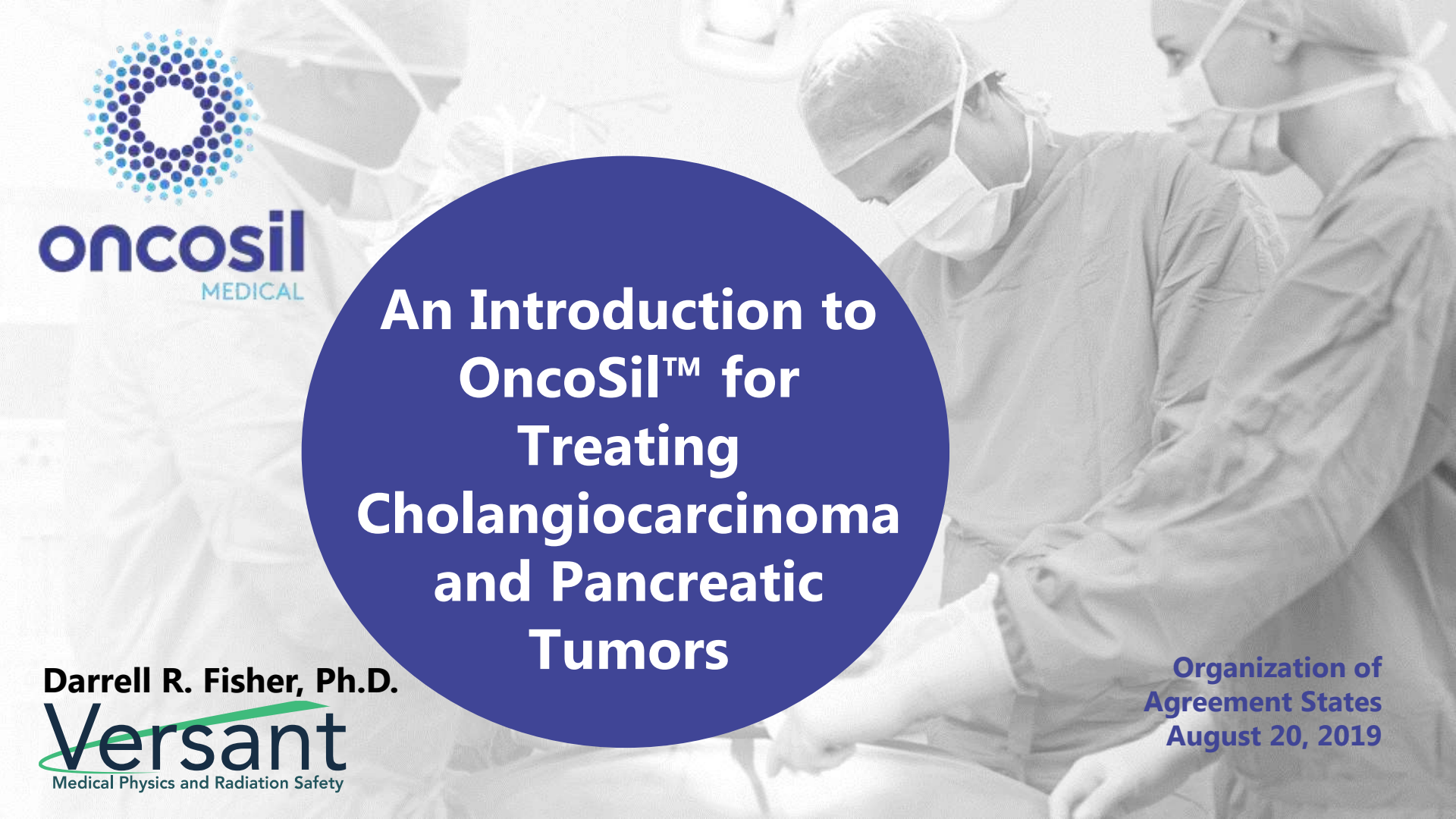


oncosil MEDICAL

An Introduction to OncoSil™ for Treating Cholangiocarcinoma and Pancreatic Tumors

Darrell R. Fisher, Ph.D.
Versant
Medical Physics and Radiation Safety

Organization of Agreement States
August 20, 2019

Disclosures/Disclaimer

Versant
Medical Physics and Radiation Safety

The speaker is an employee of Versant Medical Physics and Radiation Safety, which provides professional services for various clients, including radiopharmaceutical suppliers and others involved in development and testing of diagnostic and therapeutic medical devices.

