

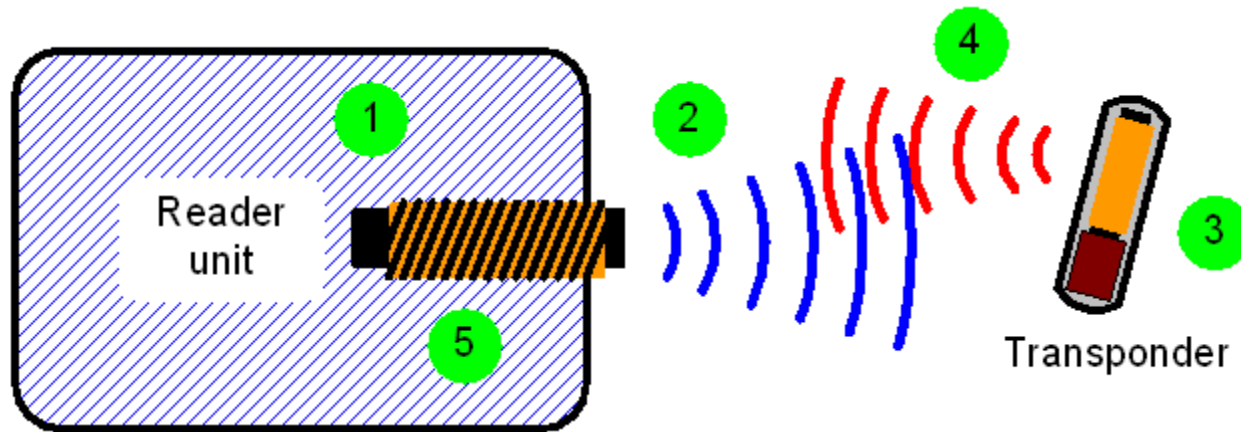
Small Tech, Big Issues

RFID Implants

Outline

- How It Works
- Advantages of RFID
- History of the RFID
- Proposed Uses
 - Identification
 - Medical Records
 - Immigration
 - Security Authentication
- Ethical Issues
 - Purchase tracking
 - Lack of encryption
 - Location tracking
 - Unauthorized tag reading
 - Requiring implant for job / immigration

How It Works



<http://www.rotil.nl/communications/products/rfid.en.php>

1. Controller initiates read
2. Reader antenna sends short range radio-frequency signals
3. Tag converts signal to energy
4. Tag uses stored energy to transmit its memory contents back to reader
5. Reader antenna collects sent data

Advantages of RFID

- Tags are:
 - Cheap
 - Resilient
 - Long lived
 - Don't need power source
 - Small
- Operate under extreme conditions (cold / heat)
- Contactless recognition
 - Through materials like plastic, glass, wood
 - Can be made invisible to the user

History – 1940s

- In WW2, the Germans, Japanese, Americans, and British were all using radar
- No way to identify planes
- Germans discovered that if pilots rolled their planes as they returned to base, it would change the radio signal reflected back
- First passive RFID system



History – 1960s

- EAS Systems Introduced
 - Checkpoint
 - Sensormatic
- 1-bit tags: on or off
- Deactivated by partially destroying capacitor by running tag over a strong electromagnetic field
- Multi-bit tags size of a loaf of bread, size limited by circuitry



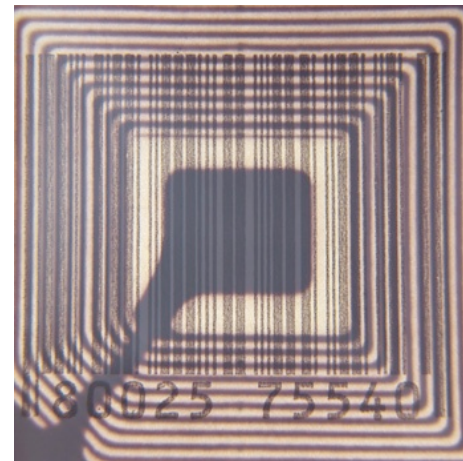
Label found sewn into Old Navy shirt.

