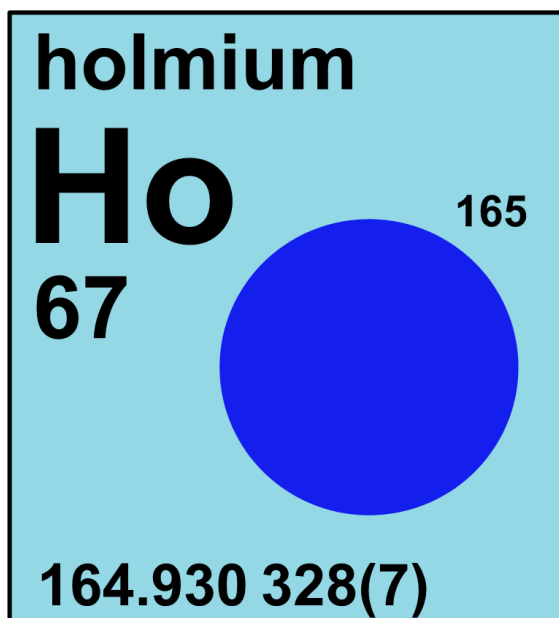





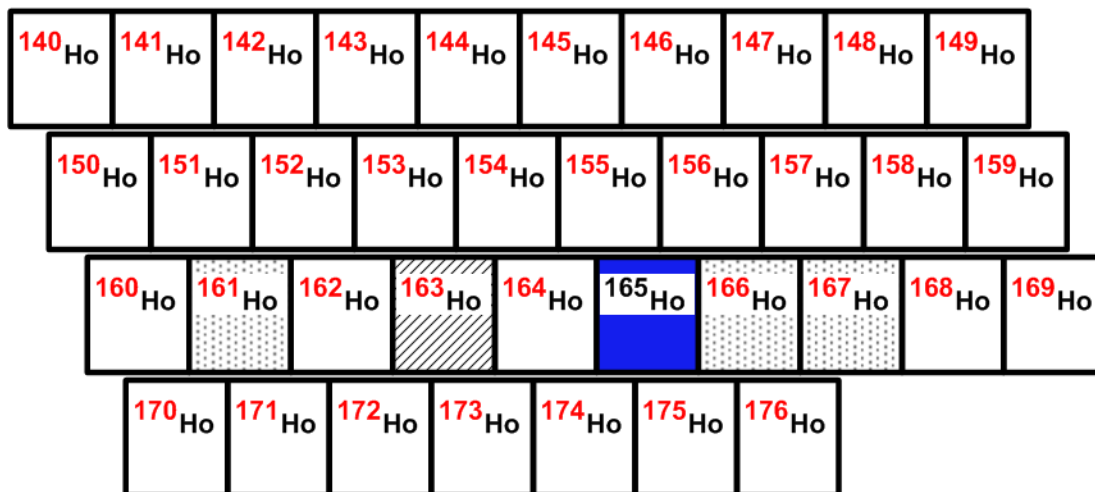
## 4.67 holmium



Stable isotope	Relative atomic mass	Mole fraction
$^{165}\text{Ho}$	164.930 33	1

## Half-life of radioactive isotope

Less than 1 hour	
Between 1 hour and 1 year	
Greater than 1 year	



## 4.67.1 Holmium isotopes in medicine

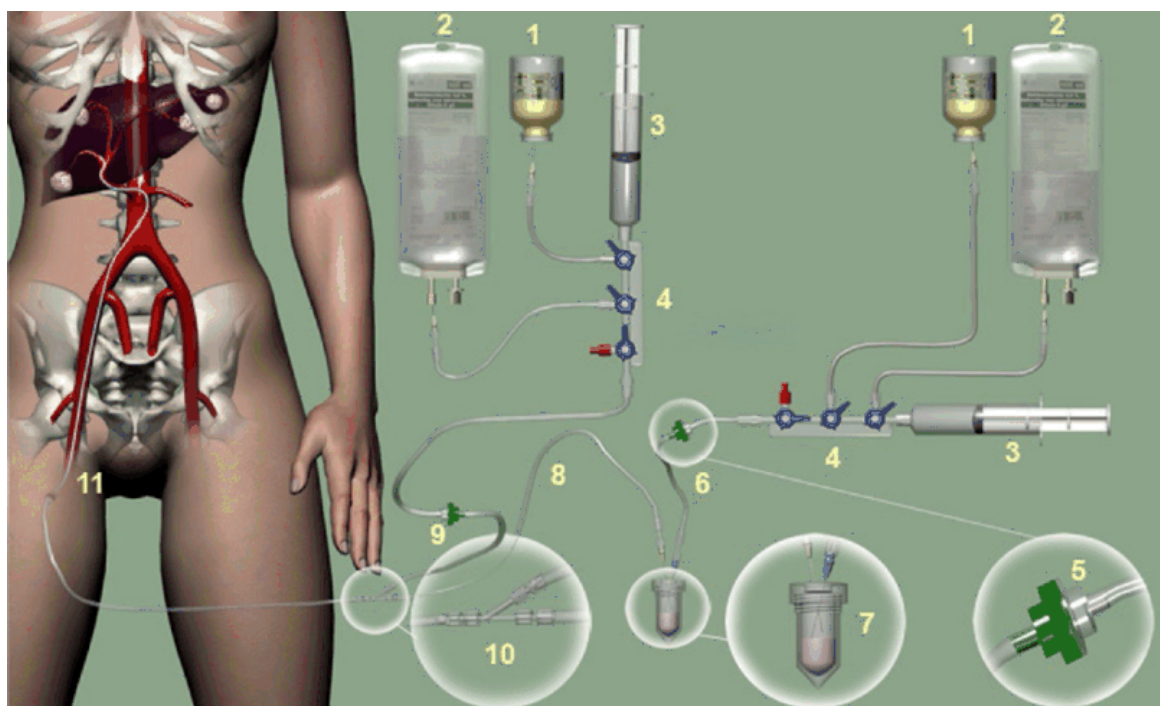
**Radiosynovectomy** with  $^{166}\text{Ho}$ -**radiopharmaceutical** agents can be used for treatment of arthritis. The half-life of  $^{166}\text{Ho}$  is 1.1 days.  $^{166}\text{Ho}$  ferric hydroxide macroaggregate ( $^{166}\text{Ho}$  FHMA) radiosynovectomy is being used because FHMA minimizes extra-articular (outside a joint) leakage of the **radioisotope** [469, 470].  $^{166}\text{Ho}$  has been used for **radioimmunotherapy** (RIT) with labeled antibodies [471]. The  $^{166}\text{Ho}$ -chitosan complex (a linear polysaccharide, which is a long-chain molecule like cellulose that is used by the body for energy storage) is being used

## IUPAC

for hepatic (liver) cancer therapy [472].  $^{166}\text{Ho}$ -labeled radiopharmaceuticals have been used for alleviating pain from bone **metastases** [440, 470, 473].

