Analyst Report
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Aurgalys is contracted by Quantum Genomics to provide equity research

Aurgalys

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Quantum Genomics

Alternext: ALQGC [FR0011648971]

July 8th, 2015

Share Price: €10.35
(as of July 8th, 2015)

Estimated Price: €12.66

High/Low (€) since Jan. 1st, 2015	14.27/5.37
Market Cap (€M) (as of Jul. 8th, 2015)	71.0
Estimated Net Cash (€M)	9.7
Estimated Market Cap. (€M)	86.8
Number of shares (M)	6.86
Estimated price (€)	12.66
Volume 3-month average	86,000
Free float	43.2%
12-month Dividend Forecast (€)	0.00

	2013	2014	2015e	2016e
EPS (€)	(0.38)	(0.46)	(0.57)	(0.80)
Diluted EPS (€)	(0.33)	(0.40)	(0.52)	(0.73)

Quantum Genomics

Quantum Genomics accelerates clinical development of QGC101 in Congestive Heart Failure

Quantum Genomics, developing cutting-edge drugs addressing unmet medical needs in the field of cardiovascular diseases, announced it would accelerate the clinical development of QGC101 in Congestive Heart Failure (CHF). Originally planned in 2017, the phase 2a clinical study has now been scheduled to begin in mid-2016. This decision was taken after successfully demonstrating efficacy in animal models. This preclinical study in dogs was performed by Quantum Genomics' partner, a major animal health pharmaceutical company responsible for assessing the drug potential. Under the terms of the agreement signed in 2014, the pharmaceutical partner has 6 months to exercise an option to further develop and market the drug in the field of animal health, which could provide recurring revenues to Quantum Genomics. Considering the new clinical program in congestive heart failure in humans, and the pending option for QGC101 licensing agreement in animal health, we increased our valuation of Quantum Genomics to €12.66/share.

Congestive Heart Failure, a strong health-economic burden driven by aging

Congestive heart failure (CHF) is the 3rd leading cause of mortality among cardiovascular diseases, after stroke and myocardial infarction. According to the European Society of Cardiology, CHF affects 1-2% of adults in developed countries, and the prevalence significantly increases with aging, exceeding 10% in people over 70 years old. In France, the prevalence of the disease is 2.3% in adults, and about 1.8% in the general population (INVS, Institut National de Veille Sanitaire). In Europe and the US alone, it is estimated that more than 20 million people are living with CHF, and the American Heart Association estimates that this number could increase by 25% in 2030. Moreover, as many as 50% of heart failure patients die within five years of diagnosis. Patient management and cost associated with CHF represent a strong economic burden. In western countries, heart failure is the leading cause of hospitalization for patients over 65 years old. In the US, heart failure healthcare expenses represented $21B in 2012, with the majority of costs

related to hospitalizations. This figure is expected to reach $51B by 2030. (Heidenreich et al, 2013).

CHF is a structural and functional chronic cardiovascular disease, characterized by the inability of the heart to pump an adequate volume of blood to fulfill the body requirements (Figure 1). CHF generally originates from prolonged dysfunctionalities in the cardiovascular machinery, leading to subsequent damages on the heart muscle, ventricular impairment and gradual weakening of the heart due to overuse. The main causes for CHF are coronary heart disease (CHD), myocardial infarction and high blood pressure (hypertension). For instance, studies showed that the lifetime risk to develop CHF doubles for people with high blood pressure (Lloyd-Jones et al, 2002). Other common causes are valve disease, congenital heart disease, cardiomyopathy, endocarditis, severe lung disease, obesity and diabetes.