The speaker has no other relevant financial conflicts of interests in OncoSil Medical, Ltd., and provides no product endorsement. This presentation represents a technical overview for educational purposes only.

Introduction

We expect to see new radioisotope brachytherapy devices enter the field of interstitial radiation therapy because:

- High-dose cancer therapy involving directly administered radioisotopes is highly energy-efficient in terms of therapeutic ratio,
- . . . resulting in more effective cancer treatment with greater sparing of normal organs and tissues, that is, fewer or negligible normal-tissue toxicities and adverse side-effects

What is the OncoSil device?

- Phosphorus-32 microparticle brachytherapy in a sterile carrier diluent
- Administered by direct injection into tumors using CT and endoscopic ultrasound guidance
- Submitted to the U.S. FDA for a class III humanitarian device exemption (HDE) approval

Brachytherapy with P-32 microparticles provides a new option for treating cholangiocarcinoma and pancreatic cancer

Intra-tumoral radiation therapy

- The radioactive P-32 source material is placed directly into target tissue
- P-32 is contained within the microparticles
- The microparticles do not migrate away from the site of placement
- The P-32 sources are calibrated to deliver 100 Gy to target tumor tissue
- The short-range beta radiation is not delivered to normal organs and tissues beyond the injection site

Company overview

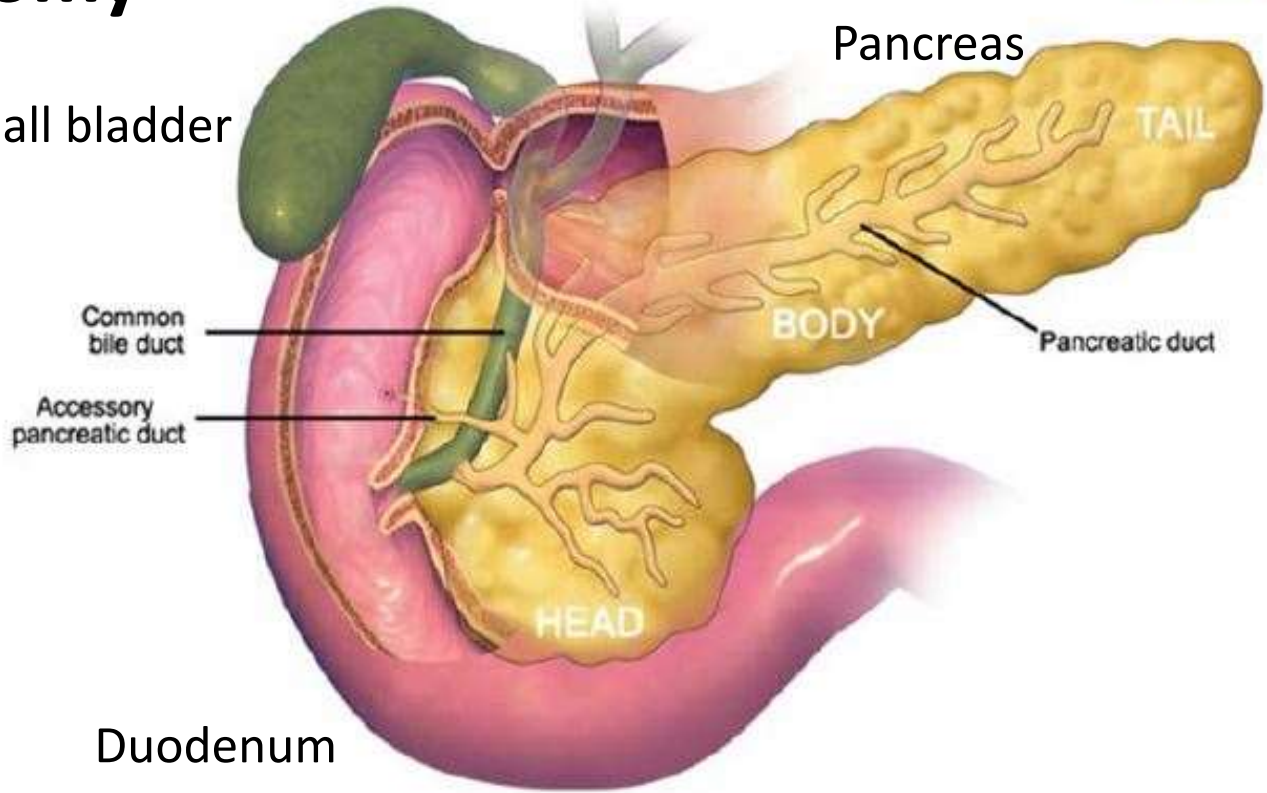
- OncoSil Medical Ltd. is a small medical device biotechnology company
- Based in Sydney, Australia
- An ISO 13485 accredited company
- With P-32 microparticle production in collaboration with Eckert & Ziegler GmbH in Braunschweig, Germany

