

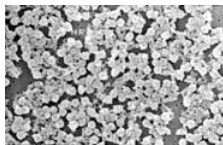
Immunomagnetic Separation (IMS): Selective Isolation and Concentration of Pathogens

Tara Sarian
Dynal Biotech - An Invitrogen Company

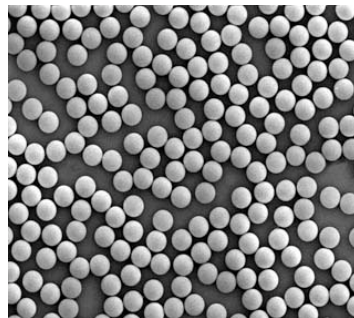


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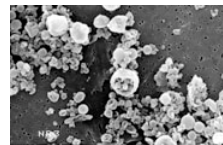
Types of Magnetic “Beads”



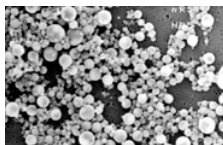
Alternative magnetic particles



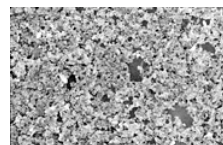
Dynabeads



Alternative magnetic particles



Alternative magnetic particles



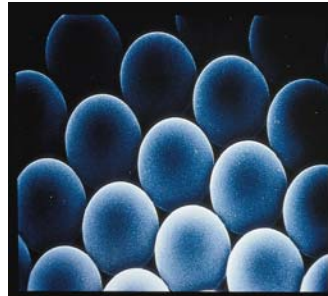
Alternative magnetic particles



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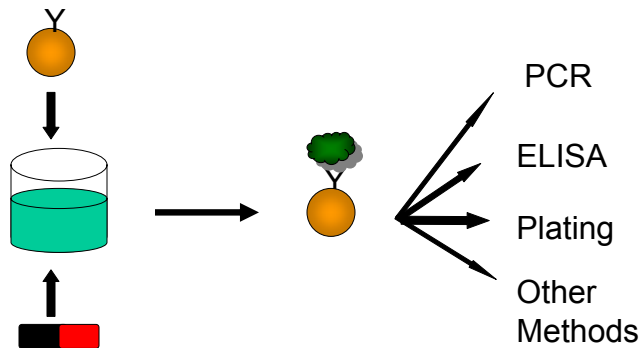
The IMS Principle

- Uniform, superparamagnetic, monodisperse, polymer beads coated with a ligand directed against the specified target, e.g antibody against surface antigen.
- Dynabeads will bind to the target, making it “magnetic”, forming a target-bead complex.
- Target is then easily isolated from the sample using a magnet particle concentrator (MPC).



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Concept of IMS



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Flexibility

- IMS can be performed on practically any sample matrix provided appropriate sample pre-treatment is done
 - Food
 - Water
 - Faecal material
 - Blood
 - Soil



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Versatility

- IMS can be used with any detection system
 - Culture media
 - PCR
 - ELISA
 - ATP
 - Luminometry
 - Microscopy



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Bacterial IMS



SEM picture of Dynabeads anti-E.coli O157
with target bacteria attached



Isolation of Salmonella on XLD media using
Dynabeads anti-Salmonella



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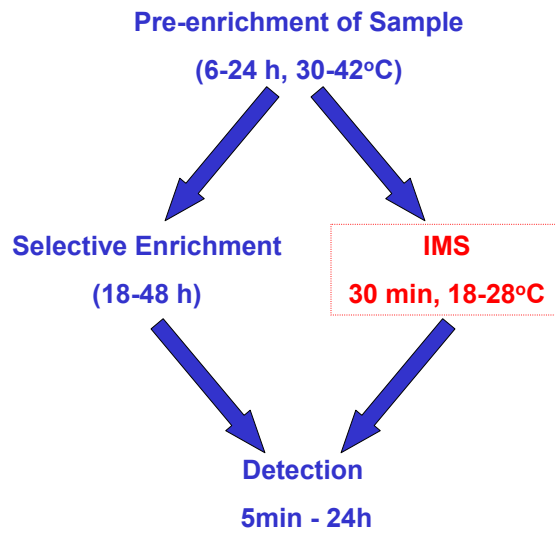
Bacterial Microbiology Targets

- **Dynabeads anti-Salmonella**
 - Approvals: AOAC, NMKL
- **Dynabeads anti-E.coli O157**
 - Approvals: ISO, FDA- BAM, DIN, CCAM, JHM, NMKL, U.S.D.A.-FSIS
 - **CT- supplement**
 - **CHROMagar O157**
- **Dynabeads EPEC/VTEC (O145, O111, O103, O26)**
 - Products for rapid selective concentration of important emerging human pathogens. Difficult to detect strains due to the lack of specific culture protocols and distinct phenotypic characteristics, unlike O157
- **Dynabeads anti-Listeria**
- **Dynabeads anti-Legionella**
 - New Product for the selective isolation of Legionella spp. from difficult environmental and water samples



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IMS and Work Flow



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Manual IMS (MIMS) Bacterial Applications



Sample Mixer



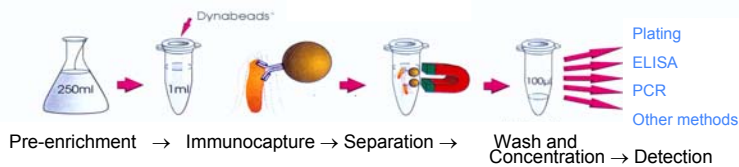
MPC-S



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Bacterial Manual IMS Procedure

- Sample pre-treatment (enrichment)
- Add 1 mL aliquot of pre-enriched sample to 20 μ L Dynabeads in a microcentrifuge tube.
- Incubate for 10 minutes at room temperature using a Dynal Sample Mixer.
- Perform immunomagnetic separation using the MPC-S.
- Aspirate supernatant and wash with PBS Tween buffer.
- Re-suspend in 100 μ L of wash buffer and then complete end detection.