CHF-related costs to reach $51B by 2030 in the US

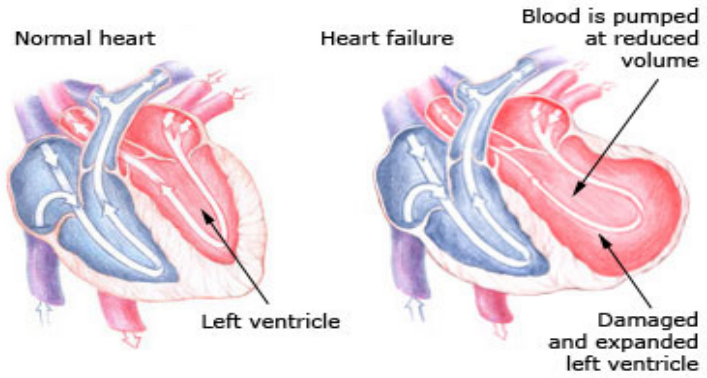

Figure 1. Damages occurring in heart failure patients (Source: http://www.smerete.com/heart-failure-types-symptoms-and-causes/)

People with heart failure are categorized into 4 different groups, from I to IV of severity, according to the New York Heart Association (NYHA, see Table 1). About 30-40% of heart failure patients suffer from moderate/severe class II-III heart failure with low ejection fraction, and 10% have advanced or NYHA class IV heart failure (source: Mesoblast). For people with moderate CHF (class I-III), several drugs are used to prevent disease progression, including ACE inhibitors/ARB antagonists, beta-adrenergic receptor blocking agents, and diuretics. For people with severe and end-stage CHF (Class IV), the only treatment options are heart transplant, and medical devices.

Table 1. Stages of congestive heart disease, Source: New York Heart Association (NYHA)

Class	Symptom
I	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea (shortness of breath).
II	Slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea (shortness of breath).
II	Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes fatigue, palpitation, or dyspnea.
IV	Unable to carry on any physical activity without discomfort. Symptoms of heart failure at rest. If any physical activity is undertaken, discomfort increases.

QGC101: first-in-class drug candidate in congestive heart failure

QGC101: First-in-class drug for the treatment of CHF

Despite the large number of drugs available, heart failure is still a disease of strong medical needs. Moreover, very few pharmacological innovations have been recorded in the past decade. Current medicines are mainly RAS-acting molecules (RAS, Renin-Angiotensin System), such as ACE inhibitors/ ARB antagonists, beta-adrenergic receptor blocking agents and diuretics, which have historically been used in other cardiovascular pathologies such as hypertension.

Quantum Genomics develops a new class of centrally active molecules targeting the Brain Renin-Angiotensin System. The Renin-Angiotensin System (RAS) is a complex chain of enzymatic reactions involving several organs in the body and responsible for blood pressure regulation. Quantum Genomics' expertise, and intellectual property result from 15 years of research in 2 major French institutes (INSERM and Collège de France), which established the critical role of the local brain-RAS in blood flow regulation. Moreover, these research institutes demonstrated the central role of an enzyme, brain aminopeptidase A (APA), which is responsible for the synthesis of angiotensin III, the main effector in the brain RAS. Angiotensin III increases blood pressure through 3 mechanisms of action (Figure 2):

- increase in vasopressin level
- increase in the sympathetic nerve activity
- inhibition of the baroreflex.