Photos © Liz McIntyre 2005



The Checkpoint tag sandwiched inside the cloth label.

http://www.spychips.com/blog/2006/01/eas_or_rfid_new_labels_prompt.html



<http://www.contractpharma.com/articles/2007/06/images/rfid.jpg>

History - Size

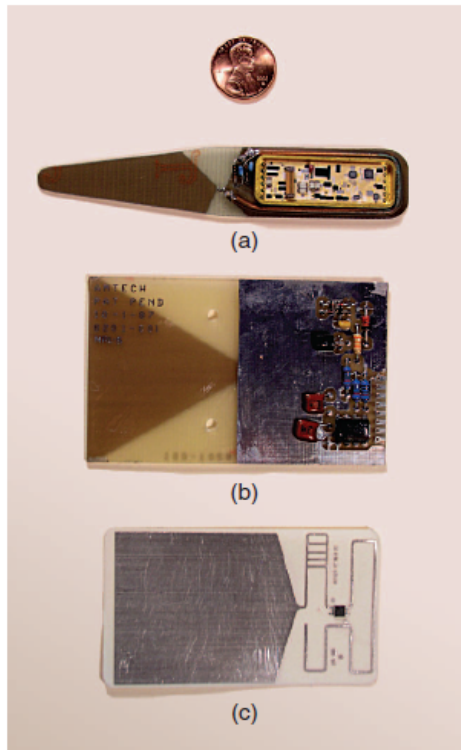
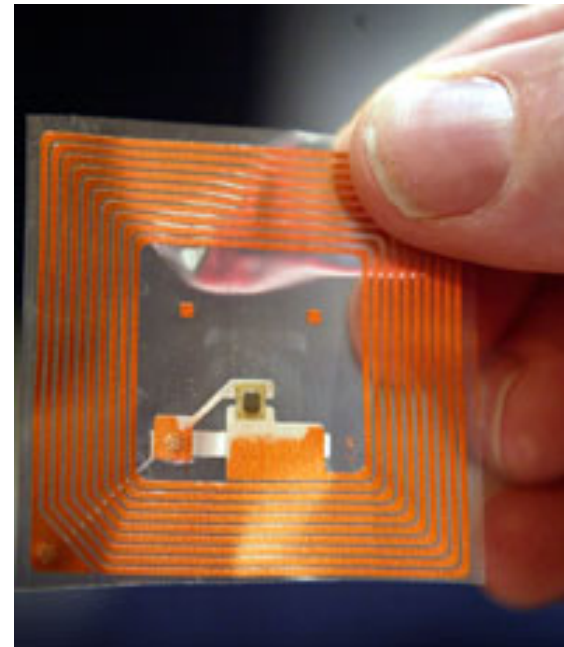
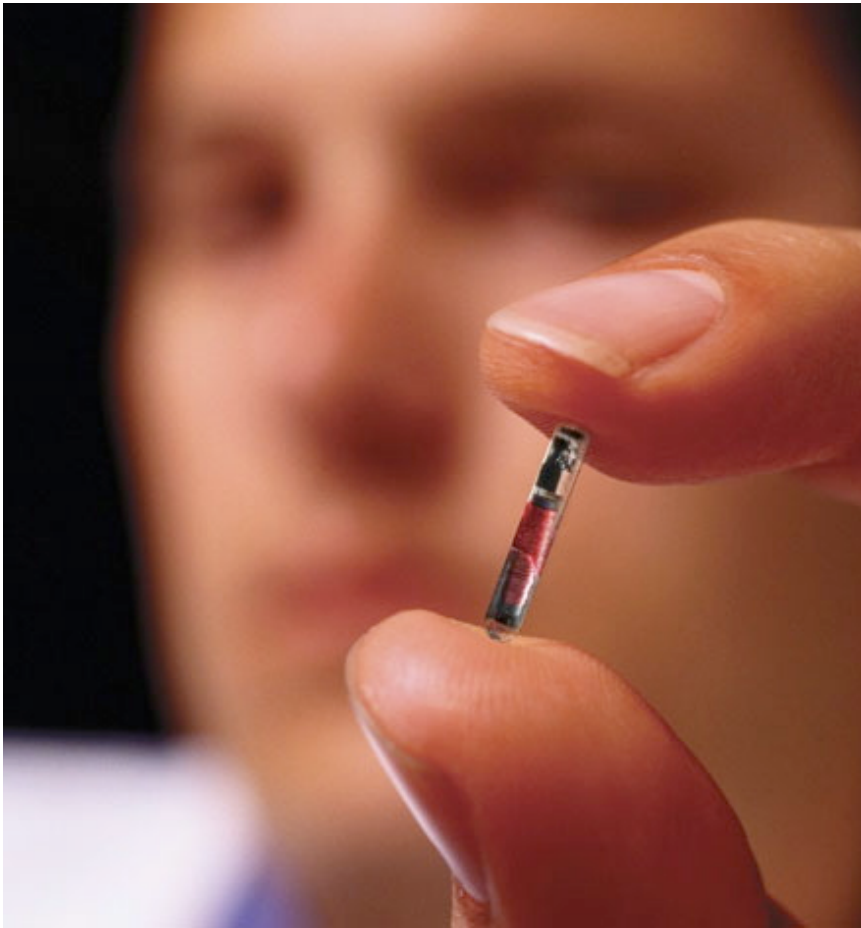


