: **95** patients with high / very high risk prostate cancer were enrolled<sup>1</sup>

### Patients Characteristics

N = 88

Median age

68 (52-76)

Median iPSA ng/ml

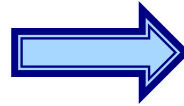
14.6 (2.0-80)

Median post-operative PSA ng/ml

0.06 ng/ml (0-4)

# IORT for Prostate Cancer at University Hospital of Novara

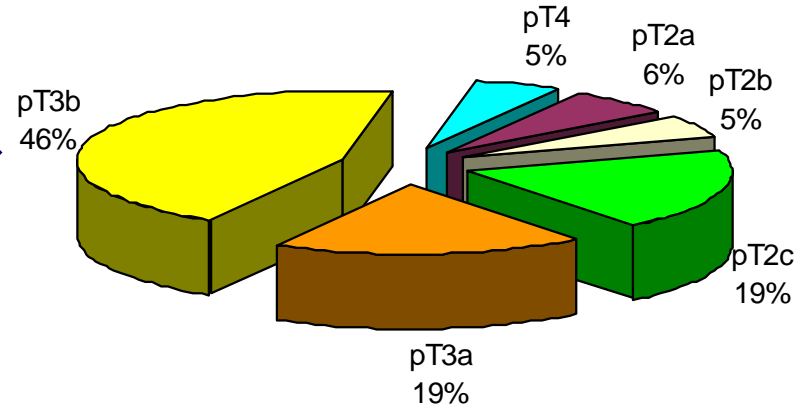
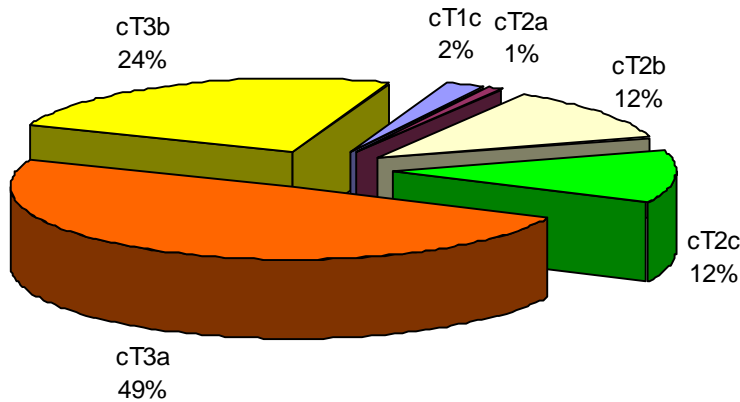
**Median Bioptical GS → 8**  
**Range (4-10)**