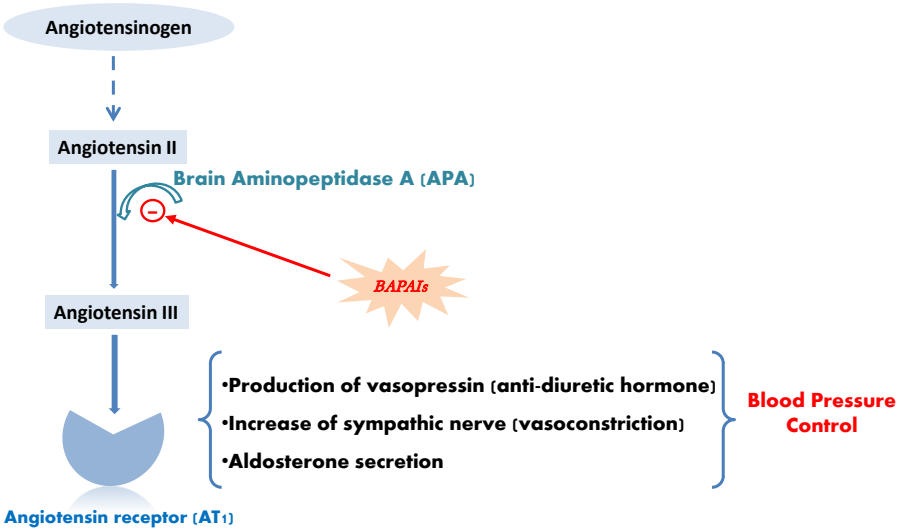

Figure 2. BAPAI mechanism of action

Based on this mechanism, Quantum Genomics developed Brain Aminopeptidase A Inhibitors (BAPAIs), first-in-class drugs targeting brain APA. So far, BAPAI have shown promising preclinical results, demonstrating the relevance of developing further this new class of drugs, for severe cardiovascular diseases such as hypertension and heart failure. QGC101 is a preclinical stage drug candidate for CHF treatment. Should the drug

demonstrate efficacy in human patients, it would be a serious candidate to address the needs of heart failure patients, but also those of pharmaceutical companies seeking to innovations to renew their pipeline.

QGC101 clinical status

On June 29th, 2015, Quantum Genomics announced positive preclinical results of QGC101 in heart failure. It was demonstrated that QGC101 could significantly improve cardiac ejection fraction in dogs treated over a 28-day period. These results were obtained from a collaboration with a large pharmaceutical company, in the field of animal health, signed in February 2014. The partner has 6 months to exercise an option to further develop the drug in animal health and market the drug. Should the option be exercised, Quantum Genomics could generate short term revenues through milestone payments and royalties on sales, in a licensing agreement in animal health that still has to be negotiated. Marketing approval in dogs could be granted after 2 to 3 years of development.

QGC101's Phase 2a to start in mid-2016

Following the positive preclinical results obtained by its partner in animal health, Quantum Genomics announced it would accelerate the clinical development of QGC101 in human. The phase 2a trial is expected to start in mid-2016, instead of 2017, and should last 2 years. Although QGC101 demonstrated efficacy in improving cardiac ejection fraction in dogs, Quantum Genomics still needs to perform additional preclinical studies in rodents, which will be conducted in partnership with the University of Ottawa Heart Research Institute, and the Center for Interdisciplinary Research in Biology at Collège de France.

Since the company already demonstrated the good safety and tolerance profile of the drug in healthy human volunteers, QGC101 could directly enter Phase 2a clinical trial. In case of positive results, Quantum Genomics could license the drug to a large pharmaceutical company which will ensure further clinical development and marketing.

QGC101 market potential

• Human health

According to BCC Research, the global pharmaceutical market for CHF was $11.2B in 2010 (expected to grow to $18.6B in 2016). However, a more recent market research report from Decision Resources Group indicated that the total heart failure drug market is expected to grow from $2.9 billion in 2013 to $8.9 billion in 2023, driven by the growing aging population. The upcoming approval (2015 in the US and 2016 in Europe) of Novartis's LCZ696, a new drug combination of a neprilysin inhibitor (sacubitril) with an angiotensin II antagonist (valsartan), is expected to significantly contribute to the market growth, as the drug sales forecast are estimated between $2B and $5B by 2023 (Reuters). Owing to the upcoming expiration of several major patents, generic drugs are expected to capture a larger share of the market, to the detriment of large pharmaceutical companies.

QGC101's peak sales could reach €1B (human health)

QGC101 sales in the heart failure indication were estimated considering 3 territories: North America (USA + Canada), Europe (EU28) and Asia (Japan + South Korea + China). We considered a heart failure prevalence of 2.3% in the adult population (INVS) and a treatment rate ranging from 25% to 80% depending on the country, which is the estimated number of people with the disease that are actually under medication. Due to the growing number of generics and the arrival of Novartis's LCZ696 in the heart failure market, we considered a market penetration of 10 % for QGC101, and an annual cost per patient from €250 (China) to €650 (USA). Considering these assumptions, we estimate QGC101 peak sales in congestive heart failure could reach €1 B (see Table 2).