Fig. 2 Evolution of RFID tags compared in size to a penny. (a) A 12-b read-only tag built using CMOS logic chips and hybrid thick film, circa 1976. Circuitry covers half of tag area. (b) A 128-b read-only tag built using a custom CMOS Integrated circuit with off-chip components, circa 1987. Circuitry covers a quarter of tag area. (c) A 1024-b read-write tag built using a single custom CMOS Integrated circuit, circa 1999. Circuitry covers an insignificant portion of the tag area.



VeriChip



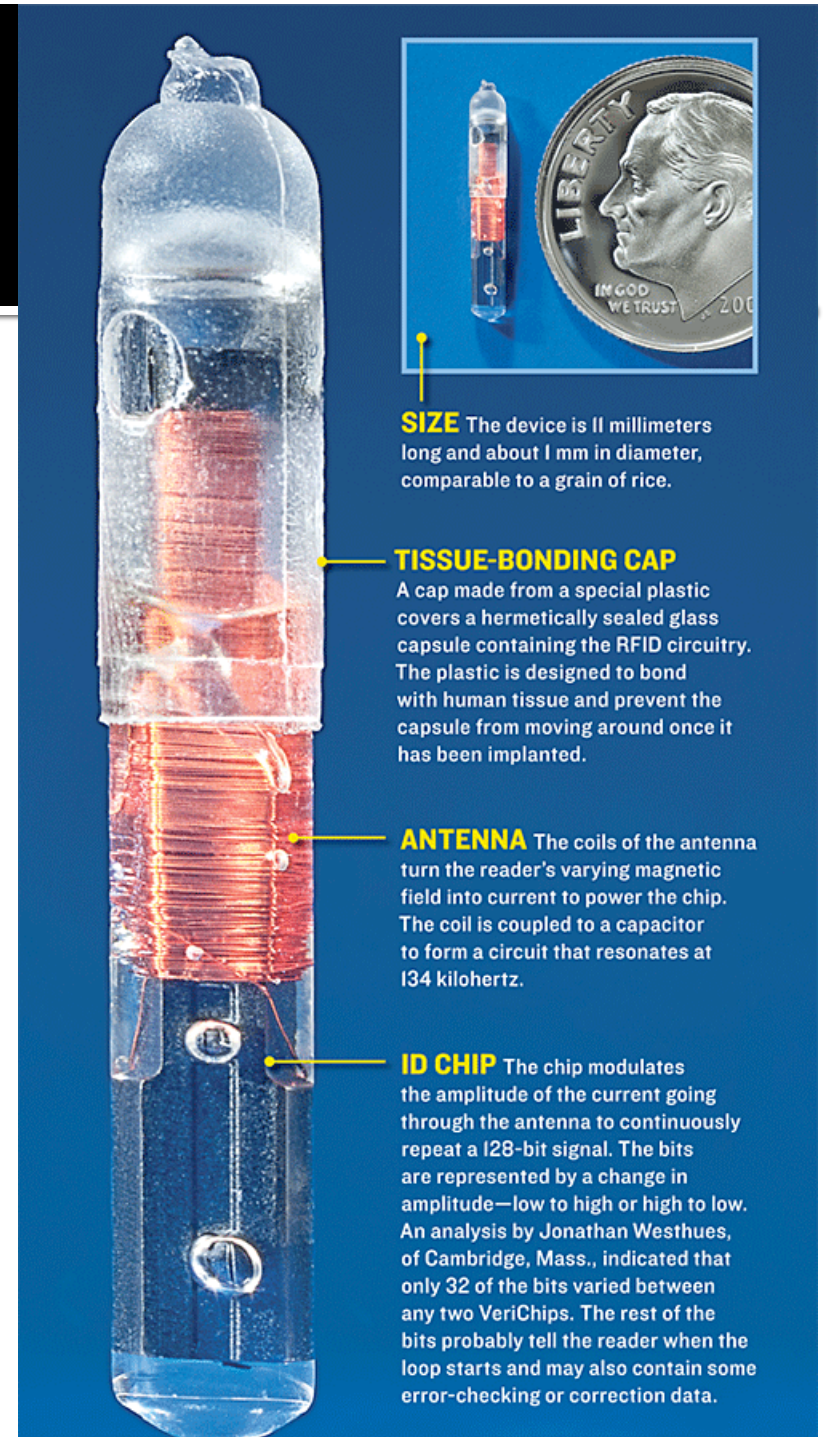
<http://images.businessweek.com/ss/06/01/medtech/image/verichip.jpg>