**Median Patological GS → 9**  
**Range (6-10)**

**Clinical Stage** cT3: 73%  
cT2: 25%

**Patological stage** pT3/4: 70%  
pT2: 30%

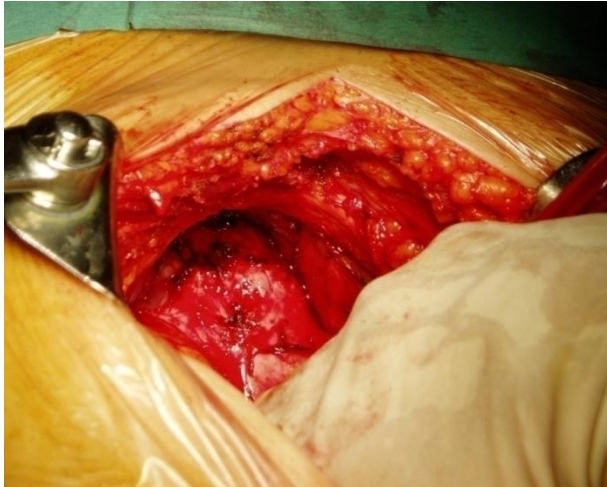


**R+: 59/95 pts (62.1%)**

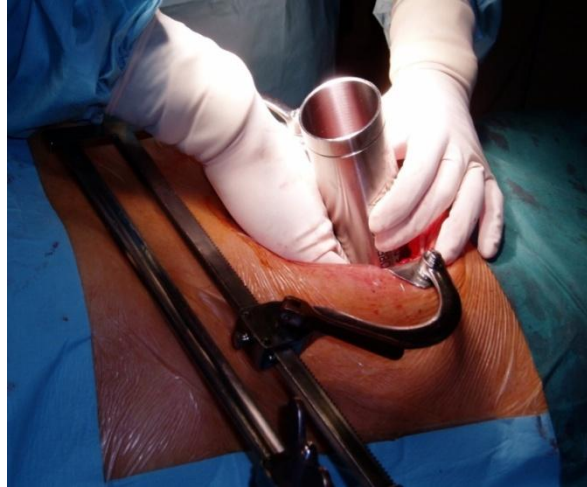
**pN+: 28/95 (29.5%)**

# IORT for Prostate Cancer at University Hospital of Novara

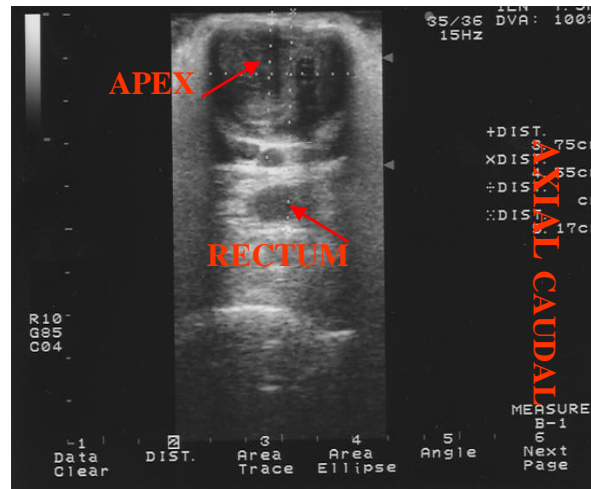
## Prostate exposure



IORT target: prostate *plus* a suitable margin for subclinical disease (0.5-1 cm)