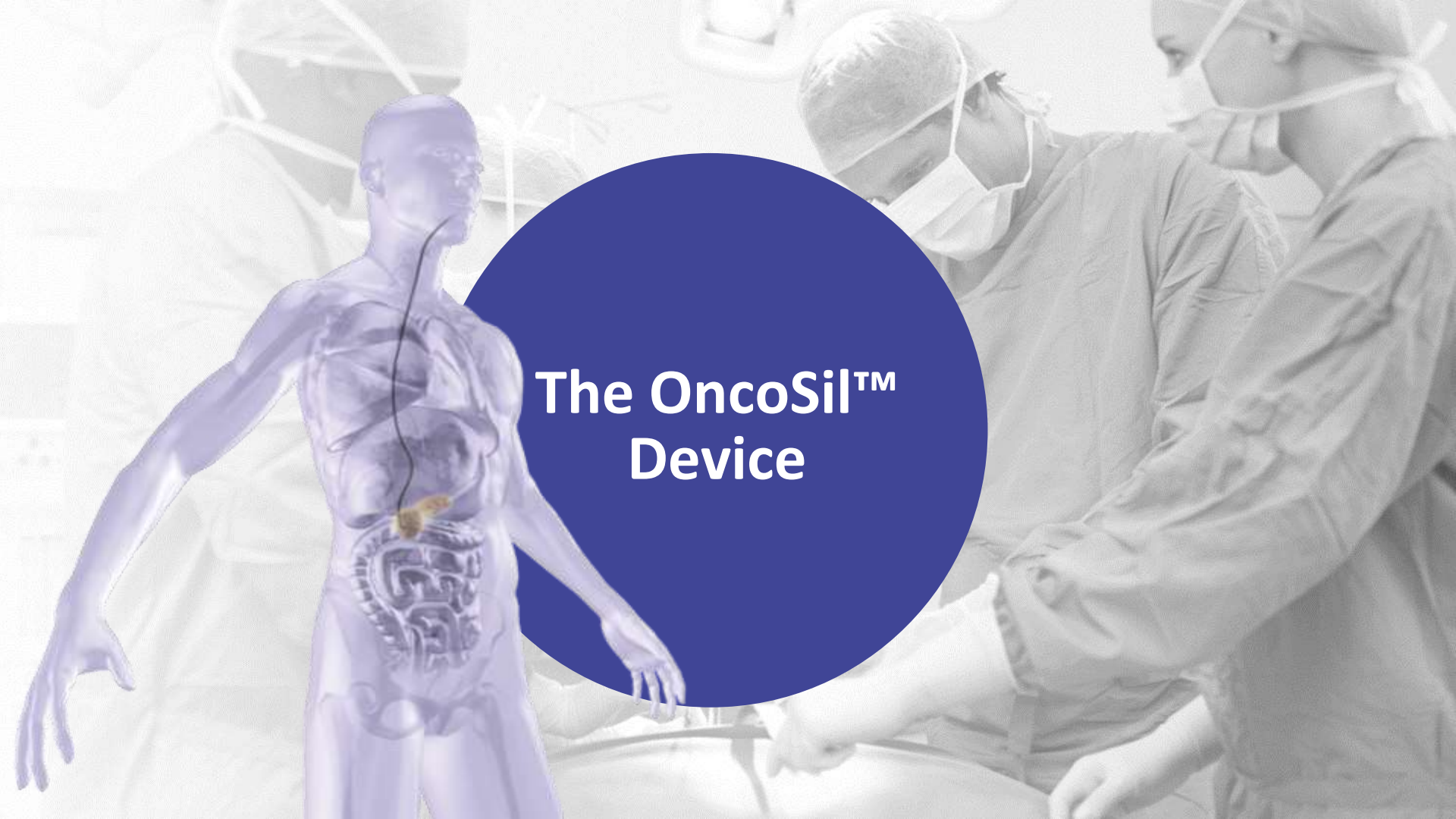
Disease Overview

Cholangiocarcinoma and pancreatic cancer

- Cholangiocarcinoma is bile duct cancer (10,000 cases per year in the U.S.)
- Pancreatic cancer affects 56,000 new patients each year in the U.S.
- These cancer are difficult to diagnose early and treat effectively, and the long-term prognosis is usually poor
- Today the only potentially curative therapy is surgical resection
- Generally unresponsive to chemotherapy
- Late-stage cancer associated with significant pain