Table 2. Sales estimates for QGC101 in CHF (Source: Aurgalys).

	2015e	2016e	2017e	2018e	2019e	2020e	2021e	2022e	2023e	2024e
Population +20yo (M)	2639,7	2662,1	2684,7	2707,6	2730,9	2754,4	2778,3	2802,4	2826,9	2851,8
CHF prevalence (M)	60,7	61,2	61,7	62,3	62,8	63,4	63,9	64,5	65,0	65,6
Hypertension related CHF (M)	60,7	61,2	61,7	62,3	62,8	63,4	63,9	64,5	65,0	65,6
Undermedication (M)	25,5	25,6	25,8	26,0	26,1	26,3	26,5	26,7	26,9	27,0
Penetration	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
QGC101 sales (m€)	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**28,4**	**174,9**

	2025e	2026e	2027e	2028e	2029e	2030e	2031e	2032e	2033e	2034e
Population +20yo (M)	2877,0	2902,5	2928,3	2954,5	2981,1	3008,0	3035,3	3063,0	3091,0	3119,4
CHF prevalence (M)	66,2	66,8	67,4	68,0	68,6	69,2	69,8	70,4	71,1	71,7
Hypertension related CHF (M)	66,2	66,8	67,4	68,0	68,6	69,2	69,8	70,4	71,1	71,7
Undermedication (M)	27,2	27,4	27,6	27,8	28,0	28,2	28,4	28,6	28,8	29,0
Penetration	5%	8%	10%	10%	3%	1%	0%	0%	0%	0%
QGC101 sales (m€)	**523,9**	**834,8**	**953,5**	**980,9**	**296,3**	**89,5**	**27,0**	**8,2**	**2,5**	**0,7**

• Additional revenues in animal health

QGC101's peak sales to reach €30 M (animal health)

The total animal health market including drugs, vaccines, medicated food additives and parasiticides, was estimated to be $23B in 2014 (Zoetis). According to the consulting company Vetnosis, there are approximately 225 million of owned dogs worldwide. In the United States, the Humane Society estimates to 78.2 million the number of owned dogs. In Europe and according to the World Society of the Protection of Animals, the number of owned dogs varies from 5-7 million in each of the top-5 countries.

To estimate QGC101 revenues in congestive heart failure, in dogs, we only took into account the North American and European markets (115 million dogs). With an estimated prevalence of 2.0%, we estimate that 2.3 million of dogs suffer from CHF. The yearly price for CHF in dogs was estimated using currently available drugs as a benchmark (Enacard, Vetmedin…). In our model, we estimated the average treatment cost of €265. Interestingly, according to the American Veterinary Medicine Association, no more than 50% of dog owners would spend more than $500 per year to support healthcare expenses for their dog. In this study, it is also revealed that 20% of dog owners would not bring their pet to the vet, primarily because they do not believe their dog is sick (49% of respondents), but also because they cannot afford the expenses (29% of respondents). This suggests that current pet owner habits on drug spending could limit market penetration of QGC101 (50% treatment rate and 10% market penetration rate). The resulting peak sales estimate from our assumptions is €30 M (See Table 3).

Table 3. QGC101 sales estimates in CHF in dogs (Source: Aurgalys)

	2015e	2016e	2017e	2018e	2019e	2020e	2021e	2022e	2023e	2024e
# dogs top5 EU + USA (M)	115,0	115,0	115,0	115,0	115,0	115,0	115,0	115,0	115,0	115,0
Dogs with CHF (M)	2,3	2,3	2,3	2,3	2,3	2,3	2,3	2,3	2,3	2,3
Under medication (50%)	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Penetration (%)	0,0%	0,0%	0,1%	0,5%	1,9%	5,0%	8,1%	9,5%	9,9%	10,0%
QGC101 sales (€M)	-	-	**0,4**	**1,5**	**5,7**	**15,2**	**24,8**	**29,0**	**30,1**	**30,4**