## Intraoperative ultrasound



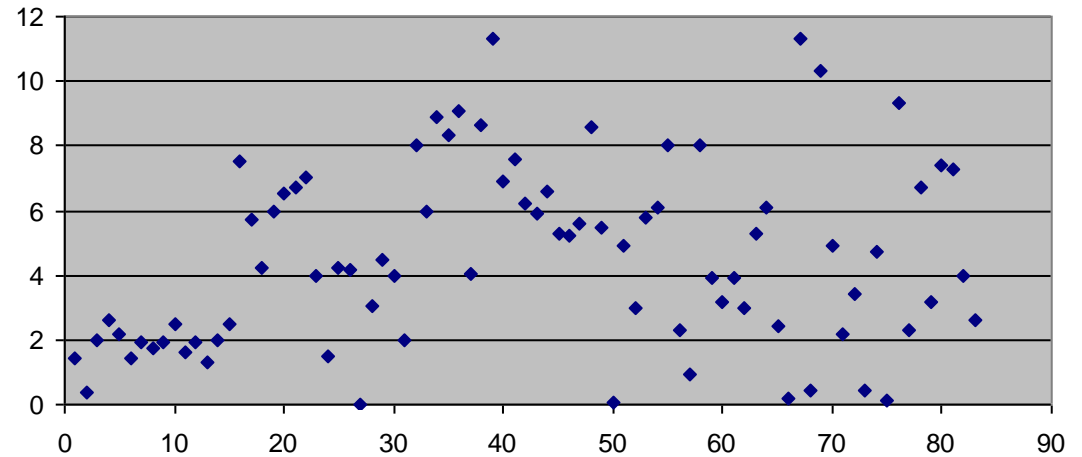
## Soft Docking





## IN VIVO DOSIMETRY (max rectal dose)

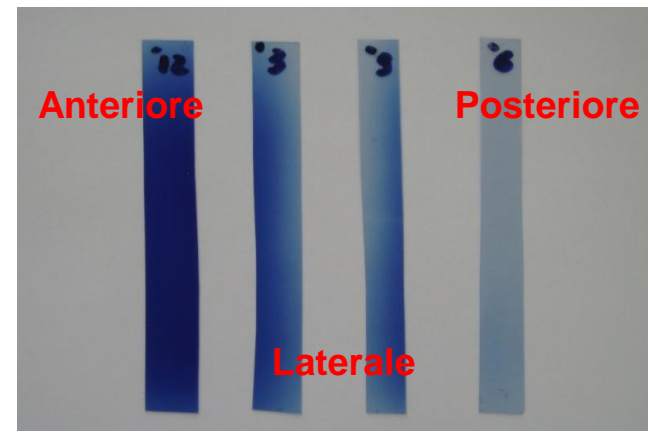
Median dose to rectal wall **4.32 Gy** (range: 0.06-11.3 Gy)



Rectal probe (12 cm, diam. 2.5 cm)



4 radio-chromic films positioned on the surface

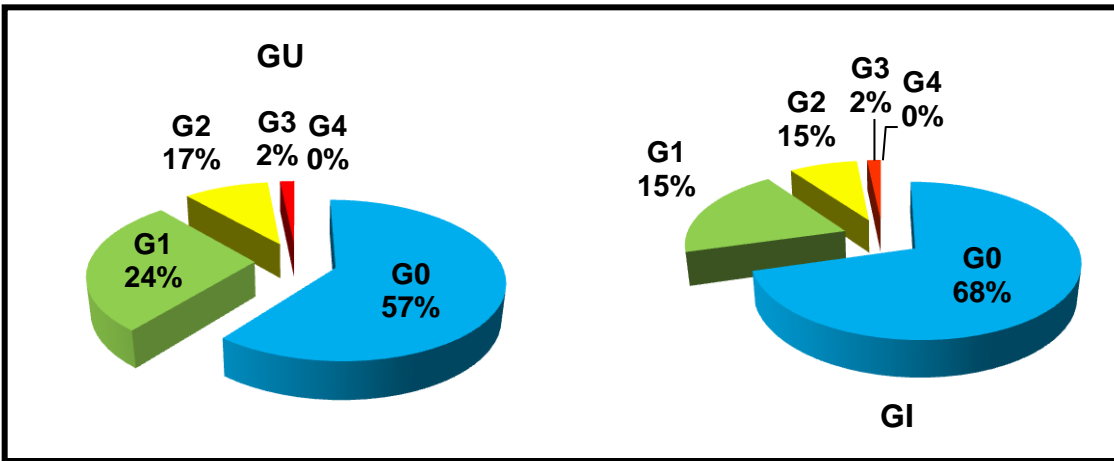


## Procedure-related Events

- No major peri-operative complications
- 71.6% of patients required transfusion
- Minor complications (lymphoceles, urethral-bladder anastomosis strictures, pelvic haematomas) were observed in 29.5% of cases
- No symptoms of acute rectal toxicity in relation to the IORT
- 1-yr continence 76%