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Principal of Manual IMS



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Automated IMS (AIMS) Dynal BeadRetriever™



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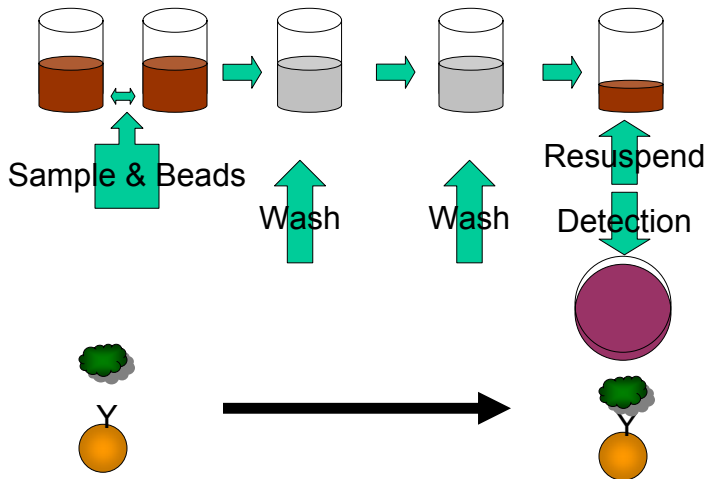
AIMS using the BeadRetriever™

- All steps are automated. Simply load and go.
- Pre-programmed to work with all the Bacterial Microbiology Dynabeads kits currently available.
- Processes 15 samples within 25 minutes.
- Completely closed system without aerosol formation.
- Utilizes inverse IMS with increased bead recovery & reduced contamination of culture plates.
- Continuous operation at room temperature.
- Small footprint for unit and consumables.



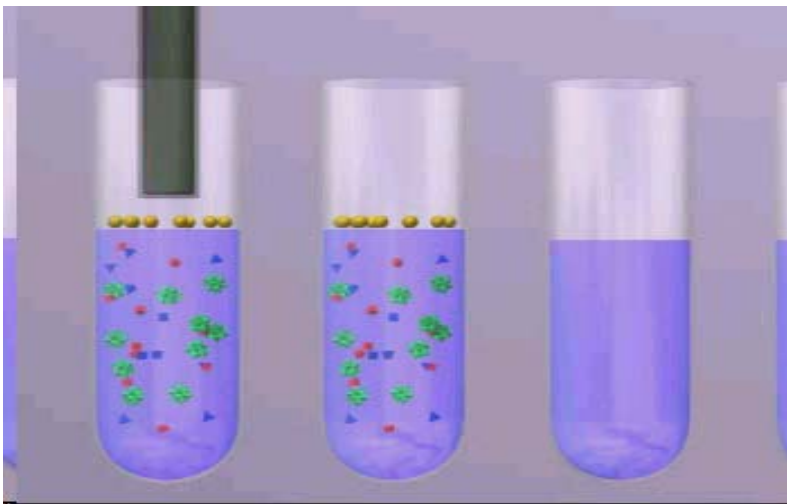
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BeadRetriever Procedure™



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Principle of Automated IMS



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Automated IMS

- Inverse IMS solves the problem of bead recovery from samples that have:
 - o High particulate matter
 - o High fat content
 - o High resident flora
- Assures the safety of the test performer.
- Increases consistency and confidence in results.



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BeadRetriever Sample Throughput

Number of Samples:	289	
	BR Run Time (hours)	Number of runs
1 BeadRetriever	8.0	19
2 BeadRetrievers	4.0	10
3 BeadRetrievers	2.7	6

- Experienced Manual Operator:** 6 samples/30 minutes
96 samples/8 hour shift
- Beginning Manual Operator:** 6 samples/60 minutes
48 samples/8 hour shift



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BeadRetriever™ Performance Features

Dynabeads Product Tested	Relative background flora reduced (%) by:	
	AIMS	MIMS
Salmonella	99	97
Listeria	98	93
E. coli O157	99	98

Measurements done by ATP assay after both automated and manual IMS using the respective product lines on BPW-enriched minced beef samples containing approximately 10^8 cells/ml.



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Advantages of BeadRetriever Unit

- **Eliminates:**
 - Biological hazards
 - Hands-on time
 - Technician error
- **Increases:**
 - Safety
 - Throughput
 - Easy of use
- **Prevents:**
 - Cross-contamination
 - Background flora
- **Improves:**
 - Bead recovery
 - Consistency



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Advantages of IMS

- Isolation and concentration
- Increased recoveries
- Flexible
- Versatile
- Inexpensive
- Simple
- Reliable
- Minimum space requirements



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Questions?

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