<http://www.rfidjournal.com/imagecatalogue/imageview/5154/?RefererURL=/article/articleview/4055/>

VeriChip

- Received permission from USFDA to market VeriChip in 2004
- 2000+ implants as of 2007
- ~\$200
- 16-digit code (128-bits)



VeriChip -> PositiveID

- “Although currently PositiveID does not actively market the VeriMed system, it continues to support existing patients and healthcare facilities.”

-PositiveID website FAQ

Current and Proposed Uses

- Medical Records
- Immigration
- Security Authentication
- Kidnapping Prevention
- Tracking of criminals/parole....and sick people?

Medical Records

- # of record in secure database
- Focus market: Cancer patients, people w/ pacemakers, or people who might be cognitively impaired



Medical Records - Issues

- Detection:
 - How does ER staff know you have a VeriChip?
 - Bracelet? Tattoo?
 - Big problems if not detected
 - Does hospital have RFID reader?
- Health Issues **CAUSED** by chip?

Medical Records - Issues

The potential risks to health associated with the device are:

adverse tissue reaction; migration of implanted transponder; compromised information security; failure of implanted transponder; failure of inserter; failure of electronic scanner; electromagnetic interference; electrical hazards; magnetic resonance imaging incompatibility; and needle stick.

-USFDA

<http://www.spsychips.com/devices/verichip-fda-letter.pdf>

Immigration

- CEO of VeriChip proposed implants in immigrants and guest workers to assist the government in later identifying them
- President of Columbia quoted telling a US senator that he would agree to require Columbian citizens to be implanted before they could gain entry into the US for seasonal work

Immigration - Issues

- Who pays for it? Maintenance? Problems w/ chip? Cloning?
- Dangerous Precedent
- Similar to branding cattle or tattoos the Nazis forced on their victims in concentration camps?

Security

- Suggested use by VeriChip
- 2004: Mexico's attorney general Carlos Altamirano and staff receive VeriChip implants for the purposes of "access, for security".



http://msnbcmedia1.msn.com/j/msnbc/Components/Photos/040714/040714_mexicoChip_hmed_3p.hmedium.jpg

Security - Issues

- Lack of encryption
 - Power/memory constraints prevent any security measures, rolling code and challenge-response authentication systems being worked on
- Unauthorized reading
 - Few laws preventing
 - Hand held readers ~\$250
 - Make your own?
- Cloning

Kidnapping Prevention / Tracking

- 2000+ Mexican citizens have had tags implanted for the purpose of tracking in case they are kidnapped
- No GPS capabilities in current RFID implants..
- CEO of VeriChip's parent company
“concedes that the company's Mexican distributor may not have tried very hard to dispel the notion that VeriChips have GPS capabilities, which would be required for real remote tracking” [McHugh]

Need for Control and Regulation

- life in the U.S. will become difficult for those who do not want a chip inside them (in much the same way as it is currently difficult for anyone without a credit card, cellphone, email address or internet access
- <http://industry.bnet.com/pharma/10005641/positiveid-deal-advances-use-of-microchip-implants-in-florida-health-system/>).

Need for Control and Regulation

If there were a societal benefit, could a government require individuals to modify their bodies? For public health purposes, the answer is yes. In the United States, for example, students must have certain immunizations before attending public school.

-Foster & Jaeger

Control and Regulation

- Little legislation
 - Washington (2008) – Unauthorized Reading
 - California, Georgia, North Dakota, Virginia, Wisconsin – Prohibits forced RFID implants
 - 28(?) other states w/pending RFID legislation
- Need a comprehensive set of regulations
- EPIC – Electronic Privacy Information Center
 - “Public interest research center”
 - “No clients, no customers, no shareholders”

EPIC Guidelines

- Give notice of:
 - Tag Presence
 - Reader Presence
 - Reading Activity
- Removal
- Anonymity Priority
- Security
- Openness
- Accountability
- Rights
 - Access
 - Removal
 - Accountability

Conclusion

RFID implants can be powerful tools if used while being conscious of their vulnerabilities or if sufficient advances in the technology are made.

Even though RFID implants aren't widely deployed at this time, legislation needs to be put in place to prevent potential issues from turning into real issues.

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Questions?

Be gentle.....