# POSTOPERATIVE EBRT (70/95 pts, 78,7%)

Early

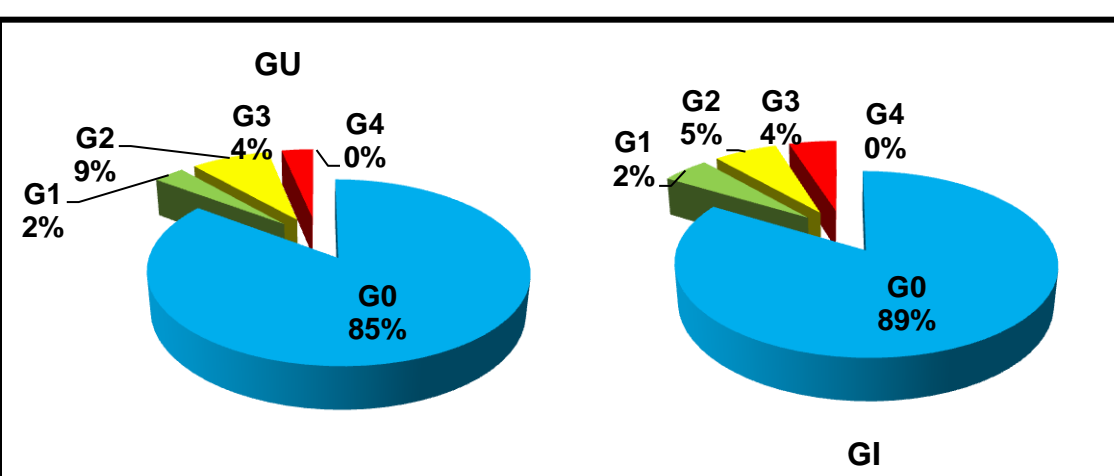


Data from Valicenti R. IJROBP, 2013

**Table 1** Acute toxicity effects of RT after prostatectomy (ranges based on RTOG or CTCAE grading system)

Study arm type	Genitourinary		Gastrointestinal	
	Grades 1-2	Grades 3-4	Grades 1-2	Grades 3-4
Adjuvant	10.5%-26%	2.0%-8.0%	22.0%-25.0%	0.0%-2.0%

Late



**Table 2** Late toxicity effects of RT after prostatectomy (ranges based on RTOG/EORTC or CTCAE grading system)

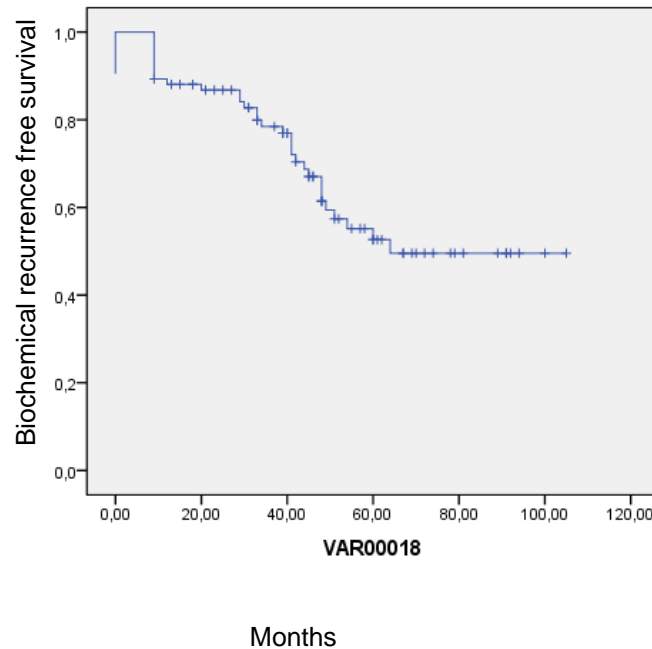
Study arm type	Genitourinary		Gastrointestinal	
	Grades 1-2	Grades 3-4	Grades 1-2	Grades 3-4
Adjuvant	2.0%-22.0%	0.0%-10.6%	1.0%-12.7%	0.0%-6.7%