Anatomy


Pancreas
Gall bladder
TAIL
Common bile duct
BODY
Pancreatic duct
Accessory pancreatic duct
HEAD
Duodenum



The OncoSil™ Device

OncoSil™ microparticles

- Phosporus-32 within insoluble phosphorus-silicon biocompatible (non-toxic) particles
- Nominally 15 to 50 µm in diameter (average 30 µm)
- Measured by scanning electron microscopy
- Heat sterilized

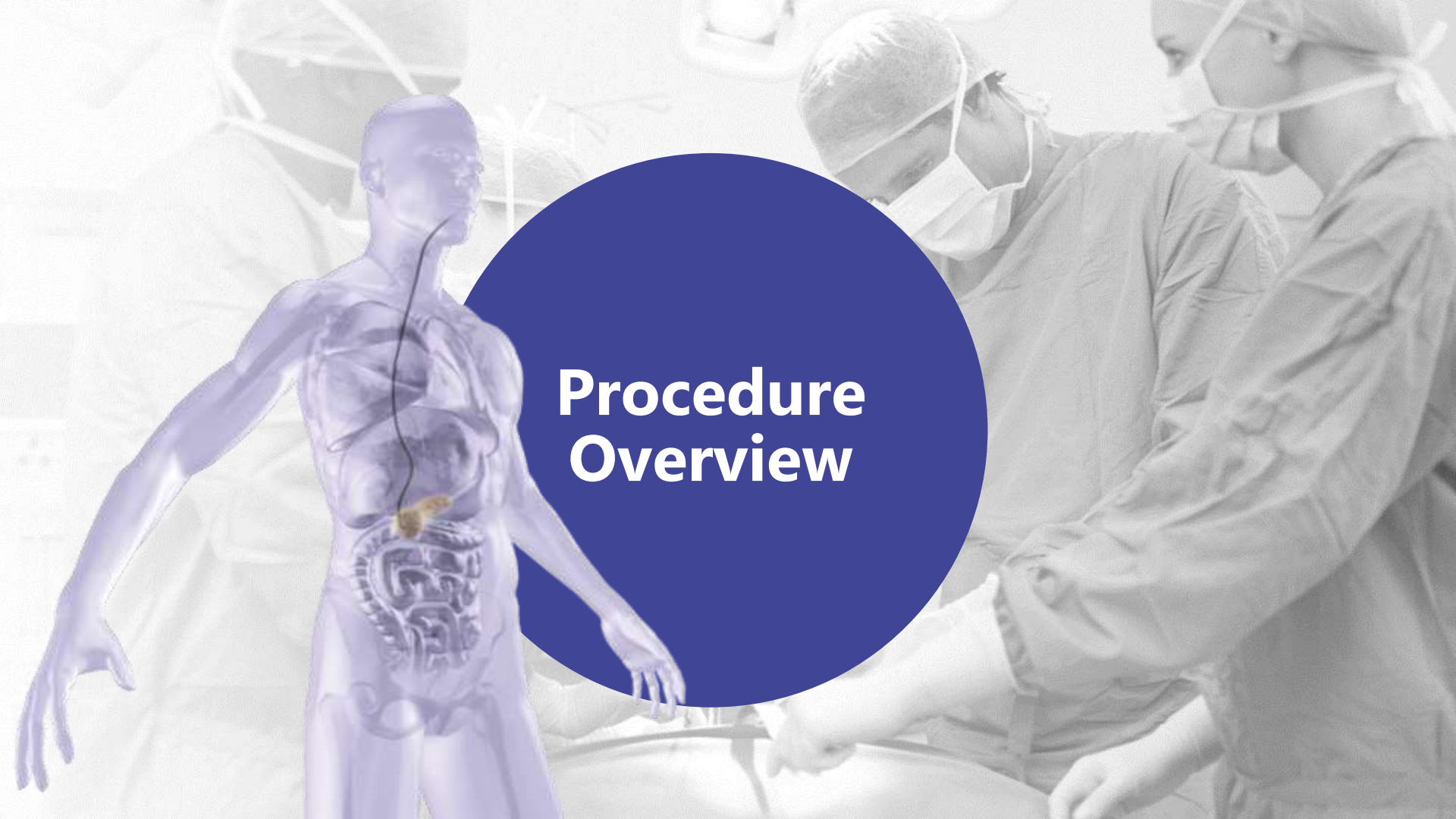
Phosphorus-32 microparticles

- Decays to stable sulfur-32 (pure beta emission), with half-life of 14.3 days
- Beta particles:
  - The maximum energy is 1.710 MeV
  - The average energy is 0.649 MeV
  - The maximum range in tissue is 8.2 mm
  - The average range of emissions in tissue is 2.8 mm
- Each vial contains 250 MBq (6.8 mCi) calibrated to the day of infusion

OncoSil™ system

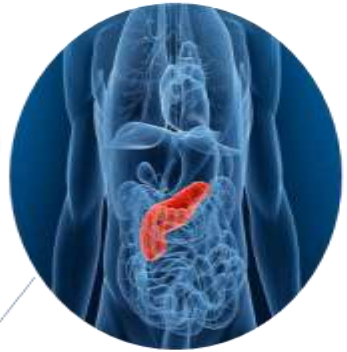
- Type A package
- 1 vial of microparticles in a Perspex-lined lead pot
- 2 vials of 9 mL sterile OncoSil diluent
- 1 empty sterilized P6 vial for dilution of suspension of OncoSil
- 1 empty lead pot for diluting the OncoSil

Packaged OncoSil™ system

