

## 1 The Problem: Cancer



### Impacts the UK public

1 in 2 in the UK will develop cancer in their lifetime.<sup>1</sup>  
In 2022, 138,579 people died from cancer in England alone.<sup>2</sup>



### Socioeconomic Impacts

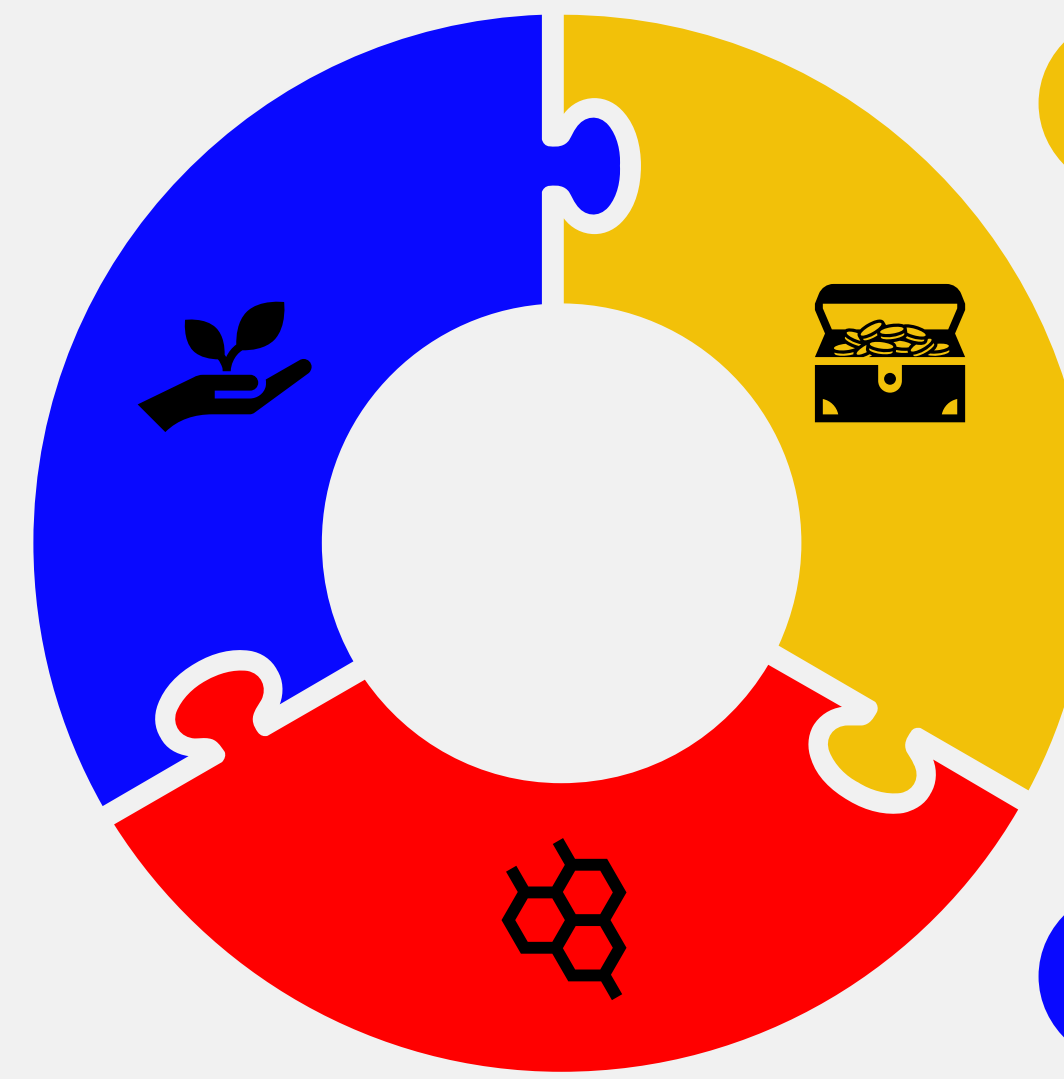
Costs the UK £7.6-11.6bn p.a. in lost GDP due to lost productivity.<sup>3</sup>  
On average, 83% of cancer patients face extra monthly expenses of £570.<sup>4</sup>



### NHS Impacts

Cancer care within the NHS is at breaking point.<sup>5</sup>  
The final year of patient care costs the NHS roughly £18K per person.<sup>3</sup>

## 2 Our Solution: New Drugs



### Gold(I) Centre

Gold in chemotherapeutics offers a promising alternative to platinum-based drugs, such as Cisplatin, higher tumour selectivity, ability to overcome drug resistance, and lower systemic toxicity.