# BRFS

Biochemical failure: PSA  $\geq$  0.2 ng/ml

Median follow-up 52 months  
(range 10-105)  
**24 Failures**



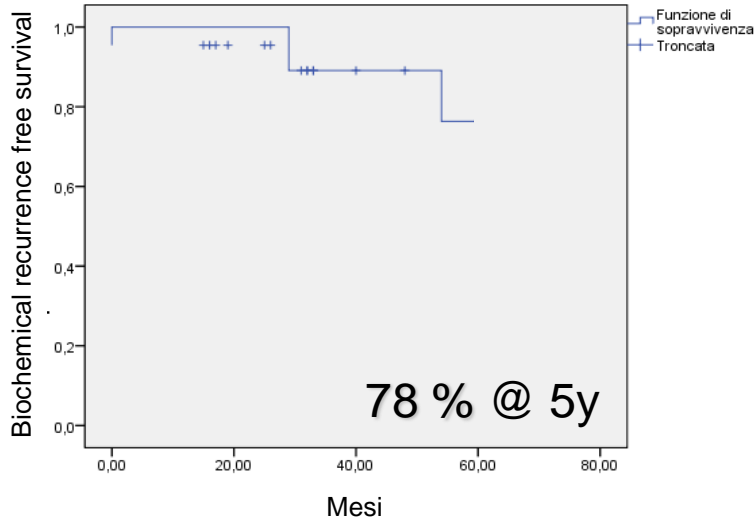
	N° (%)
Biochemical failure	16/85 (18.8%)
Lymph node recurrence	4/85 (4.7%)
Bone M+	2/85 (2.3%)
Lung M+	1/85 (1.2%)
Brain M+	1/85 (1.2%)
<b>No evidence of failure in prostate bed</b>	

## Locoregional failure:

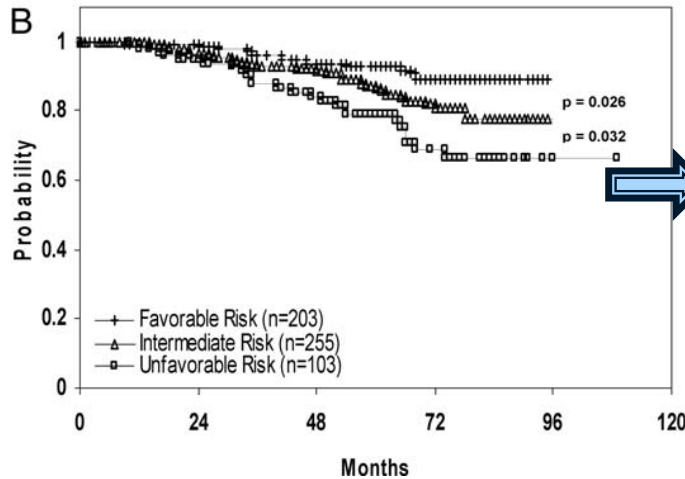
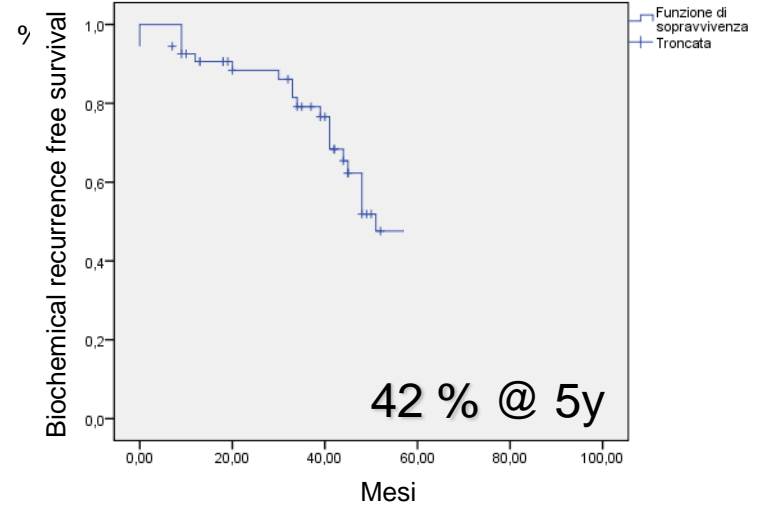
	RT adjuvante	No RT
EORTC 22911	8.4%	17.3% p<0.05
SWOG 8794	8%	22%