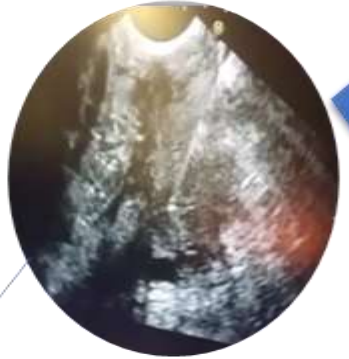


Procedure Overview

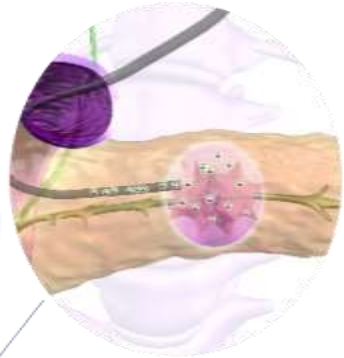
OncoSil™ Microparticles are suspended in a rheological Diluent



Endoscope guided (ultrasound) into the upper intestine



Using ultrasound imaging the needle is guided into the target lesion



OncoSil™ injected directly into the tumor. Implanted Microparticle localization shown on Bremsstrahlung imaging


Radiation
Safety

Primary elements

- Documented radiation safety program and radiation safety committee led by an accredited Radiation Safety Officer
- Training for all persons who work with or handle P-32 source material
- Records management program for dosimetry, monitoring, training, and regulatory compliance
- Source manufacturing quality assurance program

Sealed source testing of OncoSil™ P-32 microparticles

- Each lot subjected to a hot liquid immersion test (ISO 9978)
- Performed by Eckert & Ziegler GmbH(E&Z), Braunschweig, Germany
- 200 Bq leakage limit for the ISO 9978 immersion

➢ Microparticle integrity has been confirmed by patient urine bioassay and fecal analysis