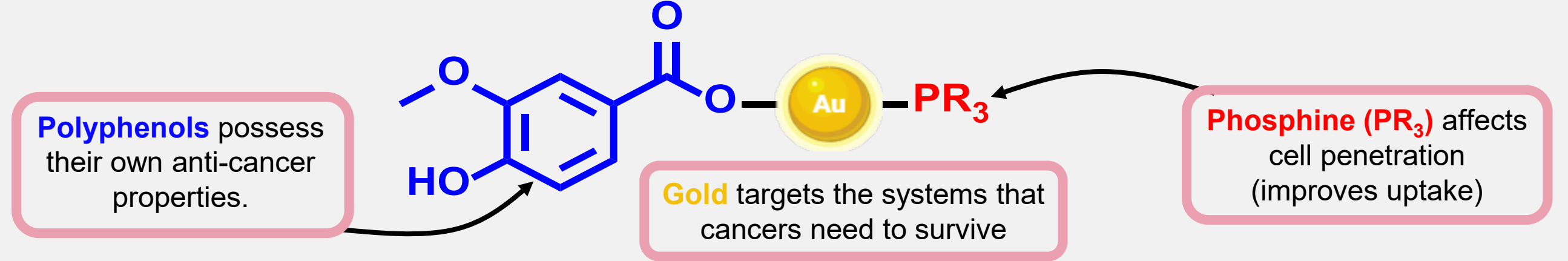
### Phosphine Ligand

Affects the lipophilicity whilst stabilising the gold. This affects how well the complex penetrates cell membranes and delivers the drug inside the cell.

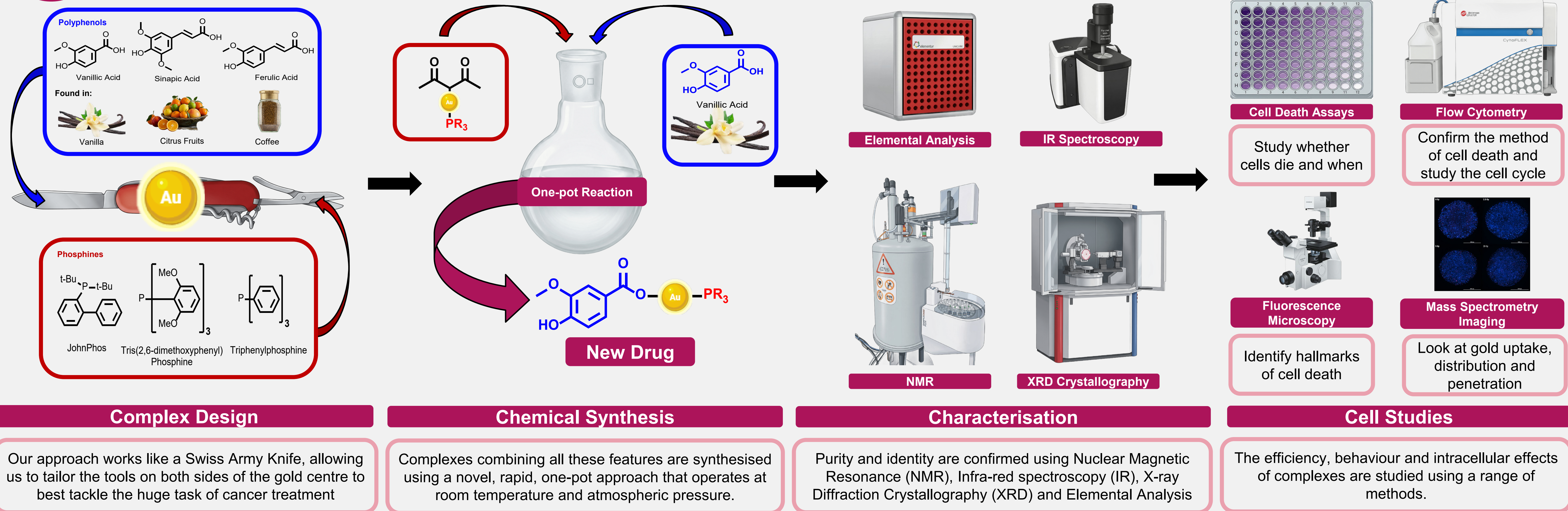
### Plant-based Polyphenols

Naturally occurring plant compounds that possess anticancer properties and can enhance the efficacy of chemotherapeutic agents.

These three pieces fit together to form a complete anticancer complex:

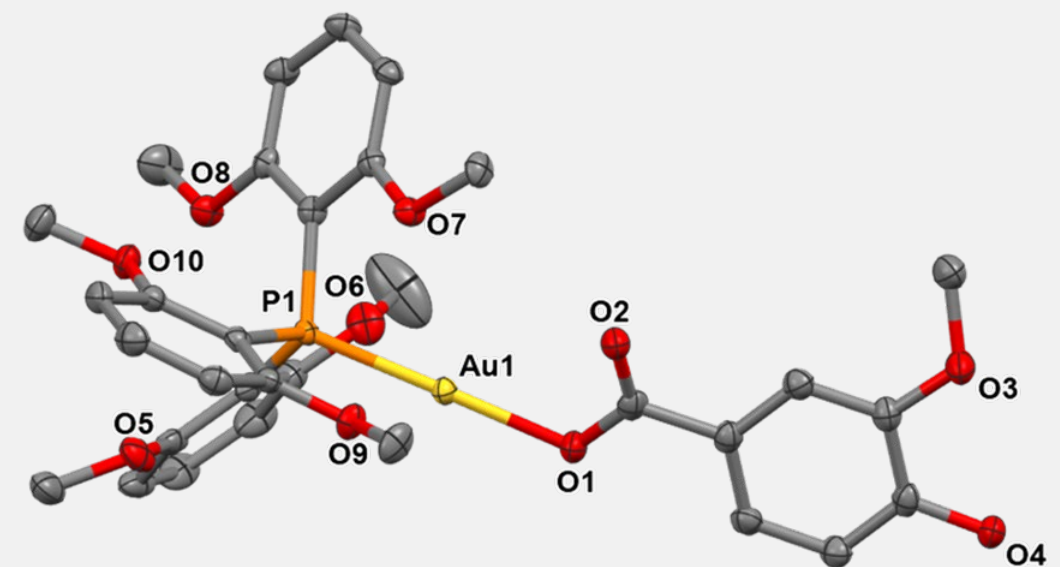


## 3 Our Approach: Gold Complexes with Plant-based Compounds



## 4 Key Findings

### XRD crystal structure of the most effective drug:

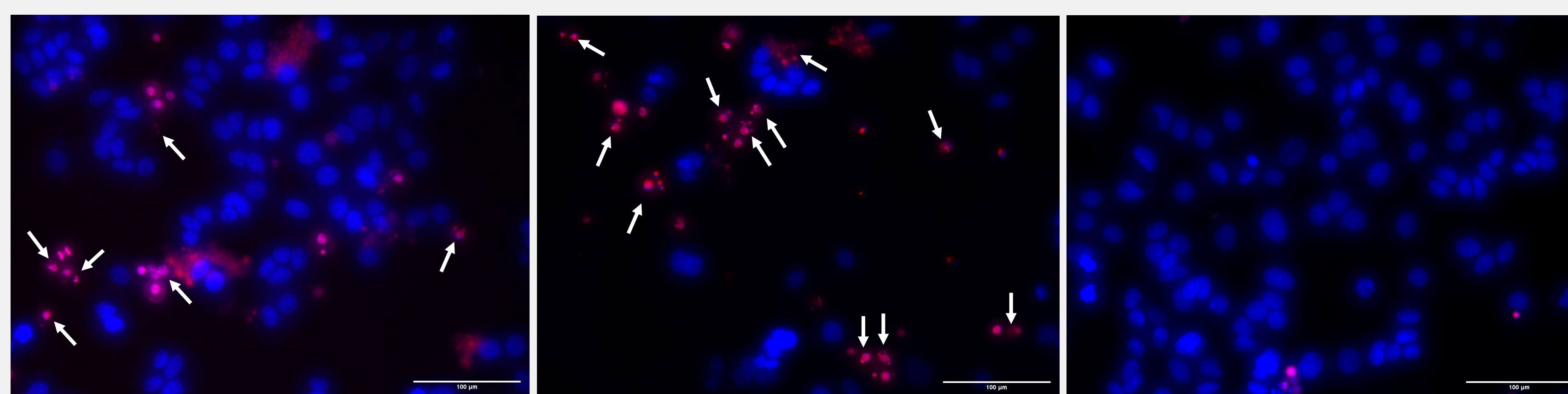


Efficacy was measured across a range of drug concentrations to determine the IC<sub>50</sub>. Below is the IC<sub>50</sub> for our drug compared with the platinum-based chemotherapeutic Cisplatin:

	IC <sub>50</sub> (µM) (72 Hours)			
	Non-invasive Breast (MCF7)	Invasive Breast (MDA-MB-231)	Non-invasive Prostate (LNCaP)	Invasive Prostate (PC3)
Our Drug	0.6 ± 0.2	0.6 ± 0.1	0.3 ± 0.1	0.7 ± 0.1
Cisplatin*	32.1 ± 1.1	28.8 ± 1.2	10.2 ± 0.3	8.3 ± 0.1

\*The platinum-based chemotherapeutic Cisplatin's IC<sub>50</sub>s are reported in the literature. Breast cancer IC<sub>50</sub>s reported by Thepalee et al, 2025.<sup>6</sup> Prostate cancer IC<sub>50</sub>s reported in Nafees et al, 2024.<sup>7</sup>

IC<sub>50</sub> = concentration that inhibits 50% of cells



### Gold without Polyphenol

### Gold-Vanillic Acid Complex

### Untreated

Early data suggests a higher level of DNA fragmentation in the gold-vanillic acid complex compared with gold without the polyphenol, suggesting a higher rate of apoptotic cell death

Red = Dead, Blue = Alive, White Arrows = DNA Fragmentation (Apoptosis)

### What is Apoptosis and Necrosis?

Imagine a computer...



Apoptosis = Pressing shutdown



Necrosis = Ripping the plug out

## 5 Impacts

Developed a novel, flexible chemical synthetic approach

Introduced a new approach to tackling tumours

Killed tumour cells more effectively

## REFERENCES and ACKNOWLEDGEMENTS

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