	2025e	2026e	2027e	2028e	2029e	2030e	2031e	2032e	2033e	2034e
# dogs top5 EU + USA (M)	115,0	115,0	115,0	115,0	115,0	115,0	115,0	115,0	115,0	115,0
Dogs with CHF (M)	2,3	2,3	2,3	2,3	2,3	2,3	2,3	2,3	2,3	2,3
Under medication (50%)	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Penetration (%)	10,0%	10,0%	10,0%	10,0%	3,0%	0,9%	0,3%	0,1%	0,0%	0,0%
QGC101 sales (€M)	**30,5**	**30,5**	**30,5**	**30,5**	**9,1**	**2,7**	**0,8**	**0,2**	**0,1**	**0,0**

Valuation of Quantum Genomics

We valued Quantum Genomics using the Risk-adjusted Net present Value (rNPV). We only valued QGC001 (hypertension) and QGC101 (CHF) clinical programs, and the potential partnership in animal health. Quantum Genomics' revenues were estimated based on licensing agreements, which could occur after obtaining phase 2a results (proof of efficacy). Cash flows were discounted using a 15% discount rate. Quantum Genomics' enterprise value is €77.1M. With €9.7M of estimated net cash, the valuation of the company is €86.8M or €12.66/share.

Table 4. Valuation of Quantum Genomics (Source: Aurgalys)

Program	Indication	Marketing	Success rate	Peak sales (€M)	rNPV (€M)	% EV
QGC001	Hypertension	2022	34%	1,500	46.4	60%
QGC101	Congestive heart failure - Human	2023	27%	1,000	22.2	29%
QGC101	Congestive heart failure - Dog	2017	80%	30	8.5	11%
EV		-	-	-	77.1	100%
Net cash		-	-	-	9.7	
Market cap.		-	-	-	86.8	

- **Valuation of QGC001**

QGC001 is the lead drug candidate of the company, currently in phase 2a clinical trial in patients with moderate hypertension. Results from this study are expected by mid-2016. Positive results could trigger a licensing agreement with a pharmaceutical partner, to further develop and market the drug. Our valuation of QGC001 remains unchanged from our previous analyst report (dated February 25th, 2015).

- **QGC101 in human's congestive heart failure**

QGC101's phase 2a study is scheduled for mid-2016 and should last about 2 years. The partner would assume further development costs and marketing of the drug that could occur in 2023, with a 27% success rate, according to our assumptions. On the basis of a partnership signed in 2018, we estimated that Quantum Genomics could claim a 12% royalty rate on sales, and total milestone payments of €130 M, including a €9 M upfront. The resulting rNPV of QGC101 from these assumptions is €22.2 M.

Euronext since Jan. 1st, 2015	
Quantum Genomics	+107.4%
Alys France*	+18.0%
Next Biotech	+17.9%
CAC Pharma.&Bio.	+15.1%
CAC 40	+8.6%
CAC Small	+17.1%

** Index of French smallcaps (less than €1B market capitalization at time of inclusion) in the healthcare and life sciences sector, listed on Euronext Paris.*

See http://www.aurgalys.com/aurgalys-indices

- **QGC101 in animal health**

Although Quantum Genomics did not communicate on the full results obtained in dogs, we decided to include the animal health indication, as it could generate short- to mid-term revenues for the company, through a licensing agreement secured with its partner. In this model, we considered that the partner would still have to complete another study (equivalent to a phase 3 trial), before filing and marketing the drug. We hypothesize that the drug could be marketed in 2017, with a 80% success rate. Quantum Genomics revenue stream on this indication was estimated with a 20% royalty rate on sales. Although the company would likely receive milestones payments, they were not included in our valuation model. Using a 15% discount rate, we value QGC101 in congestive heart failure in dogs at €8.5 M.