OncoSil™ Source Calibration and Traceability

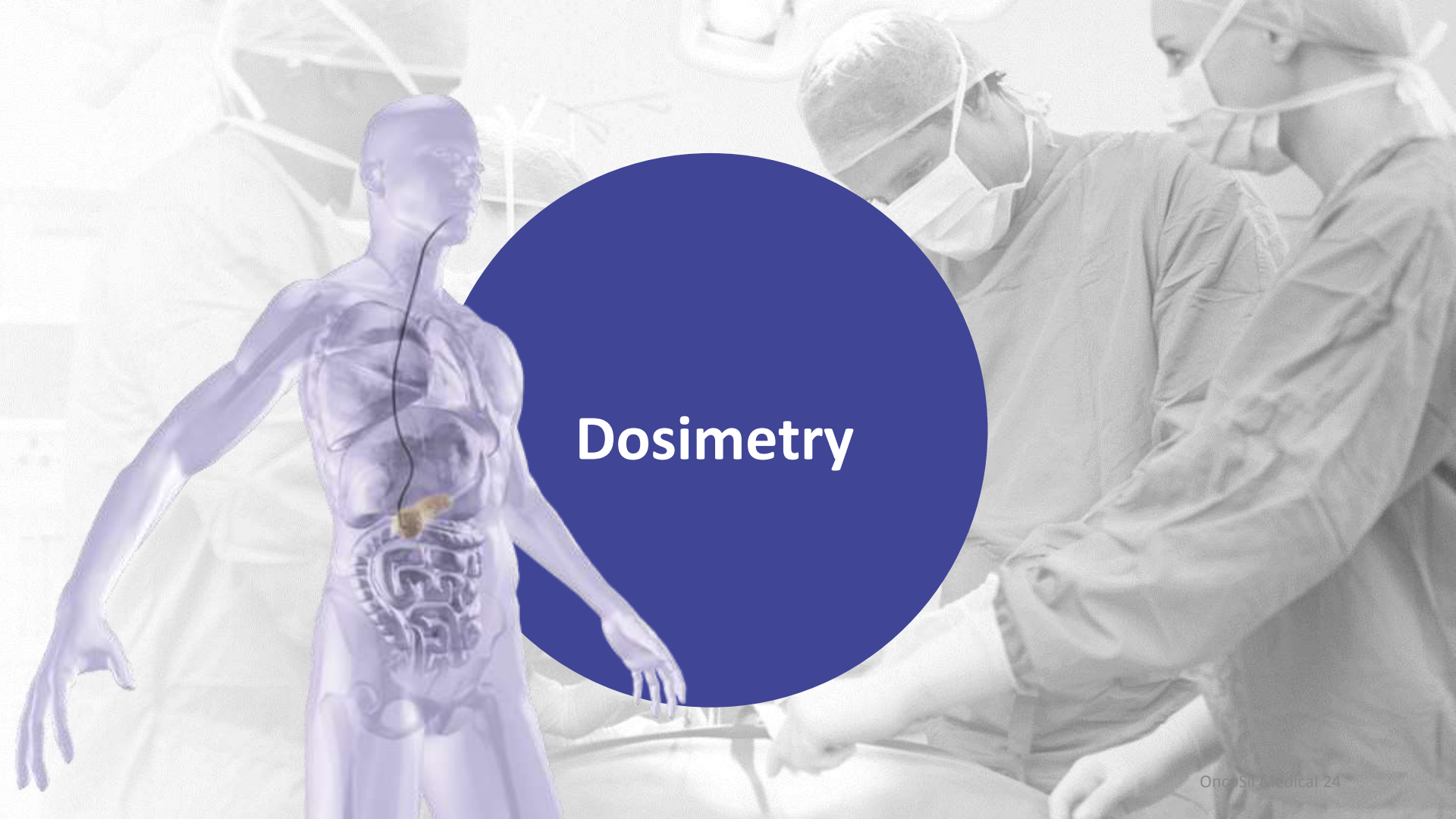
NIST secondary calibration

- The clinic using OncoSil must be calibrated to measure P-32 activity in the diluent
- Instruments at Eckert & Ziegler are traceable to a primary NIST standard
- Product P-32 source vials are assayed against the standard
- The response factors for ion chambers (Capintec and AtomLab) at user clinics are adjusted for comparability to the Eckert & Ziegler calibrated chamber

