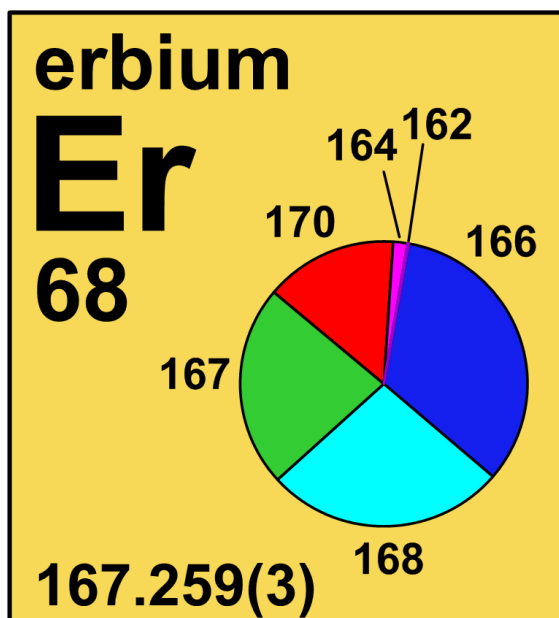


## 4.68 erbium

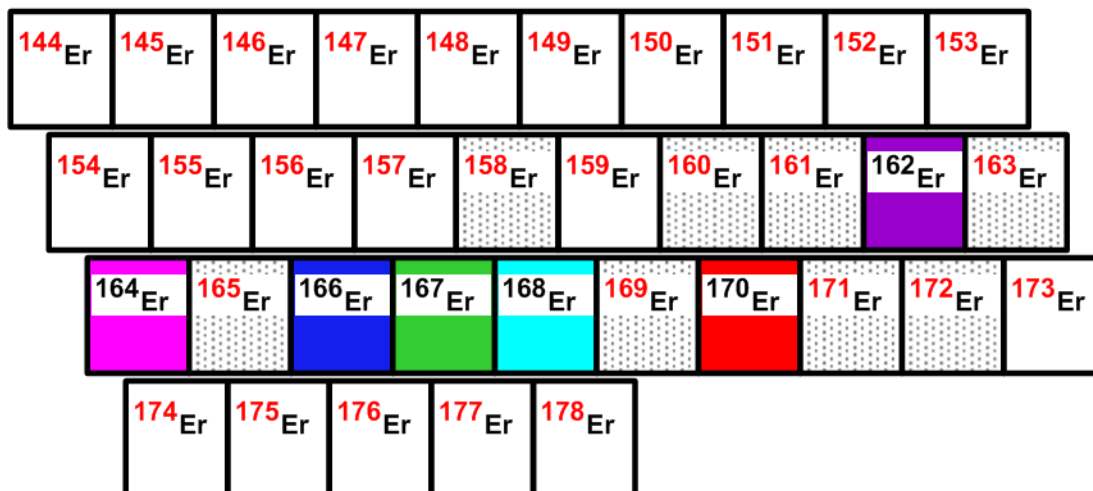


Stable isotope	Relative atomic mass	Mole fraction
$^{162}\text{Er}$	161.928 79	0.001 39
$^{164}\text{Er}$	163.929 21	0.016 01
$^{166}\text{Er}$	165.930 30	0.335 03
$^{167}\text{Er}$	166.932 05	0.228 69
$^{168}\text{Er}$	167.932 38	0.269 78
$^{170}\text{Er}$	169.935 47	0.149 10

## Half-life of radioactive isotope

Less than 1 hour

Between 1 hour and 1 year

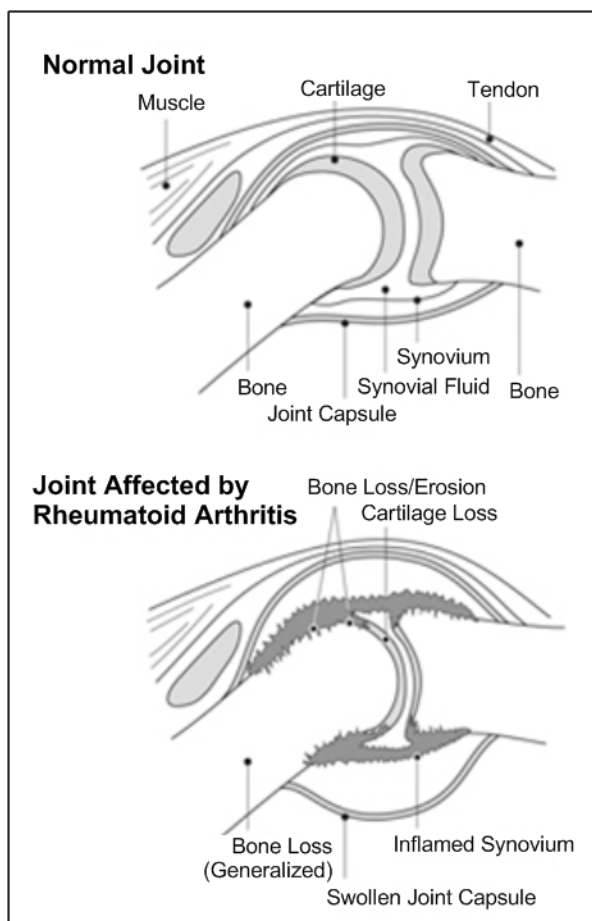


## 4.68.1 Erbium isotopes in biology

**Radiolabeled**  $^{171}\text{Er}$  (with a **half-life** of 7.5 hours) tablets have been used to study bowel movements of individuals using external **scintigraphy**. Such tablets have an enteric coating and contain small amounts of stable erbium oxide ( $^{170}\text{Er}$ ) initially. The tablets are then irradiated at a low neutron flux to produce radioactively labeled  $^{171}\text{Er}$  tablets, via the  $^{170}\text{Er}(n, \gamma)^{171}\text{Er}$  reaction. This method is a noninvasive approach for determining gastric emptying rates and visualizing segments of the digestive system in an individual [476, 477].

#### 4.68.2 Erbium isotopes in medicine

$^{169}\text{Er}$  (with a half-life of 9.4 days) is used in **radiosynovectomy**, which is a regularly practiced **radiotherapy**, on rheumatoid arthritis patients whose condition is resistant to standard methods of treatment (Figure 4.68.1). Rheumatoid arthritis is a chronic, inflammatory, autoimmune disease of the joint capsule (synovial sac), which is lined with a thin membrane called the synovium, of an individual's moveable joints (synovial joints). In radiosynovectomy, the **radiopharmaceutical** called  $^{169}\text{Er}$ - citrate colloid, which contains colloidal particles that are labeled with  $\beta$ -emitting  $^{169}\text{Er}$ , is directly injected into the synovial cavity (the cavity between the bones in a moveable joint inside of the synovium) of the affected joint. These radioactive-colloid particles are then phagocytized (engulfed) by macrophage-like synoviocytes as well as other phagocytizing inflammatory cells in the patient's synovium. Necrosis (tissue death) and the inhibition of cell proliferation (increase in number of cells) result from the radiation of the synovium and therefore, temporarily halts synovitis (which is the condition of when the synovium thickens with inflammation) and improves synovial joint function [478-481].



**Fig. 4.68.1:** Normal joint (top) vs. joint affected by rheumatoid arthritis (bottom) modified from [482].