Stock Performance

Since its first public offering in February 2015, Quantum Genomics' shares were characterized by a strong volatility, driven by the strong interest of investors, (+81.6% since January 1st, 2015). In March, the French Life Sciences and Healthcare sector was negatively impacted by Genfit's mitigated phase 2b results on its Golden trial in NASH: the Alys France and the Next Biotech indices dropped by 12.7% and 10.8% respectively. For the same period of time, Quantum Genomics' shares lost 11.3%. However, in June 2015, Quantum Genomics experienced its best monthly performance (+57.1%) since the beginning of the year, reaching an all-time high of €14.27/share in June 19th, 2015, probably due to investors anticipating the publication of preclinical results in dogs. The investor enthusiasm was obviously dampened since then due to a particularly difficult macroeconomic environment, and more specifically with the crisis on Greece's debt. Quantum Genomics' trading volumes has significantly increased since the beginning of the year (15,000 in January vs 160,000 in June) and Quantum Genomics' shares closed at €10.35 on July 8th, 2015.

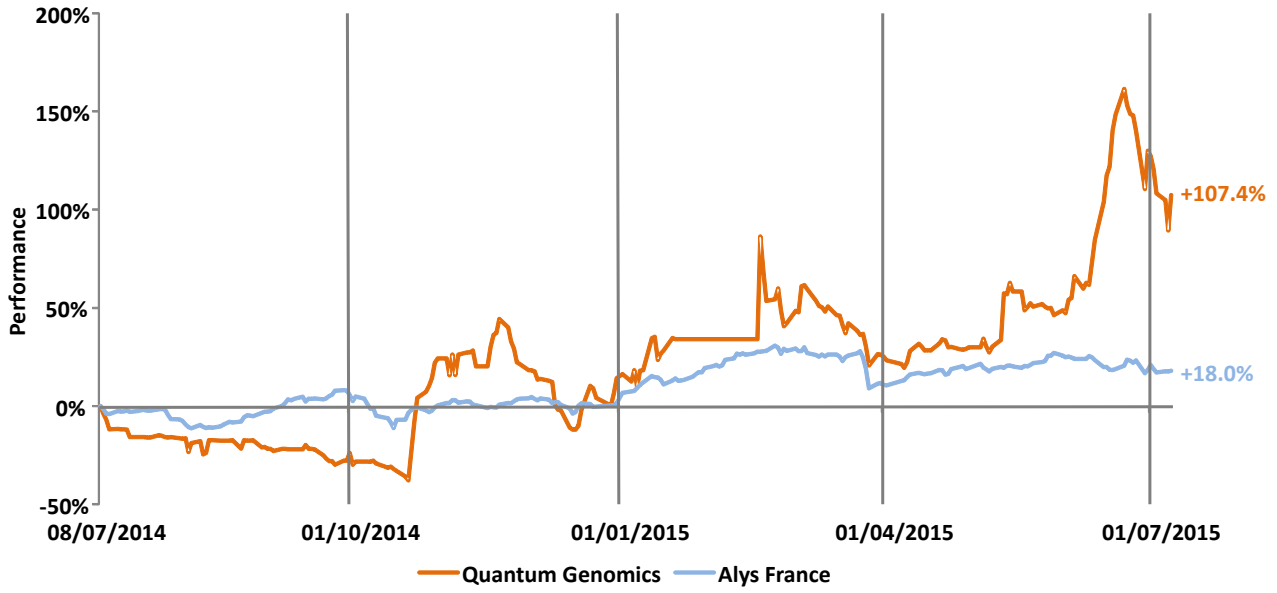

Figure 3. Quantum Genomics' one-year stock performance as of July 8th, 2015, compared to other French smallcaps of the healthcare and life sciences sector (Alys France Index)

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Aurgalys launched on October 2013, the Alys France index measuring the performance of the 59 French smallcap companies (less than €1B of market capitalization) listed on Euronext/Alternext Paris. Four other indices also measure the performance of companies dedicated to the development of therapeutic molecules (Alys Therapeutics), diagnostic tests (Alys Diagnostics), medical devices (Alys Medtech) and Greentech (Alys Greentech). You can find our reports on our website at http://www.aurgalys.com/aurgalys-indices

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