Site Eligibility

Clinical site eligibility

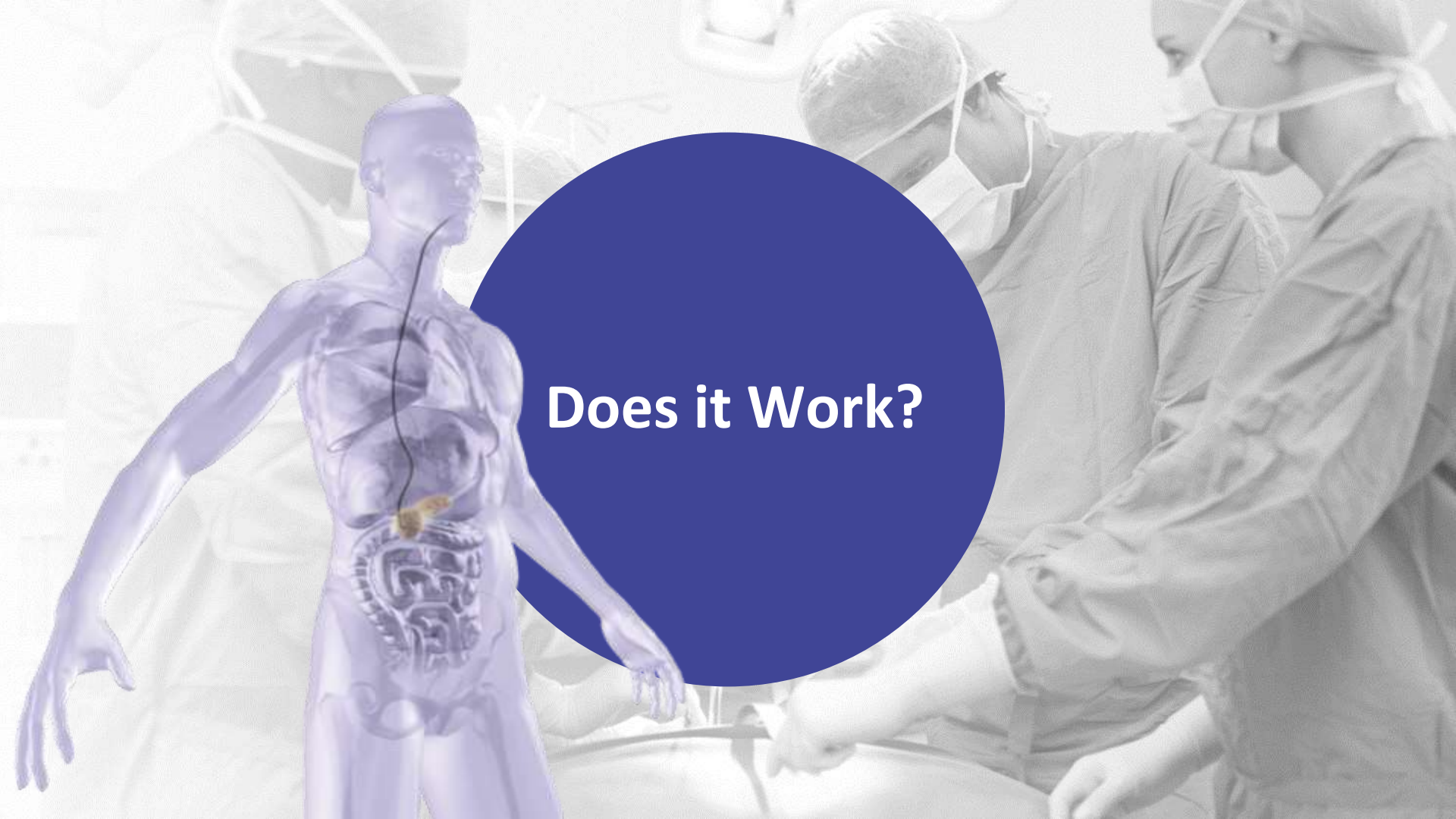
- Compliance with 10 CFR 35.1000
- Training program and certification for authorized users
- Calibrated ion chamber
- Radioactive materials license and institutional authority to administer
- Documentation



Dosimetry

Administered activity

- Target volume is determined by medical imaging (CT or MRI)
- Implant solution volume will be calculated as equal to 8% of the target by volume
- The concentration of injected OncoSil is 6.6 MBq/mL
- The injected OncoSil perfuses target tissue
- The administered activity will be calculated to impart an absorbed dose of 100 Gy to target tissue (depending on perfusion heterogeneity)


Does it Work?

Implantation success

In European clinical trials involving 74 cancer patients, OncoSil Medical has shown that:

- Tumors can be accessed under CT guidance with endoscopic ultrasound
- OncoSil P-32 microparticles can be placed safely into pancreatic and bile duct tumors
- Systemic P-32 represents about 0.1% or less of the administered activity

Clinical outcomes

- No radiation toxicity has been observed in patient normal organs and tissues
- Implanted P-32 does not represent a radiation hazard to medical care workers, janitors, or patient family members
- More follow-up time (about three years) will be needed to evaluate overall therapy effectiveness


Thank you for
your attention!
Versant
Medical Physics and Radiation Safety