# BRFS according to NCCN risk classes

## HIGH RISK (NCCN)



## VERY HIGH RISK (NCCN)



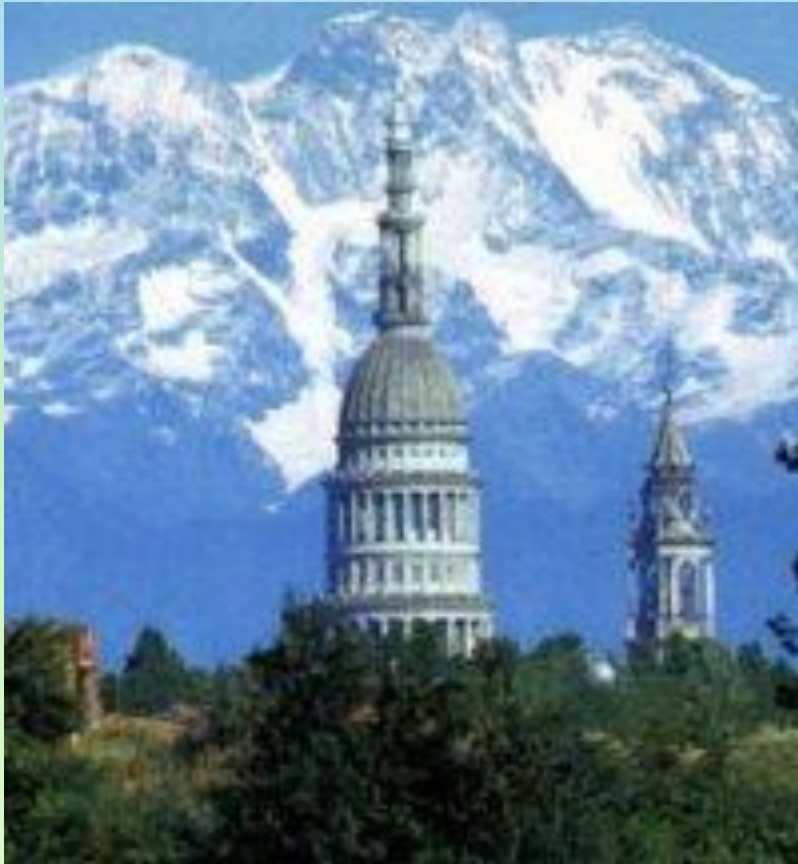
PSA relapse-free survival in pts with unfavorable risk (NCCN) treated by EBRT: 67% at 8 yrs. (Houston definition for biochemical relapse) <sup>1</sup>

<sup>1</sup> Zelefsky, The Journal of Urology 2006

## CONCLUSIONS

- ∞ Radiobiological data (low  $\alpha/\beta$ ) support the use of high dose per fraction.
- ∞ The association of RP + IORT **is feasible**, without relevant rectal toxicity.
- ∞ Limitations: time of F/U
- ∞ Open issues:
  - Patient selection: who may benefit from IORT?
  - IORT as a **single** treatment or as a boost?
  - In case of adjuvant EBRT, which fractionation?  
Hypofractionation?

# WORKING GROUP



## **Radiation Oncologists**

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Giuseppina Apicella  
Milena Di Genesio

## **Medical Physicists**

Gianfranco Loi  
Eleonora Mones  
Chiara Secco

## **Residents**

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Sara Torrente  
Marta Guffi  
Eleonora Ferrara

## **Technologists**

Cesare Bolchini  
Angela Rispoli  
Fortunata Tedesco

## **Surgeons**

(Bruno Frea)  
(Erwin Kocjancic)  
(Paolo Gontero)  
Carlo Terrone  
Alessandro Volpe  
Giansilvio Marchioro  
Roberto Tarabuzzi

## **Nurses operating room**

## **Anaesthesiologists**

## **Medical Direction**

## **Technical Office**

## **Biotechnology Office**

**Thanks !**