$^{166}\text{Ho}$  microspheres have been used for intra-arterial radioembolization (treatment where radioactive particles are delivered to a tumor through the bloodstream) of liver metastases (Figure 4.67.1) [472].  $^{166}\text{Ho}$  is paramagnetic and emits both beta and gamma radiation, which makes it ideal for radioembolization. These properties also enable the distribution of  $^{166}\text{Ho}$  microspheres to be visualized with **magnetic resonance imaging** and **single-photon emission computed tomography** (SPECT) [472].

The  $^{166}\text{Ho}$ -Patch is a specially designed radioactive skin patch that is used for external radiation of superficial skin cancers and Bowen's disease in areas that are sensitive and difficult to treat by methods that are more destructive and have poor cosmetic results (i.e. areas of the face) [474, 475].



**Fig. 4.67.1:** Schematic overview of the administration system for  $^{166}\text{Ho}$ -RE (radioembolization) [472]. The administration system consists of the following components: iodine contrast agent (Visipaque®, GE Healthcare) (1), saline solution (2), 20-ml syringe (Luer-Lock) (3), three-stopcock manifold (4), one-way valve (5), inlet line (6), administration vial containing the  $^{166}\text{Ho}$ -poly(L-lactic acid) microspheres (7), outlet line (8), flushing line (9), Y-connector (10) and catheter (11). (Copyright permission will be purchased through Copyright Clearance Center once publication is approved.)